

**NASA**

National Aeronautics and  
Space Administration

# Budget Estimates

FISCAL YEAR 1980

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1980 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

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RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1980 ESTIMATES

GENERAL STATEMENT

The Research and Program Management appropriation funds the performance of research, technology and test activities at NASA Centers, and the planning, management and support of contractor research and development activities necessary to meet the Nation's objectives in space and aeronautics research. The objectives of activities funded under Research and Program Management are to (1) to 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) to maintain facilities and laboratories in a state of operational capability and to manage their use in support of research and development programs and (3) to provide effective and efficient technical and administrative support for the research and development programs.

The more than 22,000 civil service personnel funded by the Research and Program Management appropriation represent NASA's most important resource and are the strength on which the future of space and aeronautics research activities depend. Three-fourths of this appropriation is required to cover their salaries and related costs. About two percent of the appropriation is for the travel which is vital to successfully manage the Agency's research and development programs. The remaining twenty-three percent provides for research, test and operational facility support and for related goods and services necessary to successfully operate the NASA Centers and to efficiently accomplish NASA's approved missions.

Each installation is assigned certain principal roles of fundamental importance in meeting NASA's overall program goals. These roles reflect the intrinsic competence of the installations on the basis of demonstrated capabilities and capacities. They are summarized as follows:

Ames Research Center: Principal roles include short haul aircraft and rotorcraft systems technology, computational fluid dynamics, planetary probes, and life sciences.

Dryden Flight Research Center: Principal roles include aeronautical flight testing, research and operations, as well as providing a contingency recovery landing site for Space Shuttle flights.

Goddard Space Flight Center: Principal roles include the development and operation of earth orbital flight experiments and automated spacecraft to conduct scientific investigations and demonstrate practical applications; and the management of the tracking and data acquisition activities for earth orbital missions; and management of the Delta launch vehicle.

Johnson Space Center: Principal roles include management of the integrated Space Shuttle program and of the Orbiter development project; astronaut training; mission planning, operation and control; and application of remote sensing to agricultural assessments and other earth resources uses.

Kennedy Space Center: Principal roles are the launch of payloads on expendable launch vehicles, the launch of Space Shuttle operational test flights, and preparation for launch of Shuttle operational missions.

Langley Research Center: Principal roles include long haul aircraft systems 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 include aeronautical propulsion technology; space and terrestrial energy systems; and management of the Centaur expendable launch vehicle.

Marshall Space Flight Center: Principal roles include 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; management of large automated spacecraft projects such as the Space Telescope and High Energy Astronomy Observatory; experiments in materials processing in space; and solar heating and cooling.

The National Space Technology Laboratories: Principal roles are support of Space Shuttle engine development and testing; regional earth resources research and technology transfer; and support functions for other Government agencies located there.

Wallops Flight Center: Principal roles include management and launch of sounding rockets and balloons; and operation of an instrumented flight range.

The 1980 budget provides the necessary resources to apply these inhouse capabilities to the appropriate program activities. A summary description of, and the funding required for each functional category, are as follows:

1. Personnel and Related Costs includes salaries and benefits for NASA civil service personnel, and for personnel of other Government agencies detailed to NASA. This category also includes supporting personnel costs, such as moving expenses (excluding travel of personnel), recruiting and personnel investigation services provided by the Office of Personnel Management, and personnel training.

2. Travel includes the cost of transportation, per diem, and other associated expenses required for the direction, coordination, and management of program activities for both research and development and construction of facilities; for contract management; for flight mission support; for travel to overseas development, launch and tracking sites; for travel to meetings and technical seminars; and for all local and relocation travel expenses,

3. Facilities Services includes rental of real property, the cost of maintenance and related services, engineering, custodial services, minor modifications and utilities services.

4. Technical Services includes the cost of general purpose automatic data processing, the dissemination of scientific and technical information derived from the research and development programs, as well as shop and other technical services.

5. Management and Operations Support includes the cost of administrative communications, printing and reproduction, administrative supplies, general purpose materials and equipment, transportation (excluding travel of personnel), medical services and other support services.

Summary of the Budget Plan by Function

	<u>1978</u>	<u>1979</u>		<u>1980</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)		
Personnel and Related Costs.....	677,450	695,093	720,924	727,176
<b>Travel</b> .....	17,042	18,741	18,573	19,797
Facilities Services.....	91,965	102,841	100,757	113,190
Technical Services.....	40,435	40,357	39,723	42,288
Management and Operations Support.....	<u>62,614</u>	<u>56,968</u>	<u>61,492</u>	<u>62,449</u>
Total.....	<u>889,506</u>	<u>914,000</u>	<u>941,469</u>	<u>964,900</u>

SUMMARY OF CHANGES FROM 1979 BUDGET ESTIMATE TO 1979 CURRENT ESTIMATE

The changes that have occurred in **NASA's** R&PM plans in the past year can be summarized as follows:

1. A net increase of \$27,469,000 reflecting the reduction in the appropriation request of \$3,500,000 as a result of Congressional action, offset by a request for supplemental appropriations of \$30,969,000 to cover the cost of unbudgeted pay raises. The supplemental is part of the President's Government-wide request, and covers the October 1978 general wage increase, and the various Center's wage board increases. The gross amount of these increases in 1979 amounts to \$35,080,000. Because of savings effected as a result of the President's freeze on hiring and the directed reduction in staffing of more than 400 permanent positions below the 1979 budget estimate, **NASA** is able to absorb \$4,111,000 of the cost within the existing appropriation. Therefore, the supplemental request is for \$30,969,000.
2. The net effect of many management actions to provide for, and offset, higher than anticipated increases in utility rates and in the wage rates in our support service contracts.

The current estimate for 1979, including the proposed supplemental appropriation of \$30,969,000, is \$941,469,000.

BASIS OF THE 1980 ESTIMATE

The budget estimate for 1980 of \$964,900,000, an increase of \$23,431,000 over the current 1979 requirement, provides for the personnel and related costs of 22,563 full-time permanent civil service people (a further reduction of 268 from the revised 1979 level), the full year effect of currently negotiated rate increases in support service contracts; increased utility rates; and increased costs of supplies, materials, and equipment, which continue to rise faster than conservation efforts can offset. The 1980 R&PM request, by functional category, is summarized as follows:

1. Personnel and Related Costs are \$727,176,000 for 1980. This represents an increase of \$6,252,000 over 1979; and is the net effect of (1) the full year savings of the 1979 staffing reduction, (2) the partial year savings of the 1980 decrement in personnel, (3) the net of within-grade advances, career development, and turn-over savings, and (4) the cost of two extra paid days in 1980. The latter is caused by a combination of 1980 being a leap year and the number of weekends included that result in an increase of two paid days over the normal 260 days in 1979 to 262 days in 1980. The cost of these two extra days is estimated to be \$4,966,000.

2. Travel costs in 1980 will be \$19,797,000, an increase of \$1,224,000 over the 1979 estimate. The travel of civil service personnel to contractor plants, launch and tracking sites, technical meetings and seminars for the accomplishment and coordination of technical and administrative matters is an essential element in the success of the Nation's aeronautics and space programs. The increase planned in 1980 is required to meet 1980 program milestones.

3. Facilities Services are estimated to cost \$113,190,000, which is \$12,433,000 above the 1979 requirement. This increase is the net result of the full year effect of contract wage rates, utility rates, and supplies, materials and equipment price level increases; and the increase in the level of contractor manpower levels at the Kennedy Space Center in support of the Space Transportation System operations.

4. Technical Services are estimated at \$42,288,000 for 1980. The increase of \$2,565,000 over the 1979 estimate results from the full year cost of increases in the price levels for the goods and services required.

5. Management and Operations Support is estimated at \$62,449,000 in 1980. This is an increase of \$957,000 over the estimated 1979 amount, and results from the full year effect of price increases for communications, printing and other installation common services.

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

#### PERSONNEL AND RELATED COSTS

##### A. COMPENSATION AND BENEFITS:

###### 1. Compensation:

a. Permanent Positions: This part of Personnel and Related Costs covers the salaries of the full-time permanent civil service workforce, and is the largest portion of Personnel and Related Costs. In 1980 the funds will support an end-year employment level of 22,563 people. That level represents a reduction of almost 700 from the 1979 level presented last year, and a reduction of over 12,500 from the peak employment level reached in fiscal year 1968.

b. Nonpermanent: This category includes the salaries of NASA's other than full-time permanent personnel. Programs, such as the students participating in cooperative training, summer employment, youth opportunity, and temporary clerical support, are covered in this category. Also included is the NASA Part-time Permanent Seed Program which was established in October 1978 to encourage the employment of persons who are not able to work full time. This program is in response to a Government-wide policy and the need to experiment with several approaches before committing to specific programs.

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.

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 nonpermanent personnel. The incentive awards provide cash awards for outstanding achievement by NASA employees, superior performance awards, and for improvements of a Center's operations. 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 security investigations on new hires, for recruitment advertising, career-maturity surveys, and any requested investigation of formal discrimination complaints.

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.

## TRAVEL

### A. Program Travel:

The largest part of travel is for direction, coordination and management of program activities. The complexity of the programs involved and the geographical distribution of NASA Centers and contractors and subcontractors 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 this purpose is directly related to both the number and complexity of the launches.

### B. Scientific and Technical Meeting 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 in the field which arise outside NASA, as well as allowing personnel to present both accomplishments and problems to their associates. Many of the Government-sponsored meetings are working panels convened to solve certain problems for the benefit of the Government.

### C. Management 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 Centers, including bus and taxi services and rental of motor vehicles; travel of unpaid members of research advisory committees; and initial duty station, permanent change of assignment, and other family travel expenses.

## FACILITIES

### A. 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 for in existing buildings at the NASA Centers. 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 the rental of trailers required to accommodate special short-term needs.

B. Maintenance and Related Activities:

Maintenance and related activities includes the recurring day-to-day maintenance of facilities (grounds, buildings, structures, etc.) and of their 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 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 inter-communications and television monitoring equipment.

C. 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; light fixture replacement; and laundry and dry cleaning of facility-related items.

D. Utilities Services:

Utilities services include the purchase of utilities including 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 operating costs of the utility plants and systems and the cost of plant maintenance.

## TECHNICAL SERVICES

### A. Automatic Data Processing:

#### 1. 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 to operational systems which is funded from the Research and Development appropriation.

#### 2. Operations:

Operations services include programming, computer operations and related services. Institutional-type applications include payroll, personnel data, logistics, and procurement records and reports.

### B. Scientific and Technical Information and Educational Programs:

#### 1. Libraries:

The technical libraries are established to provide Center staffs with books, periodicals, technical reports, and other documentation.

#### 2. 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, and takes such form as press kits, news releases, television and radio information tapes and clips, and feature material.

### C. Shop Support and Services:

Shop support and services include general fabrications shops, reliability and quality assurance activities, safety, photographic services, graphics, and audio visual material.

## MANAGEMENT AND OPERATIONS

### A. Administrative Communications:

Included in this category are costs of leased lines; long distance tolls; teletype services; and local telephone service.

### B. 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.

### C. 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 are also in this category.

### D. 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; operation of photocopy equipment; chart and related art work; and postage.

DISTRIBUTION OF PERMANENT POSITIONS BY INSTALLATION

<u>Installation</u>	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
Johnson Space Center .....	3.532	3.546	3.509	3.445
Kennedy Space Center .....	2.179	2.207	2.193	2.187
Marshall Space Flight Center .....	3.760	3.715	3.636	3.561
National Space Technology Laboratories .....	102	104	104	103
Goddard Space Flight Center .....	3.575	3.548	3.468	3.440
Wallops Flight Center .....	407	408	398	395
Ames Research Center .....	1.669	1,677	1,666	1,653
Dryden Flight Research Center .....	490	490	480	461
Langley Research Center .....	3.071	3.069	3.015	2.990
Lewis Research Center .....	2.921	2.938	2.858	2.835
Headquarters .....	<u>1,531</u>	<u>1,535</u>	<u>1,504</u>	<u>1.493</u>
Total. Permanent Positions .....	<u>23,237</u>	<u>23.237</u>	<u>22.831</u>	<u>22.563</u>

SUMMARY OF BUDGET PLAN BY INSTALLATION  
(Thousands of Dollars)

Johnson Space Center .....	146.654	150.296	154.163	156.466
Kennedy Space Center .....	113.765	118.431	120.907	128.149
Marshall Space Flight Center .....	143.445	140.857	148.276	148.884
National Space Technology Laboratories .....	2.732	3.488	4.527	4.689
Goddard Space Flight Center .....	123.853	124.139	128.230	131.197
Wallops Flight Center .....	15.020	15.205	15.493	16.330
Ames Research Center .....	57.730	59.212	63.761	65.839
Dryden Flight Research Center .....	18.247	19.481	19.557	19.791
Langley Research Center .....	102.019	104.579	107.996	110.258
Lewis Research Center .....	84.916	93.780	92.513	95.800
Headquarters .....	<u>81.125</u>	<u>84.532</u>	<u>86.046</u>	<u>87.497</u>
Total .....	<u>889,506</u>	<u>914.000</u>	<u>941.469</u>	<u>964.900</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1980 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

DISTRIBUTION OF PERMANENT POSITIONS BY PROGRAM

<u>Program Office and Program</u>	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
<u>SPACE TRANSPORTATION SYSTEMS</u> .....	<u>6.832</u>	<u>6.883</u>	<u>6.617</u>	<u>6.503</u>
Space Shuttle.....	5.286	4.412	4.909	4.355
Space flight operations.....	1.081	2.082	1.300	1,791
Expendable launch vehicles.....	465	389	408	357
<u>SPACE SCIENCE</u> .....	<u>2.357</u>	<u>2.313</u>	<u>2.346</u>	<u>2.089</u>
Physics and astronomy.....	1,838	1,788	1,836	1,612
Planetary exploration.....	255	267	246	215
Life sciences.....	264	258	264	262
<u>SPACE AND TERRESTRIAL APPLICATIONS</u> .....	<u>1.911</u>	<u>1,977</u>	<u>2.022</u>	<u>2,208</u>
Space applications.....	1,837	1,902	1,952	2,139
Technology utilization.....	74	75	70	69
<u>AERONAUTICS AND SPACE TECHNOLOGY</u> .....	<u>5,798</u>	<u>5,735</u>	<u>5.654</u>	<u>5.639</u>
Aeronautical research and technology.....	3.887	3.925	3.896	3.921
Space research and technology.....	1.348	1.286	1.247	1,216
Energy technology.....	563	524	511	502
<u>SPACE TRACKING AND DATA SYSTEMS</u> .....	<u>797</u>	<u>782</u>	<u>795</u>	<u>786</u>
Tracking and data acquisition.....	797	782	795	786
Subtotal. Direct Positions.....	17.695	17.690	17.434	17.225
<u>Center Management and Operations Support Positions</u> .....	<u>5.542</u>	<u>5.547</u>	<u>5.397</u>	<u>5.338</u>
<u>Total. Permanent Positions</u> .....	<u>23.237</u>	<u>23.237</u>	<u>22.831</u>	<u>22.563</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
 FISCAL YEAR 1980 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	Wallops Flight Center	Ames Research Center	Dryden Flight Research Center	Langley Research Center	Lewis Research Center	Headquarters
<u>Personnel and Related Costs</u>												
1978 Actual .....	677.450	110.801	64,543	115,638	2.648	102.718	9.978	48.214	13.777	84.607	71.998	52.528
1979 Budget .....	695.093	113.183	66.705	114.413	2.823	104.343	10.313	49.377	13.798	85.568	80.253	54.317
1979 Current .....	720.924	118.022	70.123	120.323	3.083	108.433	10.521	52.584	14.396	89.337	78.334	55.768
1980 Estimate .....	727.176	118.522	70.502	119.961	3.151	110.150	10.749	53.514	14.270	89.940	80.524	55.893
<u>Travel</u>												
1978 Actual .....	17.042	3.240	2.120	2.326	84	2.308	316	1.101	306	1.854	1.002	2.385
1979 Budget .....	18.741	3.626	2.338	2.382	65	2.476	348	1.230	388	2.156	1.187	2.545
1979 Current .....	18.573	3.505	2.416	2.492	92	2.481	372	1.218	369	2.008	1.126	2.494
1980 Estimate .....	19.797	3.781	2.368	2.684	99	2.672	406	1.313	415	2.154	1.208	2.697
<u>Facilities Services</u>												
1978 Actual .....	91.965	15.876	22.023	11,775	---	9.897	2.796	5.093	2.457	8.148	8.912	4.988
1979 Budget .....	102.841	17.560	27.906	10,598	350	9.895	2.959	5.309	3.628	9.321	9.705	5.610
1979 Current .....	100.757	14.945	26.216	11,849	1,094	9.560	3.100	6.675	2.448	9.268	10.026	5.576
1980 Estimate .....	113.190	17.667	31.421	12.395	1,173	10.288	3.398	7.439	2.661	10.192	10.894	5.662
<u>Technical Services</u>												
1978 Actual .....	40.435	7.332	5.733	5.636	---	2.169	405	621	226	2.386	732	15.195
1979 Budget .....	40.357	6.785	6.182	6.418	50	2.046	449	607	348	1,825	565	15.082
1979 Current .....	39.723	6.395	6.444	5.728	41	2.246	346	686	409	1,721	418	15.289
1980 Estimate .....	42.288	7.006	6.987	5.588	41	2.325	524	909	458	2.032	429	15.989
<u>Management and Operations</u>												
1978 Actual .....	62.614	9.405	19.346	8.070	---	6,761	1.525	2.701	1,481	5.024	2.272	6.029
1979 Budget .....	56.968	9.142	15.300	7.046	200	5,379	1.136	2.689	1,319	5.709	2.070	6.978
1979 Current .....	61.492	11,296	15.708	7.884	217	5.510	1.154	2.598	1,935	5.662	2.609	6.919
1980 Estimate .....	62.449	9.490	16.871	8.256	225	5.762	1.253	2,664	1,987	5.940	2.745	7.256
<u>TOTAL</u>												
1978 Actual .....	889.506	146.654	113.765	143.445	2,732	123.853	15.020	57.730	18.247	102.019	84.916	81,125
1979 Budget .....	914.000	150,296	118.431	140.857	3.488	124.139	15.205	59.212	19.481	104.579	93.780	84.532
1979 Current .....	941.469	154.163	120.907	148.276	4.527	128.230	15.493	63.761	19.557	107.996	92.513	86.046
1980 Estimate .....	964.900	156.466	128.149	148.884	4.689	131.197	16.330	65.839	19.791	110.258	95.800	87.497

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION LANGUAGE

RESEARCH AND PROGRAM MANAGEMENT<sup>1</sup>

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 (not to exceed one, for replacement only of one or more existing aircraft, at least one of which shall be an administrative aircraft, which existing aircraft may be exchanged in part payment),] hire, maintenance and operation of administrative aircraft; purchase (not to exceed [twenty-nine] *thirty-two* for replacement only) and hire of passenger motor vehicles; and maintenance and repair of real and personal property, and not in excess of ~~[\$25,000]~~ \$75,000 per project for construction of new facilities and additions to existing facilities. [and not in excess of \$50,000 per project for] repairs, and rehabilitation and modification of facilities: ~~[\$910,500,000]~~ \$964,900,000. *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, 1979*, additional authorizing legislation to be proposed.)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
RESEARCH AND PROGRAM MANAGEMENT

Program and Financing (in thousands of dollars)

Identification code	80-0103-0-1-999	Budget plan			Costs and obligations		
		1978 actual	1979 est.	1980 est.	1978 actual	1979 est.	1980 est.
<b>Program by activities:</b>							
Direct program							
	1	375,979	383,019	396,600	371,736	383,919	396,600
	2	117,416	119,600	121,000	115,775	119,600	121,000
	3	97,542	117,000	119,700	96,437	117,000	119,700
	4	62,275	66,950	66,800	61,576	66,950	66,800
	5	170,731	189,200	194,100	168,269	189,200	194,100
	6	24,319	23,000	23,700	23,626	23,000	23,700
	7	41,244	41,800	43,000	40,432	41,800	43,000
	Total, direct program	889,506	941,469	964,900	877,851	941,469	964,900
Reimbursable program:							
	1	1,128	1,440	1,260	1,107	1,440	1,260
	2	93	30	20	108	30	20
	3	9,708	5,310	4,110	9,460	5,310	4,110
	4	22			3		
	5	405	250	130	398	250	130
	6	12,866	10,850	9,620	12,582	10,850	9,620
	7	9,840	15,420	16,560	9,787	15,420	16,560
	Total reimbursable program	34,062	33,300	31,700	33,445	33,300	31,700
	Total program costs, funded	923,568	974,769	996,600	911,296	914,169	996,600
	Change in selected items (undelivered orders)				12,272		
10.00	Total	923,568	974,769	996,600	923,568	914,169	996,600
<b>Financing:</b>							
Offsetting collections from:							
11.00	Federal funds				-25,164	-27,231	-26,794
14.00	Non-Federal sources				-8,898	-6,069	-4,906
25.00	Unobligated balance lapsing				255		
	Budget authority				889,761	941,469	964,900
Budget authority							
40.00	Appropriation				889,761	910,500	964,900
44.20	Supplemental for civilian pay raises					30,969	
Relation of obligations to outlays							
71.00	Obligations incurred, net				889,506	941,469	964,900
72.40	Obligated balance, start of year				57,163	74,276	76,845
74.40	Obligated balance, end of year				-74,276	-76,815	-77,645
77.00	Adjustments in expired accounts				-2,229		
90.00	Outlays, excluding pay raise supplemental				870,164	909,000	963,031
91.20	Outlays from civilian pay raise supplemental					24,900	1,069

SUM 15

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1980 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, 1978, was \$709,948,000.

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. It was necessary to focus this responsibility in the Federal laboratory since the Government was to be the customer, consumer and facility owner of an activity which was viewed as possessing considerable risk and much uncertainty because of the total lack of previous experience. 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. In order to meet this responsibility, JSC has developed unique areas of recognized technical excellence within the civil service staff and facilities of superior merit; that is, major technical facilities which constitute a national resource. The principal and supporting roles are:

PRINCIPAL

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

Space Shuttle - development of the Orbiter and lead Center for management of the Shuttle system. Providing sustaining engineering and logistical support for Space Transportation System (STS) hardware. Includes Shuttle configuration management, Shuttle sustaining engineering and Orbiter operational procurement.

Advanced Missions - focus is on orbital systems and advanced transportation systems.

Environmental and Crew Support Systems - develop and demonstrate Environmental Control and Life Support Subsystems (EC/LSS) and Extra Vehicular Activity (EVA) systems suitable for the space transportation systems and other advanced needs.

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

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

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

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:

Medical Research - establishing human baseline data, investigating and developing countermeasures to solve space medicine problems, and developing information techniques and equipment to support medical operations and medical experiments.

Spacelab Payloads - development of Spacelab life sciences research capability through common operating research equipment development. Defining, developing and integrating inflight biomedical experiments. Providing for the integration of dedicated life science Spacelab experiments and integration for human studies experiments.

Lunar and Planetary Geosciences - developing and maintaining the technical discipline base for lunar and planetary geosciences and extraterrestrial sample handling techniques.

Resource Observations - provide a discipline base for resource observations applications, including airborne techniques 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.

Energy Systems - conducting Satellite Power Systems definition activities.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	1978 <u>Actual</u>	1979 <u>Budget Estimate</u>	1979 <u>Current Estimate</u>	1980 <u>Budget Estimate</u>
		(Thousands of Dollars)		
I. Personnel and Related Costs....	110,801	113,183	118,022	118,522
II. Travel.....	3,240	3,626	3,505	3,781
III. Facilities Services..	15,876	17,560	14,945	17,667
IV. Technical Services....	7,332	6,785	6,395	7,006
V. Management and Operations .....	<u>9,405</u>	<u>9,142</u>	<u>11,296</u>	<u>9,490</u>
Total, fund requirements .....	<u>146.654</u>	<u>150.296</u>	<u>154.163</u>	<u>156.466</u>

Distribution of Permanent Positions by Program

	1978 <u>Actual</u>	1979 <u>Budget Estimate</u>	1979 <u>Current Estimate</u>	1980 <u>Budget Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u> .....	<u>2,599</u>	<u>2,628</u>	<u>2,581</u>	<u>2,539</u>
Space shuttle.....	2,305	2,032	2,165	1,907
Space flight operations.....	294	596	416	632
<u>Space Science</u> .....	<u>136</u>	<u>136</u>	<u>136</u>	<u>133</u>
Planetary exploration.....	40	52	40	39
Life sciences..	96	84	96	94

	1978 <u>Actual</u>	1979		1980
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
<u>Space and Terrestrial Applications</u> .....	<u>207</u>	<u>199</u>	<u>206</u>	<u>206</u>
Space applications .....	203	195	202	202
Technology utilization .....	4	4	4	4
<u>Aeronautics and Space Technology</u> .....	<u>33</u>	<u>45</u>	<u>32</u>	<u>30</u>
Aeronautical research and technology .....	3	--	3	<b>3</b>
Space research and technology .....	8	10	8	7
Energy technology .....	<u>22</u>	<u>35</u>	<u>21</u>	<u>20</u>
Subtotal, direct positions .....	2,975	3,008	2,955	2,908
<u>Center Management and Operations Support Positions</u> .. ..	<u>557</u>	<u>538</u>	<u>554</u>	<u>537</u>
Total, permanent positions .....	<u>3,532</u>	<u>3,546</u>	<u>3,509</u>	<u>3,445</u>

PROGRAM DESCRIPTION

SPACE SHUTTLE

1,907 Permanent Positions (Civil Service)

The 1980 staffing provides for continuation of design, development, test and evaluation activity on a schedule consistent with the major program milestones including the first manned orbital flight. 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 the Lyndon B. Johnson Space Center (JSC) has program management responsibility for program control, overall systems engineering, and Space Shuttle system integration. The Space Shuttle Program Office (SSPO) provides 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 design, development, test and 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.

In order to adequately 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. For proper systems operations, systems performance data and operational information are prepared such as operational data books, mission requirement documents, etc.

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. Each represents a multitude of engineering, management, and evaluation activities. These include definition of requirements, establishment of contract, management of contractor projects, evaluation of design and performance, and provisioning of equipment in a certified "ready for use" configuration. Mission use of equipment also requires onsite processing for preparation and related reconditioning for sequential missions.

Throughout the Orbiter program, particular attention is given to prediction of vehicle performance in each area of function, to analysis of design, establishment and conduct of necessary tests and rectification of actual vs. predicted performance difference. Since the Orbiter represents an integrated complex of technical and engineering disciplines, specific test, evaluation and analysis subtasks have been assigned to the variety of technical organizations at JSC. Included in these tasks are: providing technical expertise in the Orbiter life support systems; performing engineering analysis, design definition, performance evaluation, and breadboard testing 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, evaluation and component testing of the Orbiter hydraulics system, auxiliary power unit, orbital maneuvering system components, reaction control engine performance, reaction control system engine valve leak detection techniques and development of initiator firing units; analysis and laboratory testing for vehicle attachment and separation systems; design analysis of total Shuttle systems, Shuttle/payload interface design, crew station evaluation and design, Shuttle airlock design evaluation, etc.; conduction of 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 equipments. 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 criticality of this system, very close attention is given to the identification of performance requirements, systems design, and integrated performance.

A variety of avionic elements are included within the Space Shuttle system, each of which requires 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 have effectively supported the Approach and Landing Test (ALT) effort, and configuration changeover for Orbital Flight Testing (OFT) is scheduled to start in 1979. Their purpose is to verify the functional performance of Shuttle Integrated Avionics System and validate the system design and verify compatibility of the various radio frequency communication links.

For OFT training, the Orbiter Aeroflight Simulator (OAS) was updated to the Orbiter Vehicle 102 configuration to become the second crew station in the Shuttle Mission Simulator (SMS) complex. This complex will be the main training facility but will be supplemented by a number of part task trainers and specialized training devices. Initial training operations using the motion base of the SMS and full integrated simulations (SMS tied into MCC) will begin in early 1979. This schedule will provide adequate support for the first manned orbital flight. The training schedule requires 20 training hours per week per crew station. Involved in simulator operations are the performance of simulator readiness, runs prior to the start of a scheduled program, assuring that all aspects of the simulator required for the day's operation are functioning correctly; the operation of the simulators during the exercises; and the documentation of any abnormal operation identified in the simulator performance or configuration.

The Mission Control Center (MCC) update involves the management of the design, development, integration, and testing of all MCC software required to support the Shuttle Orbital Flight Test (OFT) program. This includes modifications to old programs, new or replacement programs, their integration in the MCC, the integration of the MCC software and hardware, and software of the MCC for simulation, training, and actual flight operations. This is a major design change to the MCC software and requires new programs for the telemetry, command, tracking, and communications programs.

Orbital Flight Support includes a wide variety of planning activities ranging from operational concepts and techniques to detailed systems operational procedures and checklists. Tasks include flight 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 initial planning for the selection and operation of Shuttle OFT payloads.

Specific OFT flight planning and software products include preliminary operational flight profiles and operational flight profiles at launch minus 13 and four months respectively for each flight. A payloads opportunities list keyed to each profile is provided in approximately the same timeframe. The flight planning activity encompasses the flight design, flight analysis, and utilization planning tasks for the OFT program. The flight

design and flight analysis tasks include developing profiles on a preflight basis and supporting the development of flight techniques for OFT.

Software development is concerned with the development, formulation, coordination, and implementation of the requirements for all Orbiter onboard computer software in the guidance, targeting, navigation, and systems management .

#### SPACE FLIGHT OPERATIONS

632 Permanent Positions (Civil Service)

JSC's support of the Spacelab development effort includes establishing and controlling Shuttle interface with the Spacelab, for overall safety requirements for the Shuttle/Spacelab combination, and support of MSC in the performance of its assigned responsibilities. JSC is responsible for crew training in conjunction with flight hardware, and the development and operation of Shuttle/Spacelab simulators and trainers as well as Spacelab support software resident in the Orbiter general purpose computer.

Upgrading the capability of the Mission Control Center to configure the MCC with the flight capability to support two Orbiters simultaneously, a ground simulation network, and a MCC launch site interface requires additional hardware, equipment, and software. Work will also be done to focus on determining the most efficient method of operating the STS, provide for integrating payloads on the OFT flights, and provide facilities for command and control of Shuttle/Spacelab attached payloads.

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 development and advanced studies are conducted to obtain significant performance and reliability improvements and to reduce future program risks and development costs through the effective use of new technologies. In fiscal year 1980, the advanced studies effort will concentrate on potential future early space stations and orbital transfer vehicles. Advanced operational concepts related to integrated launch operations, orbital assembly of large structures and orbital capability will be investigated in further detail. The advanced development effort will support the advanced study concepts related to integrated launch operations, orbital assembly of large structures and orbital capability will be investigated in further detail. The advanced development effort will support the advanced study concepts in all the major technical disciplines. Orbital operations studies will be supported with design and testing of concepts applicable to assembly, maintenance and operation of large structures and complex satellite systems, rendezvous and inspection, and satellite retrieval and repair. Consumables management and advanced instrumentation studies will also be continued, and the funding will provide for testing and evaluation of major regenerative life support subsystems.

## PLANETARY EXPLORATION

39 Permanent Positions (Civil Service)

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, to provide curatorial support, to assist in information dissemination and to 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 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

94 Permanent Positions (Civil Service)

The Johnson Space 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, develop and integrate biomedical experiments for life sciences payloads. Additionally, these experiments are designed to utilize the space environment to accomplish medical and biological research for the benefit of man on Earth.

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 crewmembers. 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 provide integration of dedicated life sciences, Spacelab experiments and integration for human experiments. To this end, experiments will be selected, and experiment hardware development will be initiated.

## SPACE APPLICATIONS

202 Permanent Positions (Civil Service)

The resource observations discipline is divided into three major areas: technology development, flight projects, and applications projects. JSC's responsibility entails the conduct and implementation of major tasks in each of these areas. Efforts are evenly divided among them and include the following specific activities:

1. Technology development is directed toward determining applications of 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, applicable to these and other applications, are also being conducted.

2. Flight project responsibilities at JSC include the airborne instrumentation research project and Shuttle payload instrument development and integration. Responding to airborne measurement requirements, generated by NASA research and cooperative programs with the Departments of Agriculture, Interior, Defense, Commerce and Energy and various state agencies, JSC develops and implements an aircraft support plan. Involved is the testing, maintenance, and operation of a wide variety of remote sensors which provide data to investigators. Four aircraft, capable of data acquisition from 500 to 63,000 feet, are operated; a Lockheed C-130, two General Dynamics WB-57F's, and a Bell 206B helicopter. They are maintained at nearby Ellington Air Force Base.

Sensors currently being developed by JSC for flight on the Shuttle are the Large Format Stereo Camera and Spaceborne Imaging Radar. In addition, JSC is responsible for mission management of the Office of Space and Terrestrial Application 1 (OSTA 1) payload which includes integration of equipment to the pallet, integrating the payload into the Orbiter, and real time mission support while in orbit.

3. Applications demonstration projects are being conducted with the Department of Interior's Bureau of Land Management to monitor wildland vegetation, the St. Regis Paper Company to map and inventory forestland, the Corps of Engineers to detect and map water impoundments, and the State of Texas to inventory statewide natural resources. The objective of these applications demonstration projects is to transfer aerospace remote sensing systems and techniques to the public and private sectors.

#### TECHNOLOGY UTILIZATION

4 Permanent Positions (Civil Service)

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 space application to ground-based operations, such as: telecare, feeding the elderly, and bioisolation garment.

#### AERONAUTICAL RESEARCH AND TECHNOLOGY

3 Permanent Positions (Civil Service)

Studies working towards improving aircraft fire safety through evaluating advanced materials to reduce fire and toxicity threats.

## SPACE RESEARCH AND TECHNOLOGY

7 Permanent Positions (Civil Service)

Systems and design studies are being performed to provide the necessary analytical results which permit the successful transfusion of the technology developed under the research and technology base into systems and experimental programs. One example of this effort is the Orbiter Research and Technology Experiments Program (OEX); the intent of which is to collect research and technology data by utilizing the currently planned Developmental Flight Instrumentation (DFI) and Orbital Flight Instrumentation (OFI) configuration of the Orbiter Vehicle.

## ENERGY TECHNOLOGY

20 Permanent Positions (Civil Service)

Engineering manpower will be used for Space Solar Power System Definition. This will involve in-house engineering definition studies and contract management. The studies will involve a systematic comparative assessment of power conversion options (photovoltaic versus thermal, silicon versus gallium arsenite, etc.); major systems trades such as the location of the space construction activity (low earth orbit versus geosynchronous orbit); and critical systems definition (rotary joint, phase control, etc.). Also, the studies will provide for a second iteration of elements and emphasize techniques of space construction, construction base definition, logistics and operations, and definition of required development program.

## CENTER MANAGEMENT AND OPERATIONS SUPPORT

537 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as that support or service being provided to all Johnson Space Center organizations which cannot be directly identified to a specific benefitting 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 - Includes a wide range of activity categorized as business management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control, and management systems and analyses.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

Maintenance and operation of all buildings and facilities  
 Data processing and computer support  
 Reliability and quality assurance  
 Centerwide security and protection  
 Fire protection  
 Custodial services  
 Logistics support including transportation, supplies, etc.  
 Medical care of employees  
 Photographic and graphic support

PERSONNEL AND RELATED COSTS

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
I. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>110.801</u>	<u>113.183</u>	<u>118,022</u>	<u>118.522</u>

Basis of Fund Requirements

A. Compensation and Benefits

1. Compensation

a. Permanent positions .....	97,447	99,050	103,124	103,366
b. Nonpermanent .....	1,086	1,134	1,568	1,598
c. Reimbursable detailees.. ..	1,334	1,905	1,885	1,993
d. Overtime and other compensation .....	<u>406</u>	<u>624</u>	<u>589</u>	<u>590</u>

Subtotal, Compensation .....

	100,273	102,713	107,166	107,547
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2. <u>Benefits</u> .....	<u>9,960</u>	<u>9,955</u>	<u>10,306</u>	<u>10,365</u>
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Subtotal ■ Compensation and Benefits .....	<u>110,233</u>	<u>112,668</u>	<u>117,472</u>	<u>117,912</u>
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B. Supporting Costs

1. Transfer of personnel .....	161	150	110	145
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	1978 <u>Actual</u>	<u>1979</u>		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
		(Thousands of Dollars)		
2. Personnel training.....	407	<u>365</u>	<u>440</u>	<u>465</u>
Subtotal, Supporting Costs... ..	<u>568</u>	<u>515</u>	<u>550</u>	<u>610</u>
Total, Personnel and Related Costs... ..	<u>110.801</u>	<u>113.183</u>	<u>118.022</u>	<u>118,522</u>
A. <u>Compensation and Benefits</u> .....	<u>110,233</u>	<u>112,668</u>	<u>117,472</u>	<u>117,912</u>
1. <u>Compensation</u> .....	<u>100,273</u>	<u>102,713</u>	<u>107,166</u>	<u>107,547</u>
a. Permanent positions.....	97,447	99,050	103,124	103,366

The funds shown above will support 3,445 permanent positions in 1980. The increase from the 1979 budget estimate to the 1979 current estimate is due to the October 1978 pay raise, partially offset by the reduction in civil service positions.

Basis of Cost for Permanent Positions

In 1980 the cost of permanent positions will be \$103,366,000, an increase of \$242,000 from 1979. This increase results from the following:

Cost of permanent positions in 1979.....	103,124
Cost increase in 1980.....	+2,543
Within grade advances and career development	
Full year effect of 1979 actions.....	+843
Partial year effect of 1980 actions.. ..	+787
Full year effect of 1978 pay raise... ..	+116
Two extra paid days in 1980.. ..	+797
Cost of decreases in 1980	-2,301
Turnover savings	
Full year effect of 1979 actions.. ..	-740
Partial year effect of 1980 actions.... ..	-1,561
Cost of permanent positions in 1980.....	<u>103.366</u>

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</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. Nonpermanent positions				
1. Cost.. .. .	1,086	1,134	1,568	1,598
2. Workyears .. .	128	125	165	160

The increase from the 1979 budget estimate to the 1979 current estimate is due to the additional requirements in the youth opportunity program and the establishment of the part-time employment program. The 1980 plan includes 160 workyears which is reduced from 1979 to reflect the absorption of the part-time program into the permanent position ceiling. This effort will support the following programs as shown:

<u>Program</u>	<u>Workyears</u>
Cooperative training programs.... ..	75
Summer programs. ....	33
Youth opportunity programs.....	31
Other temporaries .....	<u>21</u>
 Total .....	 <u>160</u>

c. Reimbursable detailees .....	1,334	1,905	1,885	1,993
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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 an essential and critical function to the current and future programs.

Individuals with knowledge, experience, and with a "flight" background, are essential to the manned flight programs. The individuals most readily available within the Government ranks are in the military. The additional requirement for keeping the military informed on manned space flight technology is also essential.

One civilian employee, experienced in the field of medicine, is also detailed, on a reimbursable basis, to the Johnson Space Center.

The increase in 1979 over 1978 is due to the addition of new astronauts and mission specialists for the Shuttle programs. The workyears remain level from 1979 to 1980 with cost increases resulting from salary increases and career development.

	1978 <u>Actual</u>	1979		1980
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
d. Overtime and other compensation .....	406	624	589	590

Overtime in 1980 will be used primarily for the orbital test flights, e.g., crew training, trajectory optimization, data reduction, integration laboratory, and related support activities. In addition, there are numerous source selection boards, earth resources application system verification programs and other activities that necessitate some extension of the normal work day or week. Costs remain essentially level from 1979 to 1980.

2. <u>Benefits</u> .. .....	<u>9,960</u>	<u>9,955</u>	<u>10,293</u>	<u>10,342</u>
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Following are the amounts of contribution by category:

<u>Category of Costs</u>				
Civil Service Retirement Fund .....	6,835	7,018	7,297	7,288
Employee life insurance... ..	401	408	410	410
Employee health insurance.....	1,862	1,824	1,825	1,892
Workman's compensation. ....	567	572	572	573
<b>FICA</b> . ....	30	17	36	36
Incentive Awards.. ..	163	115	165	165
Severance pay.... ..	102	---	---	---
Other benefits. ....	---	1	1	1
 Total... ..	 <u>9,960</u>	 <u>9,955</u>	 <u>10,306</u>	 <u>10,365</u>

The increase from the 1979 budget to current estimate is due to the October 1978 pay raise, partially offset by a reduction in civil service positions. The increase in 1980 over 1979 is related to the increases in personnel compensation and reflects the savings resulting from the manpower reductions.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
B. <u>Supporting Costs</u> .....	568	515	550	610
1. Transfer of personnel .....	161	150	110	145

This category includes cost of subsistence and temporary expenses, real estate, miscellaneous moving expenses and movement of household goods made necessary with the transferring of personnel. The decrease from the 1979 budget estimate to the 1979 current estimate is due to the fact that some of the cost anticipated in 1979 actually occurred in 1978. The increase in 1980 is due to increased numbers of transfers as a result of the transition to the operational phase of the Shuttle program which will necessitate some reassignment of personnel from JSC to the Kennedy Space Center and vice versa.

2. Personnel training .....	407	365	440	465
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Training is a prime objective to permit employees to advance to more responsible positions. This also provides the Center with more highly motivated and experienced personnel not readily available in the labor market. These funds provide the means to meet the training requirements of the untrained, unskilled minorities, and to provide the training necessary to keep those employees with technological expertise abreast of the latest state-of-the-art in their respective fields. Training increases from the 1979 budget estimate to the 1979 current estimate to reflect 1978 experience and provide for additional "Upward Mobility" training. The increase in 1980 over 1979 reflects higher tuition rates.

#### TRAVEL

11. <u>TRAVEL</u> .....	<u>3,240</u>	<u>3,626</u>	<u>3,505</u>	<u>3,781</u>
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#### Basis of Fund Requirements

A. Program Travel... ..	2,764	3,072	3,054	3,265
B. Scientific and Technical Meeting Travel .....	120	175	101	115
C. Mangement and Operations Travel .....	<u>356</u>	<u>379</u>	<u>350</u>	<u>401</u>
Total, Travel.....	<u>3,240</u>	<u>3,626</u>	<u>3,505</u>	<u>3,781</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Program Travel</u> .....	<u>2,764</u>	<u>3,072</u>	<u>3,054</u>	<u>3,265</u>

Program travel is specifically required for the accomplishment of the Center's mission and accounts for 86 percent of the travel budget for 1980. Program travel in 1980 will require about 7,929 trips, an increase of 259 trips over those anticipated in the 1979 budget. Travel to support Space Shuttle development and production is expected to continue in 1980 at approximately the same level experienced in 1979. However, travel required to support Space Transportation System operations will increase, particularly in the area of payload development and the generation, review and interchange of the thermal, structural and dynamic mathematical models required for integration of the various payloads.

B. <u>Scientific and Technical Meeting Travel</u> .....	<u>120</u>	175	<u>101</u>	<u>115</u>
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Scientific and technical meeting 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 JSC 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. Approximately 205 trips are planned in 1980 to attend scientific and technical meetings. Symposia and technical seminars related to the earth observation program and lunar samples are a major requirement in this area. The decrease from the 1979 budget estimate to the 1979 current estimate reflects a decrease to approximately the 1978 actual experience. The level of travel in 1980 is expected to remain approximately the same as 1979.

C. <u>Management and Operations Travel</u> ... ..	<u>356</u>	<u>379</u>	350	401
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Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities, travel to the Center's top management to NASA Headquarters and other NASA Centers, and local transportation. The 1979 current estimate was reduced from the 1979 budget estimate to provide for fund requirements in other areas. The increase in 1980 reflects increases in source evaluation board activities.

#### FACILITIES SERVICES

The Johnson Space Center (JSC) is located on 1,620 acres with a complex of laboratory and office-type buildings as well as test facilities. This complex encompasses 2,785,820 gross square feet of building

space in 22 major buildings. Also included are 11 major technical facilities. This physical plant supports an average daily on-Center population of 7,100 to 7,500 personnel. Many of the test facilities are utilized on schedules involving more than one shift and off-peak hours.

The budget estimates also include certain resources associated with plant needs at the White Sands Test Facility (WSTF) and for facilities used at Ellington Air Force Base (EAFB) under permit from the Air Force.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
III. <u>FACILITIES SERVICES</u> .....	<u>15,876</u>	<u>17,560</u>	<u>14,945</u>	<u>17,667</u>
<u>Basis of Fund Requirements</u>				
A. <u>Maintenance and Related Services</u>				
1. Facilities.....	6,965	6,540	4,674	6,717
2. Equipment.....	<u>431</u>	<u>410</u>	<u>387</u>	<u>394</u>
Subtotal.....	7,396	6,950	5,061	7,111
B. Custodial Services.....	2,335	2,378	2,736	3,086
C. Utility Services.....	<u>6,145</u>	<u>8,232</u>	<u>7,148</u>	<u>7,470</u>
Total, Facilities Services..	<u>15,876</u>	<u>17,560</u>	<u>14,945</u>	<u>17,667</u>
A. <u>Maintenance and Related Services</u> ...	<u>7,396</u>	<u>6,950</u>	<u>5,061</u>	<u>7,111</u>
1. Facilities...	6,965	6,540	4,674	6,717

This activity involves not only JSC facilities at Houston but also White Sands Test Facility (WSTF) and Ellington Air Force Base (EAFB). It provides for 219 workyears of effort and is essentially a continuation of that level of effort to be provided in 1979. The reduction from the 1979 budget estimate to the 1979 current estimate reflects a rephasing of support contract funding to align it with the year in which the work is performed. The 1980 estimate provides for full year funding of the contracts and the cost of negotiated support contract wage increases. Major types of support in this area are:

	<u>1978</u>	<u>1979</u>		<u>1980</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. Routine facilities work (14 workyears of effort) .....				518
Provides for routine facilities support for utility systems, roads and grounds, and administrative office alteration at JSC, WSTF, and EAFB.				
b. Grounds maintenance (24 workyears of effort) .....				419
Provides for mowing and edging of 540 acres of improved land and mowing 775 acres of unimproved land. Also included is cultivation, mulching, fertilizing, insect control, and care of trees and shrubs.				
c. Maintenance and operations to include routine maintenance of applicable facilities at:				
JSC (98 workyears of effort) .....				3,015
WSIF (63 workyears of effort) .....				1,498
The above activity includes minor maintenance work, including painting at JSC and Ellington Air Force Base.				
d. Facilities design and engineering at JSC (20 workyears of effort) .....				503
This includes facility engineering consisting of engineering design, drafting and specifications preparation for construction of facilities, minor construction and repair projects, and other facility and system design and modification tasks. Also included is minor facility support to Ellington Air Force Base.				
e. Supplies and facilities equipment .....				764
Included under this category are materials, hardware and equipment that are used to maintain the facilities at JSC and WSIF.				
2. Equipment .....	431	410	387	394
a. Equipment maintenance. ....				361
Provides maintenance support for administrative equipment at JSC, WSTF, and EAFB and involves mainly office-type equipment services by local businesses.				

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	

b. Closed circuit TV maintenance and operation..... 33

One workyear is required for the maintenance and operation of JSC's closed circuit TV system for administrative purposes.

B. Custodial Services... .. 2,335 2,378 2,736 3,086

This activity involves 234 workyears of support contractor effort at JSC to provide security guard services, janitorial services, fire fighting and ambulance services. The increase from the 1979 budget estimate is due to the fact that the proposed conversion to the volunteer fire department did not prove feasible. The 1979 current estimate is based on NASA continuing to provide effort (through a support contractor) for primary response, safety inspections and alarm maintenance. The increase in 1980 is due primarily to negotiated support contract wage increases.

1. Security guard services (60 workyears of effort) ..... 1,029

This activity includes:

- a. Badging all on-site personnel and visitors.
- b. Policing 13,000 vehicles daily at five gates. One gate is covered 24 hours a day, seven days a week, and the other four gates are covered for 12 hours a day, five days a week.
- c. Protecting all Government facilities and equipment.

2. Janitorial services (151 workyears of effort) ..... 1,433

Provides janitorial services in these areas:

- a. Maintains approximately 2,555,465 square feet of area.
- b. Periodically replaces 10,000 lights.
- c. Remove 144 cubic yards of trash daily.
- d. Laundry services from two off-site firms.

3. Fire Protection (23 workyears of effort) ..... 624

This activity includes:

- a. Industrial safety and inspection (e.g., compliance with OSHA regulations)
- b. Maintenance of alarms and fixed fire fighting equipment
- c. Technical interface with Houston Fire Department for fire fighting activities

	<u>1978</u>	<u>1979</u>		<u>1980</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>Utilities Services</u> .....	<u>6,145</u>	<u>8,232</u>	<u>7,148</u>	<u>7,470</u>
<p>Includes purchased utilities and 44 workyears of support contractor effort for the operation and maintenance of the utility distribution system at JSC. The increase from 1978 actual to 1979 current reflects 17.8% rate increase in natural gas and 14.4% increase in electricity. The increase from the 1979 current estimate to the 1980 estimate reflects rate increases partially offset by 8.7% reduction as a result of conversion from natural gas to electricity. The decrease from the 1979 budget to the 1979 current reflects rate increases which were not as great as anticipated. The purchased utilities are outlined below:</p>				
1. Electricity.....				4,529
JSC (135,107 M KWH)				
WSTF (8,600 M KWH)				
2. Natural gas.....				1,244
JSC (335,085 MCF)				
WSTF (17,000 MCF)				
3. Water.....				179
4. Sewage treatment.....				188
		<u>TECHNICAL SERVICES</u>		
IV. <u>TECHNICAL SERVICES</u> .....	<u>7,332</u>	<u>6,785</u>	<u>6,395</u>	<u>7,006</u>

Basis of Fund Requirements

	1978	1979		1980
	<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>Automatic Data Processing</u>				
1. Equipment .....	2,481	2,249	2,266	2,300
2. Operations.. ..	<u>2,401</u>	<u>2,488</u>	<u>2,115</u>	<u>2,540</u>
Subtotal.....	4,882	4,737	4,381	4,840
B. <u>Scientific and Technical Information</u>				
1. Library.....	74	81	90	96
2. Education and Information.....	<u>1,365</u>	688	<u>671</u>	682
Subtotal. ....	<u>1,439</u>	<u>769</u>	<u>761</u>	<u>778</u>
C. Shop Support Services.....	<u>1,011</u>	<u>1,279</u>	<u>1,253</u>	<u>1,388</u>
Total, Technical Services.....	<u>7,332</u>	<u>6,785</u>	<u>6,395</u>	<u>7,006</u>
A. <u>Automatic Data Processing</u> .....	<u>4,882</u>	<u>4,737</u>	<u>4,381</u>	<u>4,840</u>

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 the lease and maintenance costs of all multiuse ADP equipment within JSC's Central Computer Facility. The increase from 1979 to 1980 is due mainly to negotiated support contractor wage increases. The level of effort remains essentially the same.

1. Equipment.....	2,481	2,249	2,266	2,300
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Covered herein are the maintenance costs of all JSC owned ADP equipment and the lease costs of all leased ADP hardware within the Central Computer Facility. These hardware systems includes four Univac 1108, one Univac 1110, one Univac 9300, one IBM 360/22, one IBM 360/30, one CDC 3200, and one Mohawk (data entry) computer system. Also included is associated peripheral equipment such as two microfilm processors, various terminals, and keypunch.

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>		<u>Estimate</u>
		(Thousands of Dollars)		
2. Operations .....	2,401	2,488	2,115	2,540

ADP systems supported include Institutional Management, Financial and Accounting, Procurement, Tracking and Contractual Status, Personnel Management Information, and Utility Branch.

a. Computer programming requiring 24 workyears of effort at a cost of \$903,000.

b. Key punch, operators, and other support personnel requiring 48 workyears plus purchased supplies, materials, and software programs for a total of \$1,637,000.

B. <u>Scientific and Technical Information</u> .....	<u>1,439</u>	769	<u>761</u>	<u>778</u>
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This activity, requiring 37 support contractor workyears, provides for the operation of a technical library at JSC, a public affairs educational and informational program, and support to the Center in the provision of various scientific and technical information services. The modest increase in 1980 is due to negotiated support contractor wage increases.

1. Library .....	74	81	90	96
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Six workyears provide cataloging and indexing services and provide initial distribution of publications in the operation of the JSC Technical Library. This includes, on a monthly basis, cataloging about 170 books, indexing approximately 730 reports, and distributing about 50,000 publications.

2. Education and information. ....	1,365	688	671	682
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Thirty-one workyears of support contractor effort are used to support a JSC public affairs program. Included are: exhibit management and refurbishment; visitor orientation tours; lecturing; mail answering services; and other activities.

C. <u>Shop Support and Services</u> .....	<u>1,011</u>	<u>1,279</u>	<u>1,253</u>	<u>1,388</u>
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Fifty-one workyears of support contractor effort provide the Center with support in the areas of graphics, publications, and audiovisual material. Micro-images are prepared from hard copy and vice-versa. Editorial services are provided for JSC publications. Graphic materials are prepared for use in presentations and senior

management meetings. Motion pictures, from script to screen, and film clips are produced to support Center Management and Public Affairs. Various kinds of film are processed and reproductions and reprints made. The increase from 1979 to 1980 is due to negotiated support contractor wage increases.

MANAGEMENT AND OPERATIONS

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
V. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>9,405</u>	<u>9.142</u>	<u>11.296</u>	<u>9.490</u>
<u>Basic of Fund Requirements</u>				
A. Administrative Communications. ....	2,271	2,737	2,426	2,437
B. Printing and Reproduction .....	823	572	750	761
C. Transportation .....	954	814	3,120	825
D. Installation Common Services.. ..	<u>5,357</u>	<u>5,019</u>	<u>5,000</u>	<u>5,467</u>
Total, Management and Operations .....	<u>9.405</u>	<u>9.142</u>	<u>11.296</u>	<u>9.490</u>
A. <u>Administrative Communications</u> .....	<u>2,271</u>	<u>2,737</u>	<u>2,426</u>	<u>2,437</u>

Communications support for JSC and WSIF consist of local telephone service, long distance telephone service, and various kinds of other nontelephone communications. The same level of support is projected for FY 1980 as occurred in FY 1979. The decrease from the 1979 budget estimate to the 1979 current estimate is primarily the result of transferring postage from communications to installation support services.

1. Local telephone service... .. 1,330

The major part of this covers 3,580 Centrex lines and 6,330 telephone instruments at JSC. Also included are 292 telephones at WSIF and local telephone service at: Draper Labs, Cambridge, MA; Grumman, Bethpage, NY; and SAMSO, El Segundo, CA. About 175 local circuits at JSC and 2 at WSIF (Fire Alarms, Burglar Alarms, Public Address, Data, etc.) are included within this category.

	1978	1979		1980
	<u>Actual</u>	Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
2. Long distance telephone service.....				967
a. Federal Telecommunications System (FTS) use was 932,615 calls in FY 1978.				
b. Tolls on commercial long distance calls are about 1,000 a month at JSC and 5 a month at WSTF.				
c. Four leased lines are employed: two circuits from WSIF to Las Cruces, NM, and two circuits from JSC to GSA in Austin, TX. All are teletype circuits except the WSTF/Las Cruces, NM, which are voice.				
3. Nontelephone communications .....				140
a. Teletype costs include: Western Union Lease costs, DOD Classified Teletype Network Access costs, TWX or message charges.				
b. Other communications include a UPI Wire Service for the Public Affairs Office and eight radio networks (Fire/Security, Custodial, etc.).				
B. <u>Printing and Reproduction</u> .....	823	<u>572</u>	<u>750</u>	<u>761</u>

JSC's basic printing requirements are handled by maintaining an on-site printing plant operated by JSC personnel. This printing plant produces approximately 36,000,000 units of printing each year. In addition to this on-site printing plant, JSC must also purchase from private firms, via Government Printing Office contracts, about 43,000,000 units of printing each year. This purchased printing is a combination of an overflow requirement that cannot be handled with the on-site workload and often is of such type that cannot be handled with the limited capability of the on-site equipment. The 1979 current estimate reflects the transferring of shuttle printing from contractor to in-house.

C. <u>Transportation</u> .....	<u>954</u>	<u>814</u>	<u>3,120</u>	825
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Transportation functions at JSC involve seven workyears of effort. Also included are administrative aircraft maintenance costs, and lease of trucks from General Services Administration (GSA). The 1979 current estimate is higher than the 1979 budget estimate because of the proposed replacement of an administrative aircraft in 1979. The level of effort for these services in 1980 is expected to be the same as that in 1979.

	<u>1978</u>	<u>1979</u>		<u>1980</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)		
D. <u>Installation Common Services...</u> .....	<u>5,357</u>	<u>5,019</u>	<u>5,000</u>	<u>5,467</u>

These services, requiring 163 workyears of support contractor effort, support Center management and staff activities, provide medical services, and cover various installation support services. The increase from FY 1979 to 1980 is due primarily to negotiated support contractor wage increases.

1. Center management and staff..... 38

Costs involved in patent searches and applications.

2. Medical services..... 1,226

This activity provides support in two main categories: occupational medicine and environmental health. Total support contractor workyears required is 39.

a. Occupational medicine..... 871

Occupational medicine consists of operation of the JSC on-site clinic, emergency assistance at Ellington Air Force Base (EAFB), providing physicals for JSC personnel at Downey, California, medical consultation and crew test support. Total workyears are 26.

b. Environmental health..... 355

Environmental health consists of industrial hygiene, radiological health, and an environmental health lab at a total of 13 workyears.

3. Installation support services..... 4,203

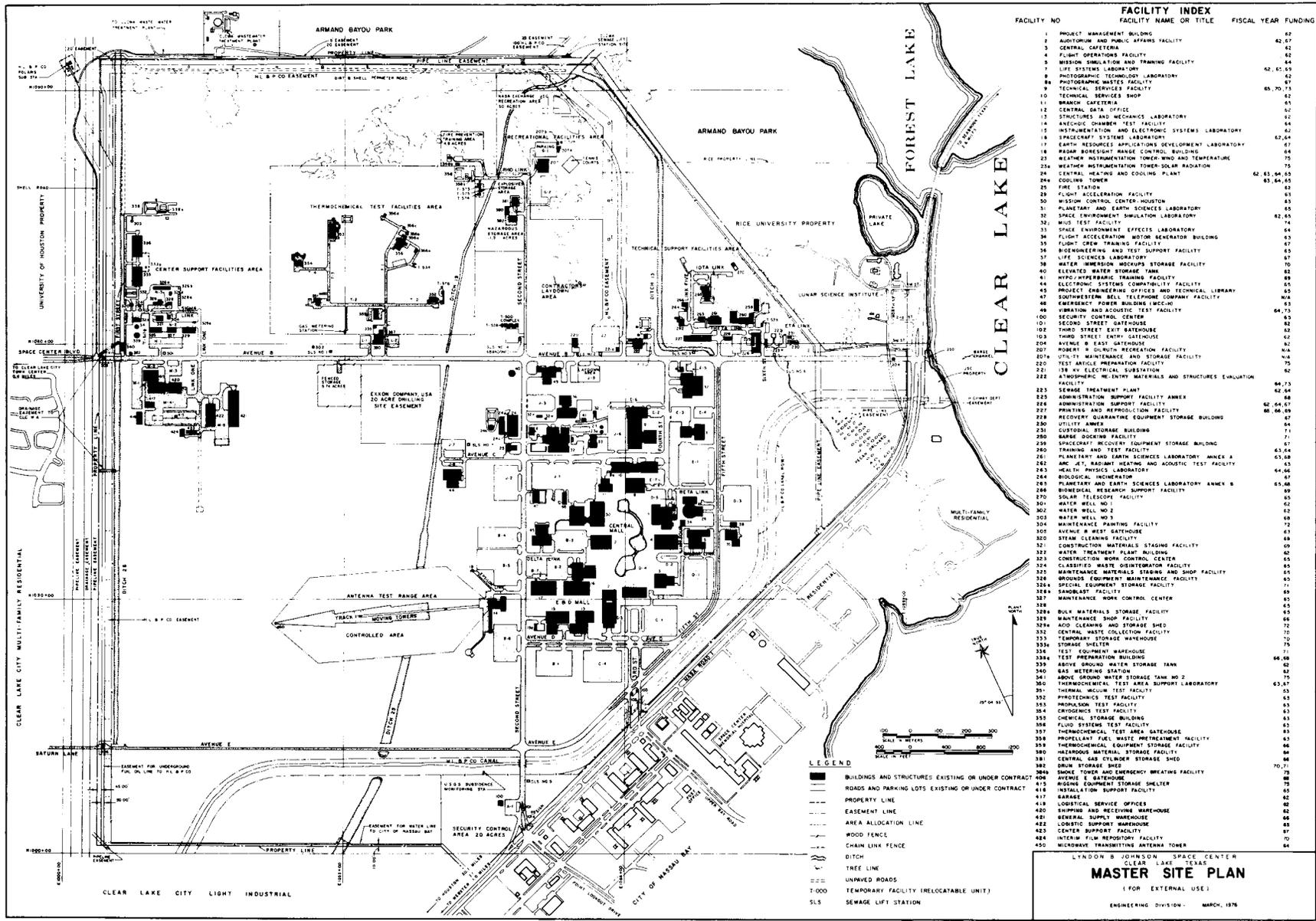
Included here, requiring 124 workyears of support contractor effort, are all administrative support services not specifically identified elsewhere. Among these services are the purchase of administrative supplies and equipment, the cataloging of supplies and equipment, warehousing and storage, moving and hauling, forms distribution, vehicle drivers and dispatchers, Ellington Air Force Base (EAFB) support, and many smaller miscellaneous services.

	1978	1979		1980
	<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. Administrative supplies, materials and equipment.....				1,337
<p>Included in this category are supplies, materials and equipment that are used to support the administrative function at JSC and WSTF.</p>				
b. Cataloging of supplies and equipment.....				312
<p>Twenty workyears are required for identification and cataloging requests for supplies into the proper Federal Supply Groups, placing orders on the proper Federal Schedule Contracts, maintaining a stores stock catalog, etc.</p>				
c. Warehousing and storage.....				908
<p>Fifty-eight workyears are needed to operate a central receiving depot for supplies, a warehousing and storage function (including bonded storage and storage of hazardous materials) and a stock issuance service.</p>				
d. Postage.....				482
<p>Administratively handled by NASA Headquarters.</p>				
e. Moving and hauling.....				595
<p>Thirty-eight workyears are required to handle shipping and packing of supplies and equipment both locally and for long distance movement, moving and hauling of items locally, and delivery of items purchased from local firms.</p>				
f. Forms distribution.....				128
<p>Eight workyears are required for the distribution of approximately 600,000 forms and publications each year.</p>				
g. Administrative support.....				441
<p>This category covers the cost of local transportation within the JSC area provided by GSA, the JSC share of operating costs at Ellington Air Force Base, and the cost of stenographic services and torts and claims.</p>				





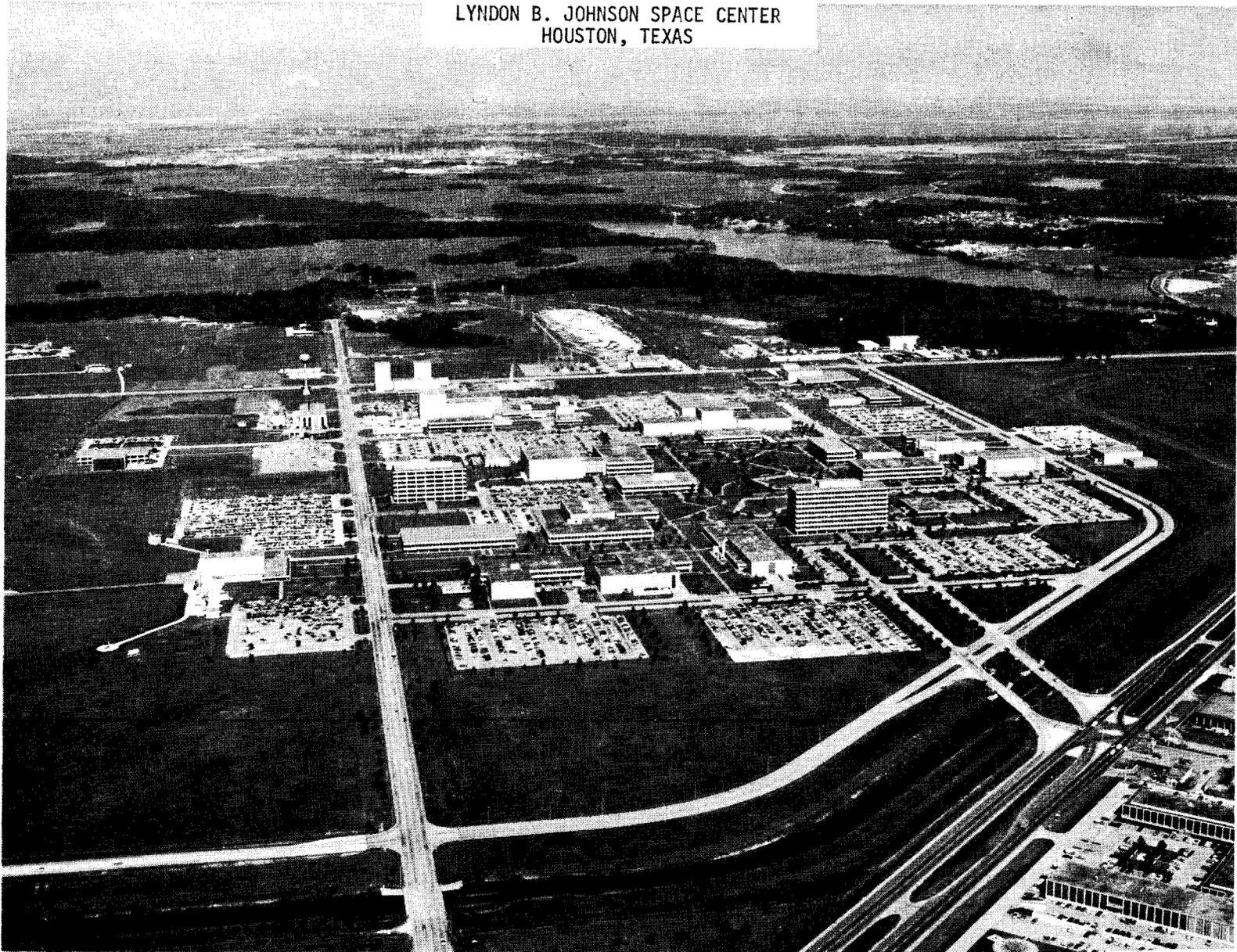




FACILITY NO	FACILITY NAME OR TITLE	FISCAL YEAR FUNDING
1	PROJECT MANAGEMENT BUILDING	82
2	MONITORING AND PUBLIC AFFAIRS FACILITY	82,87
3	CENTRAL CAFETERIA	82
4	FLIGHT OPERATIONS FACILITY	82
5	MISSION SIMULATION AND TRAINING FACILITY	82
7	LIFE SYSTEMS LABORATORY	82,82,89
8	PHOTOGRAPHIC TECHNOLOGY LABORATORY	82
8a	PHOTOGRAPHIC WASTES FACILITY	87
9	TECHNICAL SERVICES SHOP	85,75
10	TECHNICAL SERVICES SHOP	82
11	BRANCH CAFETERIA	85
12	CENTRAL DATA OFFICE	82
13	STRUCTURES AND MECHANICS LABORATORY	82
14	ACOUSTIC CHAMBER TEST FACILITY	82
15	INSTRUMENTATION AND ELECTRONIC SYSTEMS LABORATORY	82
16	SPACECRAFT SYSTEMS LABORATORY	82,84
17	EARTH RESOURCES APPLICATIONS DEVELOPMENT LABORATORY	87
18	RAJAR BORE-SIGHT RANGE CONTROL BUILDING	84
22	WEATHER INSTRUMENTATION TOWER-WIND AND TEMPERATURE	75
23a	WEATHER INSTRUMENTATION TOWER-SOLAR RADIATION	75
24	CENTRAL HEATING AND COOLING PLANT	83,84,85
24a	COOLING TOWER	83
25	FIRE STATION	83
29	FLIGHT ACCELERATION FACILITY	83
30	MISSION CONTROL CENTER-HOUSTON	83
31	PLANETARY AND EARTH SCIENCES LABORATORY	83
32	SPACE ENVIRONMENT SIMULATION LABORATORY	83,85
32a	MISC TEST FACILITY	74
33	SPACE ENVIRONMENT EFFECTS LABORATORY	84
34	FLIGHT ACCELERATION MOTOR GENERATOR BUILDING	83
35	FLIGHT CREW TRAINING FACILITY	87
36	BIOMECHANICAL AND TEST SUPPORT FACILITY	85
37	LIFE SCIENCES LABORATORY	85
38	WATER IMMERSION MOCKUPS STORAGE FACILITY	70
40	ELEVATED WATER STORAGE TANK	85
41	HPC/HPE/BARBIC TRAINING FACILITY	85
44	BIOMEDICAL INCUBATOR FACILITY	85
45	PROJECT ENGINEERING OFFICES AND TECHNICAL LIBRARY	85
47	SOUTHWESTERN BELL TELEPHONE COMPANY FACILITY	85
48	EMERGENT POWER BUILDING (MCC-40)	83
48a	VIBRATION AND ACOUSTIC TEST FACILITY	84,75
100	SECURITY CONTROL CENTER	82
101	SECOND STREET GATEHOUSE	82
102	THIRD STREET ENTRY GATEHOUSE	82
103	THIRD STREET GATEHOUSE	82
204	AVENUE B EAST GATEHOUSE	82
207	ROBERT H. DOOLITTLE RECREATION FACILITY	84
207a	UTILITY MAINTENANCE AND STORAGE FACILITY	84
220	TEST ARTICLE PREPARATION FACILITY	75
221	UTILITY MAINTENANCE SUBSTATION	82
222	ATMOSPHERIC MATERIALS AND STRUCTURES EVALUATION FACILITY	84,74
223	SEWAGE TREATMENT PLANT	85
225	ADMINISTRATION SUPPORT FACILITY ANNEX	88
226	ADMINISTRATION SUPPORT FACILITY	82,84,87
227	PRINTING AND REPRODUCTION FACILITY	80,84,89
228	RECOVERY QUARANTINE EQUIPMENT STORAGE BUILDING	84
230	UTILITY ANNEX	84
231	CUSTODIAL STORAGE BUILDING	71
232	BARBE DOCKING FACILITY	87
233	SPACECRAFT RECOVERY EQUIPMENT STORAGE BUILDING	84
234	TRAINING AND TEST FACILITY	84
261	PLANETARY AND EARTH SCIENCES LABORATORY ANNEX A	83,88
262	AEC AT-RADIATION HEATING AND ACOUSTIC TEST FACILITY	83
263	HEALTH PHYSICS LABORATORY	84,86
264	BIOMEDICAL INCUBATOR	85
265	PLANETARY AND EARTH SCIENCES LABORATORY ANNEX B	83,88
266	BIOMEDICAL RESEARCH SUPPORT FACILITY	89
270	SOLAR TELESCOPE FACILITY	82
301	WATER WELL NO. 1	82
302	WATER WELL NO. 2	82
303	WATER WELL NO. 3	88
304	MAINTENANCE PAINTING FACILITY	72
305	AVENUE B WEST GATEHOUSE	88
306	STEAM CLEANING FACILITY	88
321	CONSTRUCTION MATERIALS STAGING FACILITY	69
322	WATER TREATMENT PLANT BUILDING	82
323	CONSTRUCTION WORK CONTROL CENTER	85
324	CLASSIFIED WASTE DISINTEGRATION FACILITY	85
325	MAINTENANCE MATERIALS STAGING AND SHOP FACILITY	85
326	GROUND EQUIPMENT MAINTENANCE FACILITY	71
326a	SPECIAL EQUIPMENT STORAGE FACILITY	82
328	SANDBLAST FACILITY	89
327	MAINTENANCE WORK CONTROL CENTER	85
328a	BULK MATERIALS STORAGE FACILITY	85
328b	MAINTENANCE SHOP FACILITY	85
329	ACID CLEANING AND STORAGE SHED	72
332	CENTRAL WASTE COLLECTION FACILITY	70
333	LABORATORY STORAGE WAREHOUSE	75
334	STORAGE SHELTER	75
335	TEST EQUIPMENT WAREHOUSE	84
336	TEST PREPARATION BUILDING	84,88
339	ABOVE GROUND WATER STORAGE TANK	82
340	GAS METERING STATION	82
341	ABOVE GROUND WATER STORAGE TANK NO. 2	82
350	THERMOCHEMICAL TEST AREA SUPPORT LABORATORY	82,87
351	THERMAL VACUUM TEST FACILITY	83
352	PHOTOFACILITIES TEST FACILITY	83
353	PADULSON TEST FACILITY	83
354	CRYOGENIC TEST FACILITY	83
355	CHEMICAL STORAGE BUILDING	83
356	FLUID SYSTEMS TEST FACILITY	83
357	THERMOCHEMICAL TEST AREA GATEHOUSE	83
358	PROPELLANT FUEL WASTE TREATMENT FACILITY	86
359	THERMOCHEMICAL EQUIPMENT STORAGE FACILITY	86
380	HAZARDOUS MATERIAL STORAGE FACILITY	86
381	CENTRAL GAS COLLECTOR STORAGE SHED	86
382	DRUM STORAGE SHED	70,71
383	POWER AND EMERGENCY HEATING FACILITY	88
404	AVENUE E GATEHOUSE	75
405	COOLING EQUIPMENT STORAGE SHELTER	75
418	INSTALLATION SUPPORT FACILITY	85
417	GARAGE	82
419	LOGISTICAL SERVICE OFFICES	82
420	SHIPPING AND RECEIVING WAREHOUSE	82
421	GENERAL SUPPLY WAREHOUSE	86
422	LOGISTICAL SUPPORT WAREHOUSE	87
423	CENTER SUPPORT FACILITY	87
424	INTERIM FILM REPOSITORY FACILITY	70
450	MICROWAVE TRANSMITTING ANTENNA TOWER	84

LYNDON B. JOHNSON SPACE CENTER  
CLEAR LAKE, TEXAS  
**MASTER SITE PLAN**  
(FOR EXTERNAL USE)  
ENGINEERING DIVISION - MARCH, 1976

LYNDON B. JOHNSON SPACE CENTER  
HOUSTON, TEXAS



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1980 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).

Expendable launch vehicle operations are conducted at both the Air Force's Eastern Test Range, Cape Canaveral Air Force Station and the Western Test Range at Vandenberg Air Force Base, California, which is located 6 miles west of Lompoc, California. Space Shuttle flights will begin at KSC in 1979 and at Vandenberg in 1983.

The capital investment at the Kennedy Space Center and the Western Test Range, including fixed assets in progress and contractor-held facilities as of September 30, 1978 was \$1,329,176,000.

CENTER ROLES AND MISSIONS

The Kennedy Space Center (KSC) 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 launch operations, Solid Rocket Booster (SRB) retrieval, STS refurbishment and turnaround, Levels I and II integration, Spacelab Level III and IV integration, integrated logistics and transportation and postlanding operations, and flight line medical and biomedical support.

STS Sustaining Engineering - includes configuration management, operational hardware accommodations and modifications.

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

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
I. Personnel and Related Costs.. .. .	64,543	66,705	70,123	70,502
11. Travel .....	2,120	2,338	2,416	2,368
111. Facilities Services.....	22,023	27,906	26,216	31,421
IV. Technical Services.. .. .	5,733	6,182	6,444	6,987
V. Management and Operations .....	<u>19,346</u>	<u>15,300</u>	<u>15,708</u>	<u>16,871</u>
Total, fund requirements .....	<u>113.765</u>	<u>118.431</u>	<u>120.907</u>	<u>128.149</u>

Distribution of Permanent Positions by Program

	1978 <u>Actual</u>	1979		1980
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
<u>Direct Positions</u>				
<u>Space Transportation Systems</u> .....	<u>1,625</u>	<u>1,654</u>	<u>1,627</u>	<u>1,624</u>
Space Shuttle .....	1,224	1,089	1,225	1,146
Space flight operations .....	218	434	250	342
Expendable launch vehicles .....	183	131	152	136
<u>Space Science</u> .....	<u>2</u>	<u>3</u>	<u>2</u>	<u>2</u>
Life sciences .....	2	3	2	2
<u>Space and Terrestrial Applications</u> .....	<u>11</u>	<u>17</u>	<u>10</u>	<u>7</u>
Space applications .....	9	12	9	6
Technology utilization .....	2	5	1	1
<u>Aeronautics and Space Technology</u> .....	<u>3</u>	<u>---</u>	<u>2</u>	<u>2</u>
Space research and technology .....	2	---	1	1
Energy technology .....	1	---	1	1
Subtotal, direct positions .....	1,641	1,674	1,641	1,635
<u>Center Management and Operations Support Positions</u> .....	<u>538</u>	<u>533</u>	<u>552</u>	<u>552</u>
Total. permanent positions .....	<u>2,179</u>	<u>2,207</u>	<u>2,193</u>	<u>2,187</u>

## PROGRAM DESCRIPTION

### SPACE SHUTTLE

1,146 Permanent Positions (Civil Service)

The Kennedy Space Center has been assigned the Launch and Landing Project of the Space Shuttle program. Major roles for the accomplishment of this responsibility include launch systems development and ground operations. In the performance of these roles, 1980 will represent a period of continuing activity at KSC in preparation for fully operational shuttle. Orbiter 102 will be used for the first manned orbital flight in late 1979, and preparations will be in progress for three additional orbital test flights during 1980.

Construction of new launch support facilities and modification of existing facilities will be complete with installation and checkout of remaining support equipment in preparation for scheduled flights. Major facilities involved are:

#### Orbiter Landing Facility (OLF)

The installation and checkout of operational television (OTV) will be completed. This system along with the ground support equipment previously installed will support Shuttle landings after the fourth orbital flight test.

#### Orbiter Processing Facility (OPF)

Integration and checkout of all ground support systems in the Low Bay Annex and High Bay 2 will continue in preparation to be completed when the second orbiter arrives at KSC in 1981.

#### Vehicle Assembly Building (VAB)

Modification of support systems and equipment will continue in preparation for the Solid Rocket Boosters and External Tanks as well as full Shuttle integrated operations. Installation and checkout of support equipment in High Bays 1 and 2 will also commence.

#### Mobile Launcher Platforms (MLP)

Mobile Launcher Platform 1 became operational in 1979 with Mobile Launcher Platform 2 support equipment installation and checkout starting in 1980.

In addition to the activity involving major facilities, KSC will continue the design, acquisition, and installation of equipment to be used in support of the Shuttle. This includes not only that equipment provided

by KSC contractors, but also that to be supplied by the development contractors as part of their flight vehicle contract. KSC will also continue the refurbishment of selected existing support equipment for reuse on the Shuttle program.

A new category of support equipment is the Launch Processing System (LPS). This automated checkout system, conceived and developed by KSC, is a major innovation in the checkout and launch of sophisticated space vehicles. This system will not only provide automated checkout capability for the Shuttle vehicle, but also provide engineering data for operations and management decisions. It will be operational for orbital test flights.

Another major role for KSC in the Shuttle program, in addition to ground system development, is that of ground operations. This includes the test and checkout of each flight element as it arrives at KSC for development flight testing, the integration of the several elements (Orbiter, External Tank, Solid Rocket Booster) into the Shuttle vehicle and integrated testing of the stacked configuration, propellant loading, and launch. Subsequent to landing, KSC will refurbish the Orbiter in preparation for the next mission. Also included is retrieval, disassembly, and refurbishment of the expended solid rocket boosters. Since the initial orbital flight test launches will land at Dryden Flight Research Center (DFRC), provisions will be made for the ferrying of the Orbiter back to KSC (for maintenance and launch).

#### SPACE FLIGHT OPERATIONS

342 Permanent Positions (Civil Service)

The conduct of the space flight operations program at KSC includes Spacelab, Inertial Upper Stages, Payload support and multimission support that may be assigned for Shuttle flight operations.

KSC'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 1979 and flight equipment in the latter part of 1979, KSC will continue the additional task of analytical engineering. Responsibility for this task of ensuring that the experiments to be mounted on or in the Spacelab are compatible with the Spacelab, with each other, and with safety requirements will transfer to KSC for the third Spacelab mission. The first Spacelab flight unit will be delivered in 1980 with preparations for the first flight in 1981.

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

The Interim Upper Stage (IUS) is being developed by the Air Force and will be operational in 1980. KSC will be responsible for mating the Spacecraft to the IUS. Initial design review of the IUS integration activities will continue in 1980 with the first delivery of hardware in mid-1980.

Under current plans the Spinning Solid Upper Stages (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 requirements, identify payload facility capability at KSC, and prepare documentation for 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.

The primary activity in 1980 will be in the integration and checkout of support equipment required in the interfacing of payloads with the STS.

EXPENDABLE LAUNCH VEHICLES

136 Permanent Positions (Civil Service)

KSC is responsible for the launch preparation and checkout of the current inventory of expendable launch vehicles. This includes the Atlas Centaur and Delta. Launches at both the Eastern Test Range and the Vandenberg Air Force Base are the responsibility of KSC. Eight launches are scheduled for 1980.

LIFE SCIENCES

2 Permanent Positions (Civil Service)

In 1980 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. These experiments are designed to use the environment of space to accomplish medical and biological research for benefit of man through technological advancement of the state-of-the-art.

SPACE RESEARCH AND TECHNOLOGY

1 Permanent Position (Civil Service)

The Standards and Practices Program develops equipment for multimission applications and business practices to effect cost savings and for improvements in current and future space programs. In 1980, efforts will continue to manage the development of selected projects.

ENERGY TECHNOLOGY

1 Permanent Position (Civil Service)

Studies leading to development of technology requirements and the assessment of technology developments on space vehicle launch and landing.

SPACE APPLICATIONS

6 Permanent Positions (Civil Service)

In the field of applications, KSC will continue in 1980 with resource observation surveys, involving pollution monitoring, and in developing methods of sensing and predicting weather and climatic conditions.

In the area of specialized application tasks, KSC will be performing studies related to requirements, procedures, and techniques of processing space applications payloads for Spacelab.

TECHNOLOGY UTILIZATION

1 Permanent Position (Civil Service)

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.

CENTER MANAGEMENT AND OPERATIONS SUPPORT

552 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as the support or services being provided to all Kennedy Space Center organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

Director and Staff - The Center Director, Deputy Director and the immediate staff, e.g., Legal, Patent Counsel, Equal Opportunity, Public Affairs (includes operation of the Visitors Information Center and its related NASA tours activity), and Safety.

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management resources control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

Maintenance and operation of all buildings and facilities  
Data processing and computer support

PERSONNEL AND RELATED COSTS

		<u>1979</u>		<u>1980</u>
	<u>1978</u>	<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. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>64,543</u>	<u>66,705</u>	<u>70,123</u>	<u>70,502</u>
<u>Basis of Fund Requirement</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions .....	57,605	58,836	61,765	62,396
b. Nonpermanent .....	638	841	1,045	986
c. Reimbursable detailees.....	157	179	153	26
d. Overtime and other compensation .....	<u>243</u>	<u>442</u>	<u>397</u>	<u>375</u>
Subtotal, Compensation .....	58,643	60,298	63,360	63,783
2. <u>Benefits</u> .....	<u>5,699</u>	<u>5,874</u>	<u>6,230</u>	<u>6,186</u>
Subtotal, Compensation and Benefits.....	<u>64,342</u>	<u>66,172</u>	<u>69,590</u>	<u>69,969</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel .....	99	258	258	258
2. Personnel training .....	<u>102</u>	<u>275</u>	<u>275</u>	<u>275</u>
Subtotal, Supporting Costs .....	<u>201</u>	<u>533</u>	<u>533</u>	<u>533</u>
Total, Personnel and Related Costs .....	<u>64,543</u>	<u>66,705</u>	<u>70,123</u>	<u>70,502</u>

	1978	<u>1979</u>		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
A. <u>Compensation and Benefits</u> .....	64,342	66,172	69,590	69,969
1. <u>Compensation</u> .....	58,643	60,298	63,360	63,783
a. Permanent positions .....	57,605	58,836	61,765	62,396

The funds shown above will support 2,187 permanent positions in 1980. Permanent personnel staffing will decrease slightly from 1979 to 1980, but the funding increases in both years is due primarily to the October 1978 pay raise.

Basis of Cost for Permanent Positions

In 1980 the cost of permanent positions will be \$62,396,000. The increase results from the following:

Cost of permanent positions in 1979.....	61,765
Cost increase in 1980.....	+1,826
Within grade advances and career development:	
Full year effect of 1979 actions.....	+716
Partial year effect of 1980 actions.....	+576
Full year effect of 1979 pay increase.....	+68
Two extra paid days in 1980.....	+466
Cost decrease in 1980.....	-1,195
Turnover savings and abolished positions:	
Full year effect of 1979 actions.....	-339
Partial year effect of 1980 actions.....	-740
Change in reimbursable activity.....	-116
Cost of permanent positions in 1980.....	<u>62,396</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
(Thousands of Dollars)				
b. Nonpermanent positions				
1. cost...	638	841	1,045	986
2. Workyears	71	103	118	113

The 1979 current estimate increases from the 1979 budget estimate due to the implementation of a non-baccalaureate cooperative training program and an experimental part-time program. The 1980 estimate reflects a slight decrease from 1979 as a result of the absorption of the part-time program into the permanent position ceiling. The level of 113 workyears is distributed to the following programs:

Distribution of Nonpermanent Workyears

<u>Programs</u>	<u>Workyears</u>
Cooperative training programs...	55
Summer programs.	15
Youth opportunity programs	21
Other temporaries	<u>22</u>
Total..	<u>113</u>

c. Reimbursable detailees...	157	179	153	26
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Provides funding for the services of a software applications officer in support of the Shuttle program. The decrease from the 1979 budget estimate to the 1979 current estimate reflects the completion during the year of duty tours for five others detailed from the Department of Defense. The decrease in 1980 reflects the full year effect of these actions.

d. Overtime and other compensation	243	442	397	375
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The funding decrease from the 1979 budget estimate to the current estimate is due to the slip in the scheduled launch date for the First Manned Orbital Flight (FMOF) of the Shuttle. This delay allows for less critical scheduling of Shuttle preparation efforts. The decrease from 1979 to 1980 reflects reduced demands for overtime as launch of the STS vehicle moves through the design, development, test and evaluation phase.

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
2. <u>Benefits</u> .....	<u>5,699</u>	<u>5,874</u>	<u>6,230</u>	<u>6,186</u>
<u>Category of Cost:</u>				
Civil Service Retirement Fund.. .....	4,050	4,177	4,427	4,425
Employee life insurance... .....	250	266	274	274
Employee health insurance.. .....	1,123	1,120	1,211	1,211
Workman's compensation.....	192	192	197	197
FICA.....	13	24	26	26
Incentive awards.....	60	95	95	53
Severance pay... .....	<u>11</u>	<u>---</u>	<u>---</u>	<u>---</u>
Total.....	<u>5,699</u>	<u>5,874</u>	<u>6,230</u>	<u>6,186</u>

The increase from the 1979 budget estimate to the 1979 current estimate is due primarily to the effect of pay increases. The decrease in 1980 is due to continuing personnel reductions and an increase in reimbursable activity.

B. <u>Supporting Costs</u> .....	201	533	533	<u>533</u>
1. Transfer of personnel.....	99	258	258	258

Provides for continuing recruitment and transfer of personnel essential to the KSC Shuttle mission. Funds required for the transfer of personnel in 1980 remain level with 1979. The 1980 estimates provide for 60 relocations at an average of \$4,300 each.

2. Personnel training.....	102	275	275	275
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These funds provide the means to maintain proficiency in various skills, to provide the necessary training for those employees with technological expertise to keep abreast of the state-of-the-art in their respective fields, and to meet career development needs. Personnel training costs for 1980 will remain at the 1979 level.

TRAVEL

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
		(Thousands of Dollars)		
11. <u>TRAVEL</u> .....	<u>2,120</u>	<u>2,338</u>	<u>2,416</u>	<u>2,368</u>
<u>Basis of Fund Requirements</u>				
A. Program Travel .....	1,260	1,274	1,308	1,209
B. Scientific and Technical Meeting .....	16	24	12	12
C. Management and Operations .....	<u>844</u>	<u>1,040</u>	<u>1,096</u>	<u>1,147</u>
Total, Travel. ....	<u>2,120</u>	<u>2,338</u>	<u>2,416</u>	<u>2,368</u>
A. <u>Program Travel</u> .....	<u>1,260</u>	<u>1,274</u>	<u>1,308</u>	<u>1,209</u>

Program travel is directly related to the accomplishment of the Center's mission and accounts for 54 per cent of the travel budget. Approximately 2,400 trips will be required to carry out the Kennedy Space Center responsibilities in this category. Program travel has reflected the Center's involvement in the design and manufacturing of Shuttle ground system equipment, design and construction of Shuttle facilities, and the activation of systems manufactured at off-site locations. During 1980, our effort will be to test, checkout, and launch the Orbiter. Travel to Dryden Flight Research Center, the landing site of the orbital flight tests will be required.

The reduction from 1979 to 1980 reflects the completion of the major portion of travel to Shuttle development centers and manufacturers' sites which was necessary to assure operations capability of all systems for which KSC is responsible.

B. <del>Scientific and Technical Meeting</del> .....	<u>16</u>	<u>24</u>	<u>12</u>	<u>12</u>
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Scientific and technical meeting 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. It is planned that 1980 travel for this category will be the same as 1979.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</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</u> .....	<u>844</u>	<u>1,040</u>	<u>1,096</u>	<u>1,147</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. Approximately 800 trips are planned for 1980. The increases in both 1979 and 1980 are due to increased requirements for local travel brought about by the increased on-site population for Shuttle preparations.

FACILITIES SERVICES

Kennedy Space Center (KSC) is located on 139,305 acres and has a complex of facilities which are mainly made up of test and office type buildings as well as launch operations facilities. This complex encompasses 5,297,528 gross square feet of building space, including 13 major buildings. Also included are 14 major technical facilities. This plant supports an average daily on-Center population of about 8,500 personnel. Many of the test facilities are utilized during off-peak hours or on more than one shift. A substantial increase in services is required to meet the needs of Shuttle support activities. The budget estimate also includes plant needs at its component installation on Vandenberg Air Force Base.

III. <u>FACILITIES SERVICES</u> .....	<u>22,023</u>	<u>27,906</u>	<u>26,216</u>	<u>31,421</u>
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Basis of Fund Requirements

A. <u>Rental of Real Property</u> .....	<u>1</u>	<u>10</u>	<u>110</u>	<u>110</u>
B. <u>Maintenance and Related Services</u>				
1. <u>Facilities</u> .....	4,571	7,343	5,519	6,841
2. <u>Equipment</u> .....	<u>575</u>	<u>603</u>	<u>630</u>	<u>847</u>
Subtotal.. .....	<u>5,146</u>	<u>7,946</u>	<u>6,149</u>	<u>7,688</u>

	<u>1978</u>	<u>1979</u>		<u>1980</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>Custodial Services</u> .....	<u>9,287</u>	<u>10,299</u>	<u>10,147</u>	<u>12,450</u>
D. <u>Utility Services</u> .....	<u>7,589</u>	<u>9,651</u>	<u>9,810</u>	<u>11,173</u>
Total, Facilities Services..	<u>22,023</u>	<u>27,906</u>	<u>26,216</u>	<u>31,421</u>
 A. <u>Rental of Real Property</u> .....	 1	 10	 110	 110

This provides for the rental of off-site facilities for news and reception center activities associated with launches and major public events. The increase from the 1979 budget estimate reflects the needs of the Shuttle launch activities, including the first manned orbital flight (FMOF) test of the Space Shuttle. Many of these requirements were unforeseen at the time of the 1979

B. <u>Maintenance and Related Services</u> .....	<u>5,146</u>	<u>7,946</u>	<u>6,149</u>	<u>7,688</u>
1. <u>Facilities</u> ..	4,571	7,343	5,519	6,841

This activity involves the operations and maintenance of applicable facilities at KSC, Cape Canaveral Air Force Station, and Vandenberg Air Force Base. The size, complexity and wide geographical dispersion of these facilities places heavy demands on facilities services. The decrease from the 1979 budget estimate to the 1979 current estimate is due to the deferral into 1980 of facility projects in support of Space Shuttle activities. The increase in 1980 over 1979 reflects this shift and is consistent with Shuttle program schedules.

a. Maintenance and operation of facilities (145 workyears).....	3,982
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This activity includes, in addition to the normal activities associated with facility maintenance or management of direct maintenance personnel, the responsibilities for space utilization, utility rate study and analysis as well as corrosion control and cathodic protection activities.

In addition, there are minor facility related services for such items as payment of certification fees for facility maintenance at Vandenberg Air Force Base, and internal moves of personnel and related plant rearrangements.

	<u>1978</u> <u>Actual</u>	<u>1979</u> <u>Budget</u> <u>Current</u> <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		<u>1980</u> <u>Budget</u> <u>Estimate</u>
b. Ground maintenance (29 workyears of effort) .....				840
<p>This involves the provision of grounds maintenance and related supplies and equipment and reimbursement to the Air Force for the maintenance of NASA facilities at Cape Canaveral Air Force Station.</p>				
c. Facilities design engineering (36 workyears of effort) .....				1,004
<p>This effort involves inspecting, siting, and other engineering functions associated with institutional facilities.</p>				
d. Supplies and facilities equipment .....				649
<p>Funds provide building materials, hardware, metals, plumbing supplies, electrical materials, and general maintenance and operating materials.</p>				
e. Routine facilities work. ....				366
<p>Minor construction, repair, and alteration projects are included in this activity. A level of effort of 13 workyears is provided by a support contract with off-site contractors being brought in when needed.</p>				
2. Equipment .....	575	603	630	847
<p>This funding provides for 17 workyears of support contractor effort and related supplies and equipment required for maintenance and repair of heavy equipment items. The 1980 estimate reflects equipment purchases and maintenance to support increasing operational activity.</p>				
C. <u>Custodial Services</u> .....	<u>9,287</u>	<u>10,299</u>	<u>10,147</u>	<u>12,450</u>

The demand for these services will increase especially for janitorial, fire protection, and security services in 1980 as the Space Shuttle program reaches the orbital flight test stage. The increase from 1979 to 1980 is due to negotiated support contract wage increase and additional workyears of effort to support shuttle operations.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
1. Janitorial services (117 workyears) .....				2,420
<p>This activity provides janitorial services to some 2.0 million square feet of KSC floor areas, including highly specialized services to cleanroom areas.</p>				
2. Fire protection services (108 workyears) .....				3,416
<p>This activity will provide for fire protection service for KSC property and personnel including:</p> <ul style="list-style-type: none"> <li>a. Support of increasing hazardous tests and operations and orbiter landings.</li> <li>b. Performing fire drills and fire inspections of facilities and equipment.</li> <li>c. Providing fire protection instructions.</li> <li>d. Fighting fires.</li> </ul> <p>This estimate reflects the full activation of both KSC fire station for Shuttle operations.</p>				
3. Security services (205 workyears) .....				5,341
<p>This activity includes the protection of personnel and property at KSC and involves:</p> <ul style="list-style-type: none"> <li>a. Support of increasing hazardous tests and operations.</li> <li>b. Badging of all on-site personnel and official visitors.</li> <li>c. Safeguarding flight hardware and other items of high intrinsic value arriving for OFT.</li> <li>d. Protecting classified information.</li> <li>e. Maintaining area and traffic control.</li> </ul>				
4. Other related activities.. ..				1,273

These activities are as follows:

- a. Janitorial services and security services reimbursed to the Air Force performed on NASA facilities at Cape Canaveral Air Force Station.
- b. Pest control services for KSC which involves five workyears of support contractor effort.
- c. Laundry services at both KSC and Vandenberg Air Force Base.
- d. Provision of supplies and equipment related to custodial services.

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
D. <u>Utilities Services</u> .....	<u>7,589</u>	<u>9,651</u>	<u>9,810</u>	<u>11,173</u>

The major utility service at KSC is electrical energy purchased from the 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 Cape Canaveral Air Force Station. Water services are purchased from the City of Cocoa and sewage treatment is accomplished on-site.

At Vandenberg Air Force Base, utility services are purchased through the U.S. Air Force.

Utility plant operations and maintenance and utility distribution systems maintenance are provided in this activity which also covers reimbursement to the Air Force at the Eastern Test Range (ETR) and Vandenberg Air Force Base for these services. These services involve 81 workyears of support contractor effort. The commodity costs are as follows:

1. Electricity (199,400 MW/Hrs.) .....	7,218
2. Fuel oil (2,200,000 gals.) .....	994
3. Steam (47,800 K lbs.) .....	253
4. Water and sewage. ....	60
5. Vandenberg AFB - all utilities. ....	147

The increase from the 1979 budget to the current estimate is a reduction in electricity and fuel oil costs offset by the addition of six support contractor workyears for increasing activity in STS related facilities. The 1980 increase is due to greater electricity consumption for test, checkout, and launch activity, higher utility rates, and negotiated support contract wage increases. Contractor workyears are level.

TECHNICAL SERVICES

	<u>1978</u> <u>Actual</u>	<u>1979</u> <u>Budget Estimate    Current Estimate</u> (Thousands of Dollars)		<u>1980</u> <u>Budget Estimate</u>
IV. <u>TECHNICAL SERVICES</u> .....	<u>5.733</u>	<u>6,182</u>	<u>6,444</u>	<u>6,987</u>
<u>Basis of Fund Requirement</u>				
A. <u>Automatic Data Processing</u>				
1. Equipment.....	411	509	430	464
2. Operations.....	<u>2,999</u>	<u>2,758</u>	<u>3,296</u>	<u>3,456</u>
Subtotal.....	<u>3,410</u>	<u>3,267</u>	<u>3,726</u>	<u>3,920</u>
B. <u>Scientific and Technical Information</u>				
1. Library.....	342	327	349	377
2. Education and information.....	<u>1,643</u>	<u>1,750</u>	<u>2,018</u>	<u>2,311</u>
Subtotal.....	<u>1,985</u>	<u>2,077</u>	<u>2,367</u>	<u>2,688</u>
C. <u>Shop Support and Services</u> .....	<u>338</u>	<u>838</u>	<u>351</u>	<u>379</u>
Total, Technical Services.....	<u>5.733</u>	<u>6.182</u>	<u>6.444</u>	<u>6.987</u>
A. <u>Automatic Data Processing</u> .....	<u>3,410</u>	<u>3,267</u>	<u>3,726</u>	<u>3,920</u>

These funds provide for the cost of general management ADP programs including the lease, purchase, and maintenance of ADP equipment and programming and operations services.

1. Equipment.....	411	509	430	464
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The funding provides for the maintenance and lease of the Honeywell 635 and supporting equipment. The decrease from the 1979 budget to the current estimate is due to deferred equipment purchases. Increase in 1980 is due to increased costs for the same level of services.

	1978	<u>1979</u>		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
2. Operations .....	2,999	2,758	3,296	3,456

One hundred and twenty-three support contractor workyears provide programming services for payroll, general accounting, supply reports, procurement, contract reports, technical support information retrieval (failure analysis), preventive maintenance reports of control vehicle components and ground support equipment, contract surveillance status reports for the KSC Personnel Office, security reports, and resources and financial management reports.

The increase from the 1979 budget estimate to the 1979 current estimate is due to 17 additional work-years primarily for programming support to the financial management system update for the STS operation period. The 1980 increase is due to negotiated support contract wage increases partially offset by a reduction of five workyears as programming the financial management system nears completion.

B. <u>Scientific and Technical Information</u> .....	<u>1,985</u>	<u>2,077</u>	<u>2,367</u>	<u>2,688</u>
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The funding provides for operation of a technical library at KSC and for various technical and administrative documentation services throughout the center, including support to Public Affairs' educational and information program.

1. Library .....	342	327	349	377
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Fourteen support contract workyears are required to operate the KSC library facilities. The cost includes technical reports and literature in hard copy and microfiche; scientific technical and management books and periodicals; military, federal, and professional society specifications and standards are also included. The contractor also operates a Shuttle/Spacelab documents repository which catalogs, classifies, and indexes documents for storage and retrieval; and provides document reference and distribution services. This category also includes supplies used by the contractor. The increase from the 1979 budget to the 1979 current estimate is due to higher costs for books and periodicals. In 1980, the increase is due to wage increases; workyears are level.

2. Education and information.. ..	1,643	1,750	2,018	2,311
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The funding provides for 66 support contractor workyears to prepare publications pertaining to the receipt, checkout, and launch of space vehicles; Shuttle/Spacelab activities, design engineering functions,

and institutional support. Subject matter covers tracking, facilities modifications, booster recovery, earth resources, future programs, launch processing, vehicle tests checkout operations, safety procedures, materials analysis, radiological controls, and contingency plans.

Public Affairs support provides 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. It also includes photographic support at Vandenberg Air Force Base, which is primarily for Public Affairs activities. The increase from the 1979 budget to the current estimate is primarily to support Public Affairs activities related to initial Shuttle launch activities some of which were unforeseen at the time of the 1979 budget. Increase in 1980 is due to four additional workyears for increasing Shuttle launch activities.

	1978	<u>1979</u>		1980
	<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>Shop Support and Services</u> .....	338	838	351	379

The funds provide for a support contractor to perform technical support services such as exercising coordinative control of support activities to assure a constant state of readiness to support test/launch operations. Includes disaster and hurricane planning performed on a center-wide basis through coordination with the KSC Emergency Preparedness Officer (two workyears); training of all KSC personnel engaged in hazardous occupations (five workyears); and a wide variety of shop services, primarily fabrication of non-integral institutional equipment used throughout center facilities (six workyears).

The decrease from the 1979 budget estimate is a result of a decrease of 17 support contractor workyears due to a partial reclassification of fabrication effort to facilities services. Changes in contractor structure resulted from recompetition efforts.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>19,346</u>	<u>15,300</u>	<u>15,708</u>	<u>16,871</u>
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Basis of Fund Requirements

A. Administrative Communications .....	2,332	2,351	2,333	2,359
B. Printing and Reproduction .....	3,737	3,246	3,468	3,706

	1978 <u>Actual</u>	1979		1980
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	<u>Budget Estimate</u>
C. Transportation .....	3,193	2,941	2,293	2,735
D. Installation Common Services... ..	<u>10,084</u>	<u>6,762</u>	<u>7,614</u>	<u>8,071</u>
Total, Management and Operations .....	<u>19,346</u>	<u>15,300</u>	<u>15,708</u>	<u>16,871</u>
A. <u>Administrative Communications</u> .. ..	<u>2,332</u>	<u>2,351</u>	<u>2,333</u>	<u>2,359</u>

Funds provide for the costs of local telephone service, Federal Telecommunications System (FTS), long distance tolls, and teletype services in support of all NASA personnel, contractor and civil service, located on the Kennedy Space Center, the Cape Canaveral Air Force Station, and Vandenberg Air Force Base. Costs remain essentially level from year to year.

1. Local telephone service.. ..... 1,673

Provides for the total KSC population, including contractors, and includes the administrative telephone switchboard, single line telephones for special areas, telephones acoustically coupled for data transmission, and local exchange lines for Brevard and Orange County locations.

2. Long distance telephone service..... 662

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. Service is provided to authorized users, including on-site contractors. Paid long distance and GSA leased lines are in this category.

3. Non-telephone communications..... 24

Provides specialized services such as teletype and wire news services. In addition, the lease and maintenance of various small electrical/electronic systems such as printers which support major communication systems are included.

	1978	<u>1979</u>		1980
	<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>Printing and Reproduction</u> .....	3,737	3,246	3,468	3,706

Includes the printing of test and checkout procedures, launch countdowns, microfilming, engineering drawings, telemetry data, and other related technical material.

The estimate for administrative printing includes long lead time items such as forms production and minor efforts, such as 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 printing firms. The support contractor is being increased 10 workyears from the 1979 budget estimate to cover the increasingly heavy demand of STS activities in preparation for arriving hardware and FMOF. The increase in 1980 is due to support contractor wage rates; workyears are level.

1. Scientific and technical printing .....	2,825
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Eighty-seven workyears of support contractor effort are required to print or reproduce an average of 7.4 million units per month. Supplies used by the contractor and replacement equipment are included in this category.

2. Administrative printing .....	269
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This estimate includes the cost of services provided by the Government Printing Office, Patrick Air Force Base, and Vandenberg Air Force Base.

3. Office copiers .....	612
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Provides office copier service to the total on-site population, civil service and contractor. Copiers are located in central service centers and individual offices where workload justifies assignment. This arrangement has proven to be an economical way of providing this service.

C. <u>Transportation</u> .....	3,193	2,941	2,293	2,735
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The center provides a centralized motor pool, operated by GSA, for civil service and support contractor personnel. The movement of supplies and equipment by commercial carrier are included in this area. This category also includes the operation of heavy equipment, and related supplies and materials, and aircraft

operations. Decrease from the 1979 budget from the current estimate reflects a greater shift in transportation management to program areas (15 support contractor workyears) than planned. The increase in 1980 is due to wages on support contracts; workyears are level. An increase of 400,000 miles is planned for GSA trucks to meet on-site STS contractors' needs for work vehicles.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
1. Truck rental. ....				1,531
Provides for 545 cargo-type vehicles. This is an increase of 115 vehicles over the 1979 budget estimate to provide for the STS contractors mentioned above.				
2. Common carrier and related services.....				709
Eight support contractor workyears are required to perform the transportation management functions, which include coordination, check, inspection, and document control of all shipments and delivery of in-bound shipments. The balance of this requirement is supplies used by the support contractor, minor contracts for off-site packing and crating services, landing fees, maintenance and repair, and supplies and equipment associated with the administrative aircraft.				
3. Heavy equipment.....				495
Twelve workyears of support contractor effort are required to operate KSC-owned heavy equipment, such as tractors, cranes, trailers, and trucks. The balance is for supplies.				
D. <u>Installation Common Services</u> .....	<u>10,084</u>	<u>6,762</u>	<u>7,614</u>	<u>8,071</u>

The funds provide for logistics services, mail and distribution services, medical services, Center management and staff activities, and a wide variety of minor contracts for special and one-time services. The increase in 1979 over the 1979 budget estimate reflects a 40 workyear increase in supply management, medical support, and mail services to support the increasing Shuttle workload. The increase in 1980 is due to negotiated contract wage increases.

1. Center management and staff functions. ....				103
This category includes tort claims, notary public fees, court reporting costs, patent counsel representation, and equal opportunity activities.				

	<u>1978</u>	<u>1979</u>		<u>1980</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. Medical services.. .....				1,464

Two major types of medical service are provided, occupational medicine and environmental health.

a. Occupational medicine.. .....	1,237
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Forty-nine workyears of support contractor effort are required to provide emergency and first aid care for the KSC 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 Occupational Safety and Health Administration standards compliance for all KSC elements. 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. This category also covers supplies and equipment used by the contractor and a minor contract at Vandenberg Air Force Base, primarily for physical examinations at that location.

b. Environmental health. ....	227
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Includes industrial hygiene, radiological health, and environmental sanitation requiring eight workyears of support contractor effort. This includes water supply and distribution, sewage treatment and disposal, treatment and disposal of industrial wastes, solid waste management and disposal, selection and use of pesticides, and the surveillance of operations producing atmospheric, water, or soil pollution.

3. Installation support services.. .....	6,504
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a. Supply services.....	4,251
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These funds provide 153 support contractor workyears needed to provide a broad range of logistics services including receipt, storage, and issue of supplies and equipment, as well as maintaining various management systems.

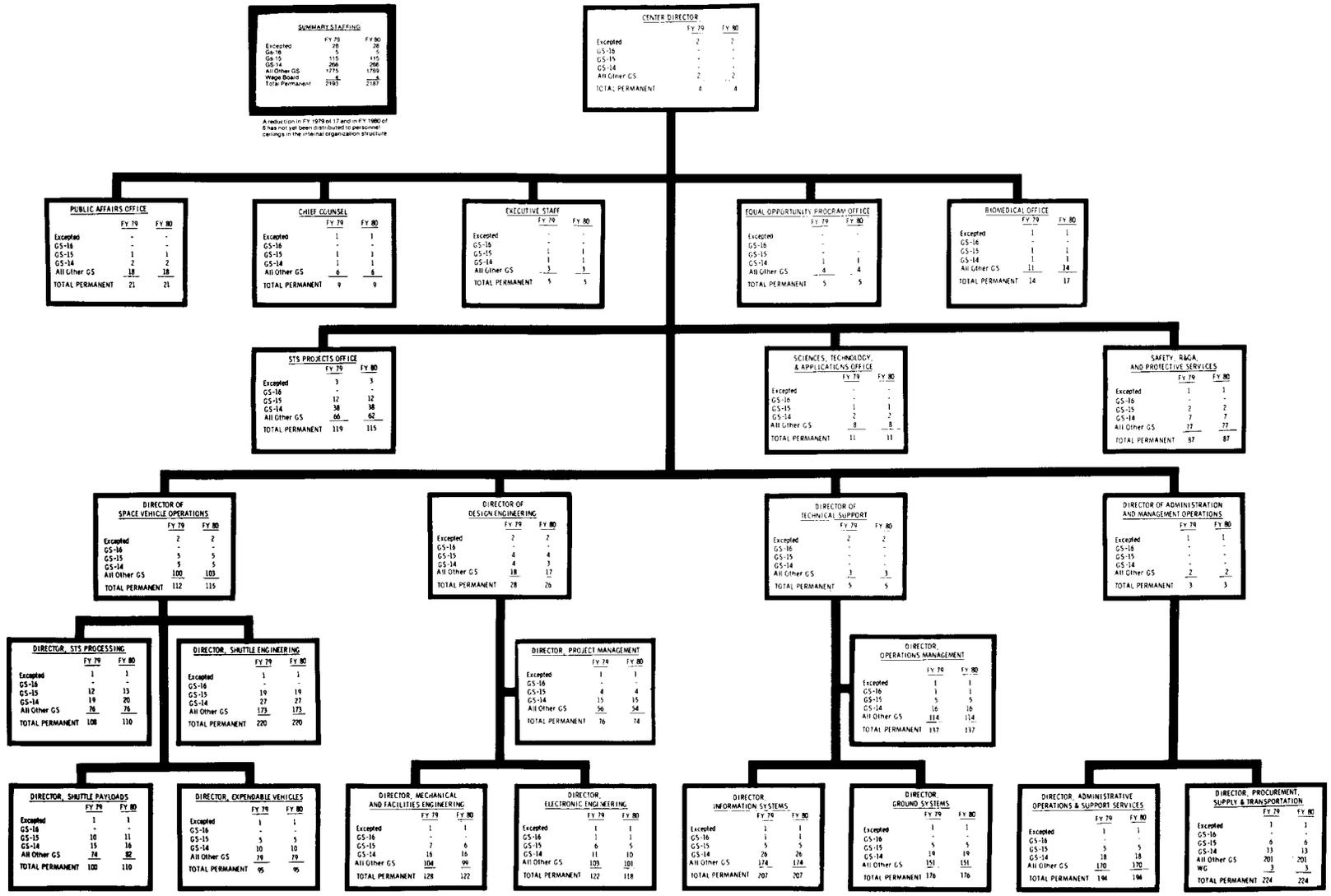
b. Mail.. .....	717
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Mail and distribution services of 34 workyears, provided by a support contractor, include distribution of inter-office mail, classified document control, operation of the KSC branch post office, and postage.

	<u>1978</u>	<u>1979</u>		<u>1980</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. Office supplies .....				839
<p>As an economy measure, KSC provides common support to the total population, civil service and contractor. This category includes a wide variety of office supplies and materials.</p>				
d. Administrative equipment .....				697
<p>This category covers lease, maintenance, and purchase of administrative equipment. Rentals are primarily special purpose office equipment more economical to lease than purchase, maintenance is provided for all government-owned administrative equipment in active service, and purchases are largely replacements of office machines such as typewriters and calculators.</p>				

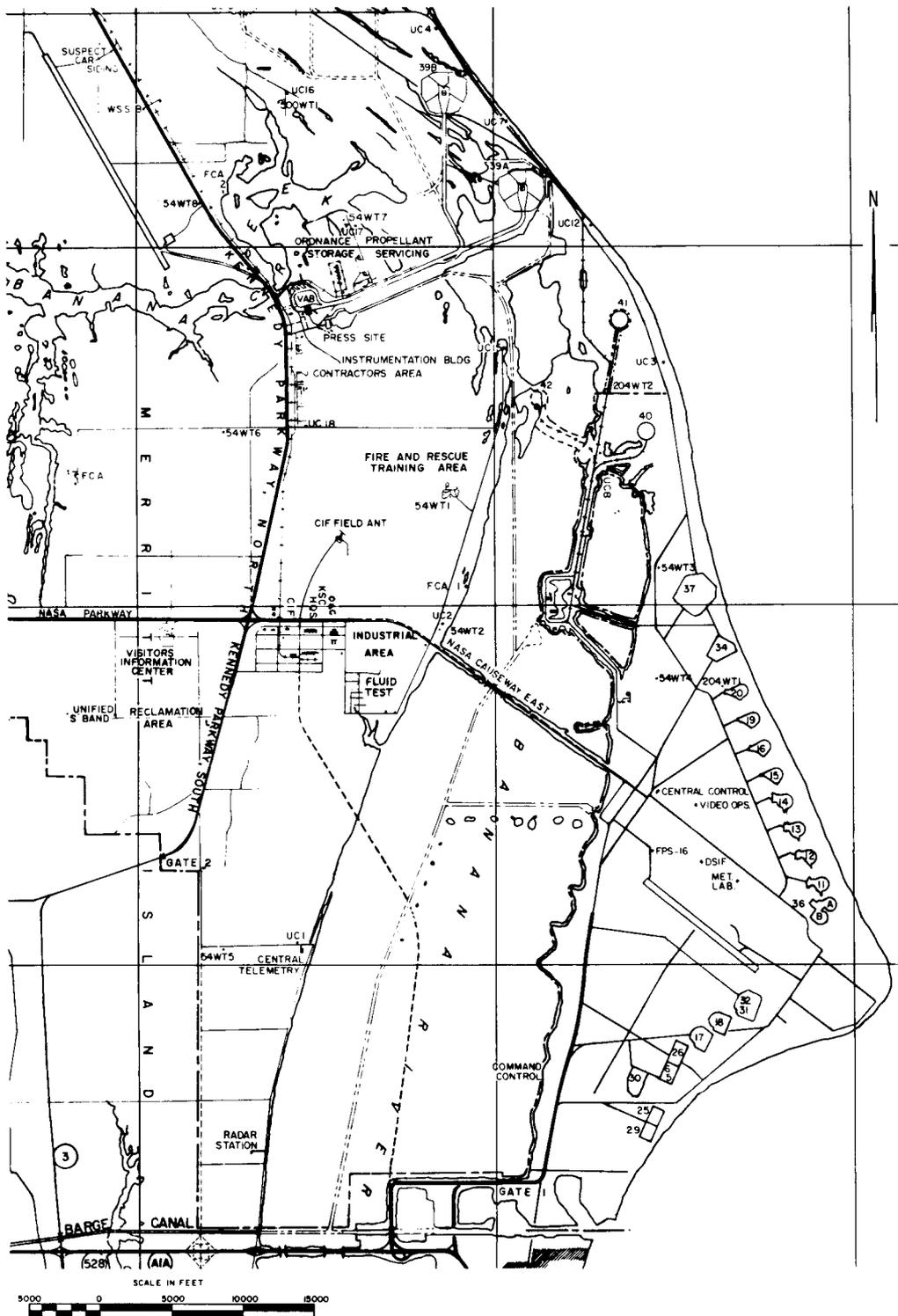


**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
JOHN F. KENNEDY SPACE CENTER**



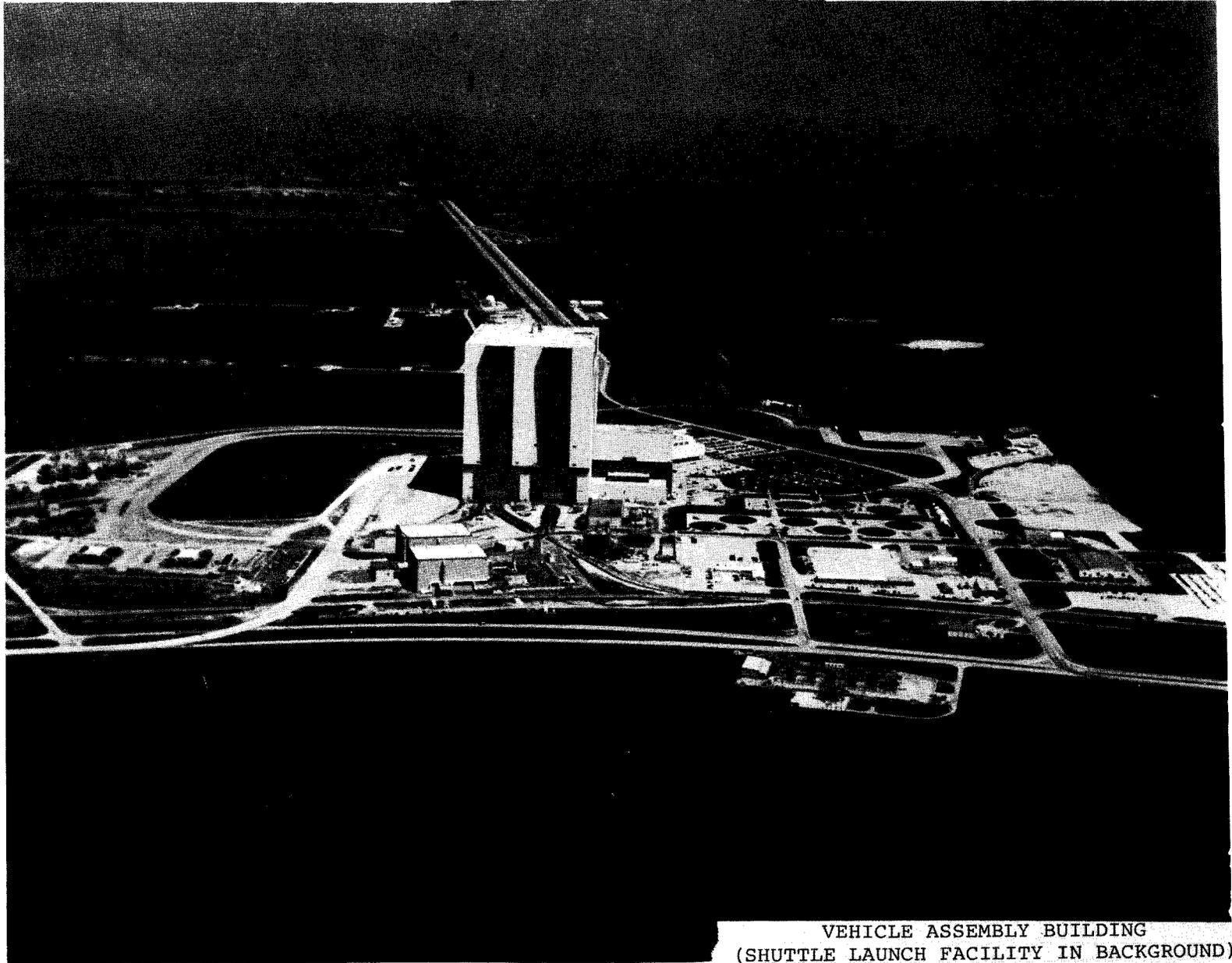
# JOHN F. KENNEDY SPACE CENTER, NASA FISCAL YEAR 1980 ESTIMATES LOCATION PLAN

RPM 2-27



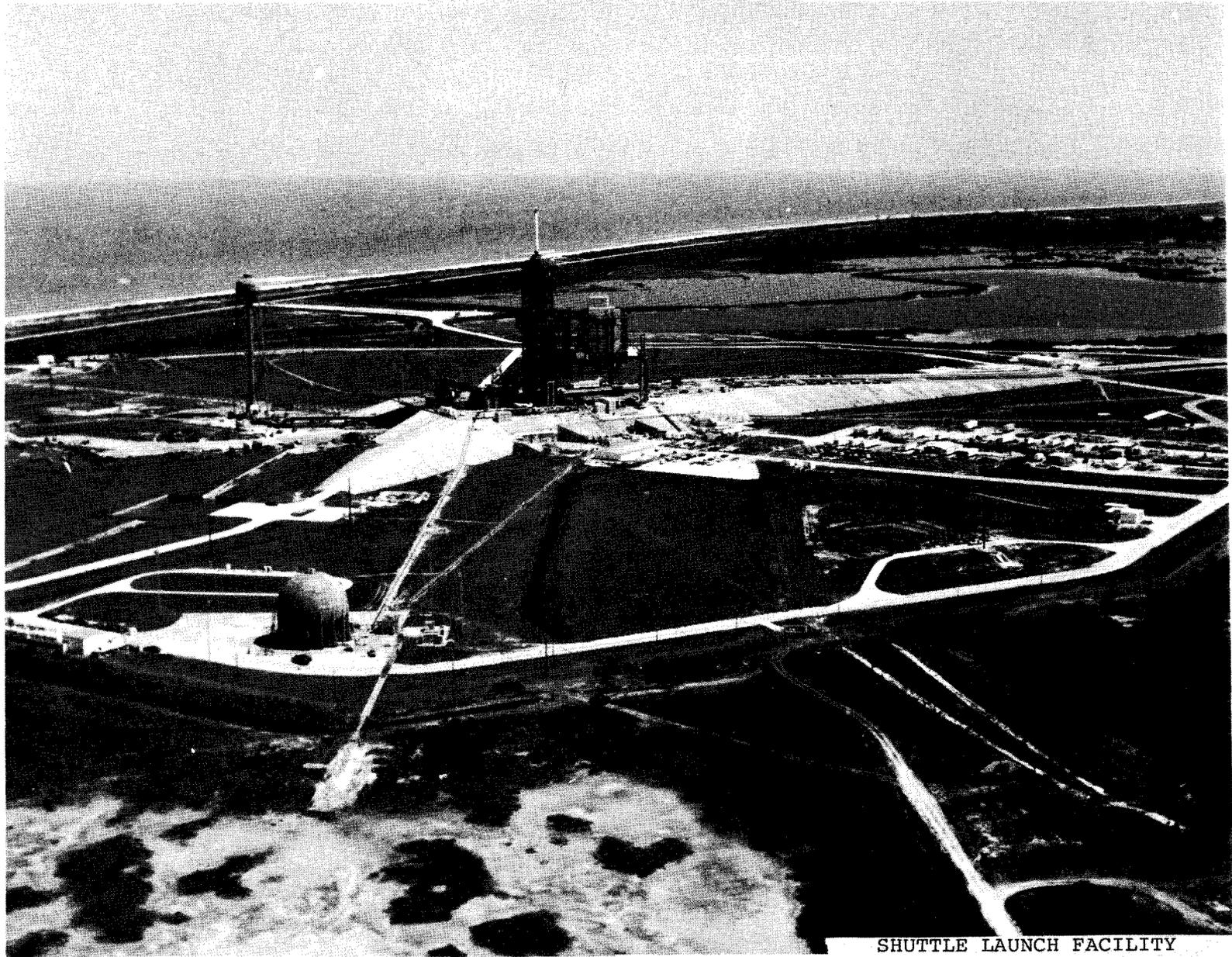


JOHN F. KENNEDY SPACE CENTER



VEHICLE ASSEMBLY BUILDING  
(SHUTTLE LAUNCH FACILITY IN BACKGROUND)  
RPM 2-29

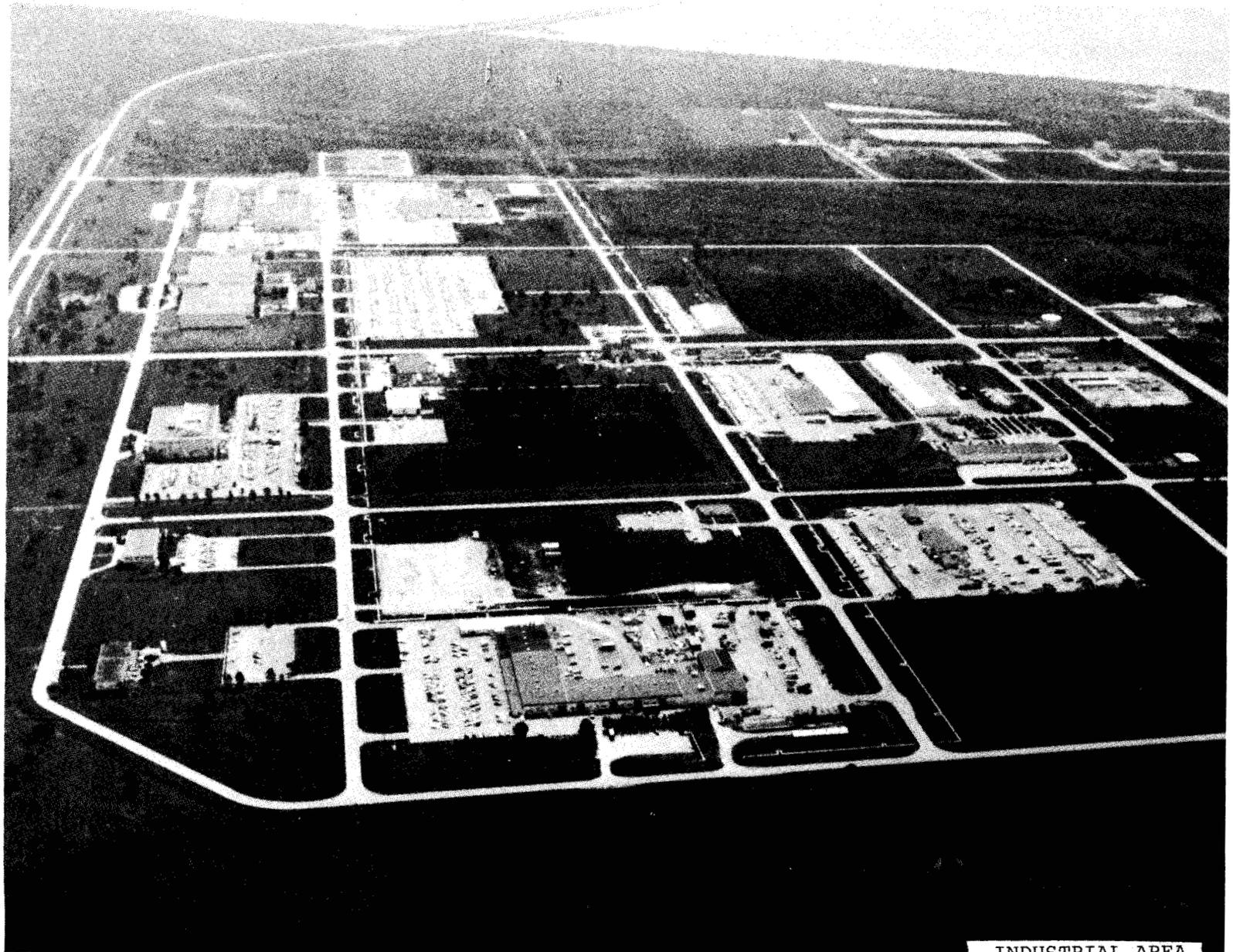
JOHN F. KENNEDY SPACE CENTER



SHUTTLE LAUNCH FACILITY

RPM 2-30

JOHN F. KENNEDY SPACE CENTER



INDUSTRIAL AREA  
RPM 2-31

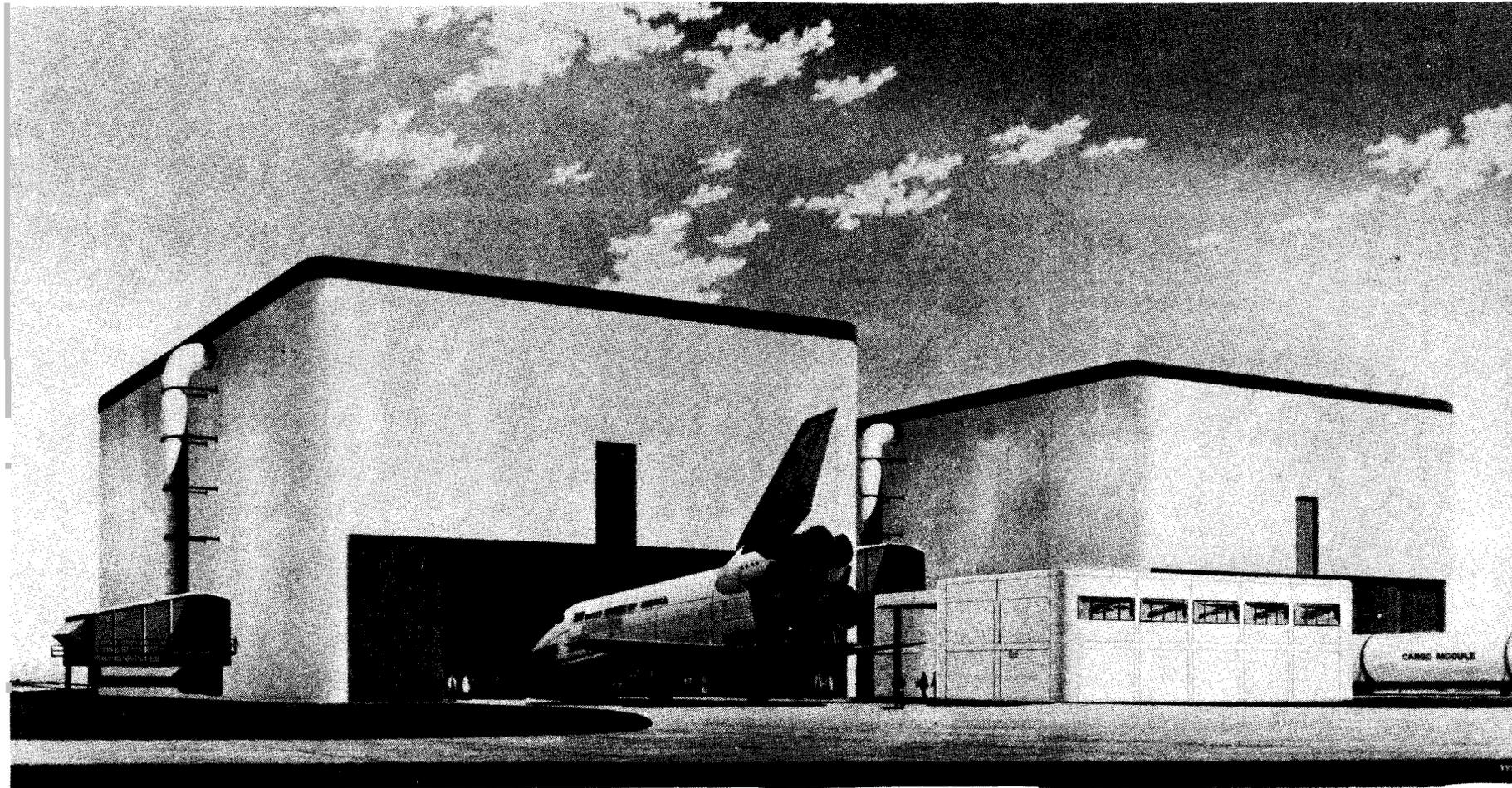
JOHN F. KENNEDY SPACE CENTER

RPM 2-32



ATLAS CENTAUR LIFT-OFF

JOHN F. KENNEDY SPACE CENTER



ARTIST CONCEPT - ORBITER  
PROCESSING FACILITY (OPF)

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1980 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 a nonrevocable use permit from the Army. Certain facilities such as the Redstone Arsenal Air Field and some utilities are used jointly by NASA and 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 3,557,331 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 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, 1978, was \$1,006,068,000.

## 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 is the principal center within NASA for rocket propulsion systems; 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 development of the space processing activity base. MSFC is a primary center within NASA for the development and processing of science and applications experiments and for the conduct of energy-related system studies. In addition, MSFC conducts a vigorous research and technology program and is deeply 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 Shuttle-related systems, including Shuttle main engine, solid rocket booster, external tank, and inertial upper stage in cooperation with the Air Force. Advanced program effort includes the solar electric propulsion systems, the heavy lift launch vehicle, and the orbital transfer vehicle.

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

Spacelab - focus is on systems engineering management, development interface with European Space Agency and procurement.

Advanced Studies - focus is on orbital systems and advanced transportation systems.

Advanced Development - technology advances focused on the advanced missions identified above.

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

Spacelab Mission Management and Payload Definition - management of Spacelab I and II missions and definition of requirements for and development of an Atmospheric Cloud Physics Laboratory for flight as a partial payload of the Spacelab.

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 High Energy Astronomy Observatory, and on Gravity Probe B spacecraft studies.

Space Processing - developing space processing discipline base, developing and managing space processing experiments for Spacelab.

Data Management - development of applications-oriented data management discipline base. Contribute to the overall data management systems expertise in support of advanced high data rate systems development.

#### SUPPORTING

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

Energy Technology - conduct energy-related system studies for reimbursable activity with primary focus on solar heating and cooling and advanced coal extraction technology.

Satellite Power System - conduct definition activity roles.

SUMMARY OF RESOURCES REQUIREMENTS

	<u>FUNDS</u>			
	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
I. Personnel and Related Costs.....	115,638	114,413	120,323	119,961
II. <del>Travel</del> .....	2,326	2,382	2,492	2,684
III. Facilities Services.....	11,775	10,598	11,849	12,395
IV. Technical Services.....	5,636	6,418	5,728	5,588
V. Management and Operations.....	<u>8,070</u>	<u>7,046</u>	<u>7,884</u>	<u>8,256</u>
Total, fund requirements.....	<u>143,445</u>	<u>140,857</u>	<u>148,276</u>	<u>148,884</u>

Distribution of Permanent Positions by Program

Direct Positions

<u>Space Transportation Systems</u> .....	<u>2,063</u>	<u>2,045</u>	<u>1,876</u>	<u>1,859</u>
Space shuttle.....	1,610	1,125	1,363	1,171
Space flight operations.....	453	920	513	688
<u>Space Science</u> .....	<u>500</u>	<u>558</u>	<u>517</u>	<u>476</u>
Physics and astronomy.....	500	558	517	476

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
<u>Space and Terrestrial Applications</u> .....	<u>287</u>	<u>281</u>	<u>394</u>	<u>401</u>
Space applications .....	274	271	382	390
Technology utilization .....	13	10	12	11
<u>Aeronautics and Space Technology</u> .....	<u>271</u>	<u>213</u>	<u>222</u>	<u>214</u>
Aeronautical research and technology .....	9	8	9	9
Space research and technology .....	94	86	94	94
Energy technology .....	<u>168</u>	<u>119</u>	<u>119</u>	<u>111</u>
Subtotal, direct positions .....	3,121	3,097	3,009	2,950
<u>Center Management and Operations Support Positions</u> .....	<u>639</u>	<u>618</u>	<u>627</u>	<u>611</u>
Total, permanent positions .....	<u>3,760</u>	<u>3,715</u>	<u>3,636</u>	<u>3,561</u>

PROGRAM DESCRIPTION

SPACE SHUTTLE

1,171 Permanent Positions (Civil Service)

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, preparing and conducting major Shuttle systems tests; and (5) Shuttle system level analysis, test and integration tasks such as: ascent control and stability analysis; flight performance analysis and predictions; aerothermodynamic and acoustic analysis and flight predictions; structural dynamic analysis and modeling; systems safety and risk analysis; and test, checkout and launch criteria requirements.

In 1980 the major emphasis will be shifting from development and ground testing to flight testing and design refinement. The First Manned Orbital Flight or Orbital Flight Test (OFT) #1 is scheduled for late 1979 with three OFT flights scheduled in 1980. Significant effort will be required to provide flight hardware and to evaluate hardware and system performance for these early flights. Additional effort will be required to increase manufacturing/tooling capacity to provide production rate capability to support the current Shuttle Mission Model.

Some current test activities that will continue in 1980 are: (1) main engine system level testing at the National Space Technology Laboratories (NSTL) and at the Santa Susana Facility to provide final flight certification in 1980 and to demonstrate the engine flight life. (2) 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 which may occur during OFT. (3) the Main Propulsion Test (MPT) Program at NSTL will be completed early in 1980 but the test facility/capability will be maintained through 1980 to provide backup support to resolve problems which may occur during OFT. Refurbishment requirements for the main engine will be finalized in preparation for the overhaul of the three engines used in the MPT. SRB refurbishment design and procedures will be verified during OFT to assure meeting the design reuse goals. Refinements 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 1980. Support will be provided to the Air Force for activation of the Western Test Range.

#### SPACE FLIGHT OPERATIONS

688 Permanent Positions (Civil Service)

The Space Flight Operations program includes Space Transportation System Operations; Space Transportation System Operations Capability Development; Development, Test and Mission Support; and Advanced Programs. The STS Operations Capability Development activity includes two major areas of effort: Spacelab, and STS Upper Stages. The Civil Service positions in 1980 are required to carry out the following program milestones:

#### STS Operations

The STS Operations is the major element of Space Flight Operations. The first operational flight is scheduled for early 1981. During 1980 the activities will include the acquisition of hardware components and production of flight hardware. Typical functions will be production engineering, design, sustaining engineering, anomaly resolution, logistics and contract monitoring. Space Transportation System Operations activity in 1980 also includes the procurement of Inertial Upper Stage flight hardware and ground support items in preparation for STS operational flights commencing in 1981.

#### Spacelab

In 1980, the Spacelab Engineering Model and Flight Unit will complete integration and testing in Europe and be delivered to NASA where integration and operational flow process verification will begin. NASA funded hardware and software activity will also be continued. Manufacturing and testing of the Spacelab Transfer Tunnel are scheduled for completion with delivery near the end of the fiscal year, and the Experiment Computer Operating System will reach operational status. Buildup, test, verification, integration and launch of the upgraded engineering model pallet to be flown on some of the Shuttle OFT missions will occur as will similar

activities for the second upgraded pallet. Activities supporting procurement of additional Spacelab flight hardware will be well underway with some hardware deliveries scheduled to begin during the period and experiment installation and integration and checkout will be in process for Spacelab Mission 1.

In 1980 activities include continuation of program management, systems requirements, and interface definition and control, NASA hardware and software development, and preparation for Spacelab ground and flight verification on a schedule consistent with the milestones for Spacelab operational capability development, which includes the first two Spacelab flights. The primary objectives of these flights, scheduled for 1981 and 1982, are to verify the Spacelab system and subsystems performance capabilities, verify Spacelab/Orbiter and Spacelab/experiment interface compatibility and to determine the Spacelab induced environment.

#### STS Upper Stages (Inertial Upper Stage - IUS)

MSFC is responsible for the definition and control of the NASA and non-DOD requirements and for providing these to SAMSO for incorporation into the IUS system development contract. In addition, MSFC participating with SMASO, will provide the management and technical evaluation of the IUS development contractor's design, development and test efforts to assure that the NASA-unique and non-DOD user requirements are incorporated.

In 1980, the NASA-unique Inertial Upper Stage (IUS) development activities will include the following: the completion of the NASA Critical Design Review; completion of the drawing release; completion of the subsystem qualification tests; and preparation for the Twin/Spin vehicle/Airborne Support Equipment structural and qualification testing. During this same period, the fabrication and final assembly of four NASA Two-Stage vehicles and one Twin/Spin vehicle will be in process. The first NASA Two-Stage vehicle delivery is scheduled for late 1980.

#### 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 1980 advanced studies activities include: 25KW Power System, Solar Electric Propulsion Stage, fabrication of structural elements in space; studies of improved propulsion systems capable of using different propellants in the same system; continue concept studies of geostationary structures 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.

The Center provides leadership in NASA's Space Science program for the High Energy Astronomy Observatory (HEAO), Space Telescope, and Spacelab Payload Missions 1 and 2; and provides supporting research and technology support to identify the **new** technologies required for future missions.

High Energy Astronomy Observatory (HEAO)

The High Energy Astronomy Observatory (HEAO) program is a series of three, large unmanned observatories developed under the direction of MSFC for performing scientific investigations in high energy astronomy. During 1980, the principal effort will be completing the baseline HEAO-2 mission and conducting the HEAO-C baseline mission. Data reduction and analysis of HEAO-2 and -C data will also be underway during this period, along with management of the HEAO Guest Investigator program and the extended HEAO program involving analysis of data from the extended HEAO-1 mission, and planning and accomplishment of HEAO-2 and HEAO-C extension.

Space Telescope

The objective of the Space Telescope project is to put into orbit via the Space Shuttle a high optical quality 2.4-meter telescope system in late 1983 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 OSS Program Manager for meeting cost, schedule, and technical performance of the project. MSFC is responsible for directing all NASA and contractor's 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 the technical assessment and evaluation of contracted activities for system engineering, design and development, and assembly and verification. In 1980, detail design and development testing will proceed on all hardware elements of the Space Telescope program. During 1980, Critical Design Reviews (CDR's) to assure that the detail design is in accordance with the specifications, will be accomplished on the scientific instruments, the Optical Telescope Assembly, and the Support Systems Module. Detail design of flight hardware will be released for manufacturing in 1980.

Spacelab Payload Mission Management

MSFC is the lead center for the management and implementation of Spacelab Missions 1 and 2 payloads. During 1980, MSFC will continue to manage development of the experiment complements of Spacelab Missions 1 and 2, which will be launched in 1981 and 1982. Supporting mission-peculiar hardware and software will be procured and tested in preparation for the Level IV integration of the mission experiments beginning in 1980. During 1980, interfaces will continue to be maintained with the NASA discipline program offices, the Principal Investigators, and appropriate engineering groups to assure that the scientific objectives of the missions are achieved.

### 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 Astrophysics and Solar Physics. In 1980 definition study efforts for specific systems of an Advanced X-Ray Astrophysics Facility will be initiated as well as definition studies of the Gravity Probe-B (GP-B) and Space Science Platform.

### SPACE APPLICATIONS

390 Permanent Positions (Civil Service)

The civil service complement requested for this line item will be involved in four major space applications assignments: (1) Spacelab Mission 3, (2) Atmospheric Cloud Physics Laboratory, (3) Materials Processing in Space, and (4) Future Space Transportation System (STS) Payload Definition.

#### Spacelab Mission 3

Spacelab Mission 3, with a planned launch in mid-1982, will be the first use of a facility in space dedicated to the user community. Significant events that will occur in 1980 include initial design evaluation and final design and operations review of the integrated payload, selection and initiation of training for the payload specialist candidates and definition of initial requirements for support from the payload operations Control Center, Spacelab Data Processing Facility and STS Operations.

#### Atmospheric Cloud Physics Laboratory

Atmospheric Cloud Physics Laboratory (ACPL), under MSFC's management direction, will be flown in 1982 as a partial payload of Spacelab to provide the scientific community a unique multipurpose laboratory facility for conducting experimental atmospheric cloud physics research in a low-gravity environment. During 1980 the ACPL Critical Design Review will be completed and development testing of the engineering unit accomplished. Utilizing the engineering unit hardware, payload specialist training will be conducted and the first flight Principal Investigators (PI's) will conduct experiment testing to check out procedures, timelines and experiment-to-laboratory compatibility. Subsequently component acquisition and hardware update or refurbishment will be conducted. Flight 2 and 3 PI's will continue experiment development and the ACPL prime contract will be modified to initiate design and development of additional laboratory equipment to support advanced experiments. Systems engineering and integration will enter a critical phase to assure proper design, engineering, and scientific relationships among the areas of Spacelab-to-ACPL, man-machine constraints, and overall performance capability.

### 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 1980, the Materials Processing in Space program at Marshall Space Flight Center will include five major elements: (1) crystal growth and solidification, (2) containerless processing, (3) fluid and chemical processing, (4) vacuum research, and (5) commercialization studies. Expansion of the program to include a wider base of investigations using existing hardware is being planned. The activities include ground-based research, engineering and scientific analyses, advanced studies, and technical management of definition, design, development, and operation of material processing experiments, apparatus, and payloads.

### Future Payload Definition and Supporting Research and Technology

Activities in this area include identifying and defining payloads which can fully capitalize on the new and unique capabilities of the STS and conducting related supporting research and technology necessary to pave the way for these missions and payloads. The 1980 milestones include the detailed investigation of user requirements for missions in the 1982 time frame and beyond. These user requirements will be used to develop conceptual definitions of candidate projects and missions. Efforts will be concentrated on the analysis of applications programs including weather and climate, communications, and geodynamics.

### TECHNOLOGY UTILIZATION

11 Permanent Positions (Civil Service)

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

### AERONAUTICAL RESEARCH AND TECHNOLOGY

9 Permanent Positions (Civil Service)

The Aeronautics Research and Technology effort is concerned with aircraft operations and safety. The major activities in 1980 will be to continue studies of turbulence over the space of an aircraft wing, to perform gust correlations, to investigate the dissipation of fog, and to continue development of a Clear Air Turbulence (CAT) detection system. Field tests of the CAT detection system will be performed to provide verification data.

## SPACE RESEARCH AND TECHNOLOGY

94 Permanent Positions (Civil Service)

The major Space Technology discipline efforts at Marshall are in materials, structures, dynamics, high density circuit technology, guidance and control, large solar array technology, fluid chemistry, magnetics, electronic systems technology, and cryophysics and propulsion. In 1980, these efforts will focus on developing technology for high performance propulsion power systems and large space systems for the future.

Also in this area is the Standards and Practices program which provides for development of equipment for multimission applications and business practices to effect cost savings and for improvements in current and future space programs. In 1980, Civil Service personnel will continue to manage the development of those projects selected by the Standard Equipment Review Panels.

Also included in this area is the Shuttle/Spacelab Payloads effort concerned primarily with the Induced Environmental Contamination Monitor (IECM), the Solar Electric Propulsion (SEP) Solar Array, Geophysical Fluid Flow and Tribological Experiments. All of these areas will have continuing emphasis throughout 1980.

## ENERGY TECHNOLOGY

111 Permanent Positions (Civil Service)

MSFC activities include energy studies, development of a guidance and control system for coal extraction, and selected tasks for development in support of the National program for Solar Heating and Cooling.

### Energy Studies

Energy from space encompasses definition studies in two areas: satellite power systems and nuclear waste management. Activities in 1980 will include the identification of system/subsystem requirements, development of conceptual designs and operational scenarios, development and impact of technology requirements, concept evaluations and selections and economic cost model development.

### Automated Coal Extraction

The Department of Energy has overall responsibility for developing an automated longwall shearer mining system which will improve productivity and enhance health and safety of the miners. MSFC is working with the Department of Energy to define a prototype automated Longwall Guidance and Control System. Activities will include program and contract management, design, fabrication, test of experimental sensors and controls, data evaluation, and systems analysis.

## Solar Heating and Cooling

MSFC is responsible for supporting two major programs of the overall National program for Solar Heating and Cooling: (1) the "Development in Support of Demonstration Program" and (2) the "Commercial Demonstration Program." The purpose of the Development in Support of Demonstration Program is to use present technology and technology emerging from the national research and technology program to bring solar heating and cooling systems and subsystems to the point where they will be tested and ready for use in residential and commercial applications. The Commercial Demonstration Program is organized to encourage the use of solar energy in commercial applications and to recommend and develop new ways to eliminate constraints against wide spread acceptance.

### CENTER MANAGEMENT AND OPERATIONS SUPPORT

611 Permanent Positions (Civil Service)

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

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

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget analysis, program control, contracting and procurement, personnel management, property management, resource control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Date processing and computer support
- Reliability and quality assurance
- Center-wide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation, supplies
- Medical care of employees
- Photographic and graphic support
- Energy management

PERSONNEL AND RELATED COSTS

	1978	1979		1980
	<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>115,638</u>	<u>114.413</u>	<u>120,323</u>	<u>119.961</u>
	<u>Basis of Fund Reuirements</u>			
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions .....	102,608	101,254	106.254	105.945
b. Nonpermanent .....	880	1,150	1.387	1.388
c. Reimbursable details .....	125	144	137	69
d. Overtime and other compensation .....	<u>787</u>	<u>792</u>	<u>785</u>	<u>786</u>
Subtotal. Compensation .....	104,400	103,340	108,563	108,188
2. <u>Benefits</u> .....	<u>10.876</u>	<u>10,702</u>	<u>11.221</u>	<u>11.205</u>
Subtotal. Compensation and Benefits .....	<u>115.276</u>	<u>114.042</u>	<u>119.784</u>	<u>119,393</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel .....	218	196	217	246
2. Personnel training .....	<u>144</u>	<u>175</u>	<u>322</u>	<u>322</u>
Subtotal. Supporting Costs .....	<u>362</u>	<u>371</u>	<u>539</u>	<u>568</u>
Total. Personnel and Related Costs .....	<u>115,638</u>	<u>114.413</u>	<u>120,323</u>	<u>119.961</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Compensation and Benefits</u> .....	<u>115,276</u>	<u>114,042</u>	<u>119,784</u>	<u>119,393</u>
1. Compensation.....	<u>104,400</u>	<u>103,340</u>	<u>108,563</u>	<u>108,188</u>
a. Permanent positions .....	102,608	101,254	106,254	105,945

The funds shown above will support 3,561 permanent positions in 1980. The increase from the 1979 budget estimate to the 1979 current estimate is due to the October 1978 pay raise partially offset by lower manpower levels. The decrease in 1980 from 1979 is due to a reduction of positions in 1980 partially offset by two extra work days and a decrease in reimbursable activity.

Basis of Cost for Permanent Positions

In 1980 the cost of permanent positions will be \$105,945,000, a decrease of \$309,000 under 1979. This decrease is calculated as follows:

Cost of permanent positions in 1979.....	106,254
Cost Increase in 1980.....	+3,150
Within grade advances and career development:	
Full year effect of 1979 actions.....	+718
Partial year effect of 1980 actions.....	+695
Full year effect of 1978 pay increases.....	+156
Decrease in reimbursable activity .....	+751
Two extra days .....	+830
Cost Decrease in 1980.....	-3,459
Turnover savings and abolished positions:	
Full year effect of 1979 actions.....	-1,873
Partial year effect of 1980 actions.....	-1,586
Cost of permanent positions in 1980.....	<u>105,945</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
b. Nonpermanent positions				
1. cost.....	880	1,150	1,387	1,388
2. Workyears.....	108	151	155	150

The 1979 current estimate increases from the 1979 budget estimate are due to the addition of an experimental part-time program to encourage use of part-time employees where feasible. The 1980 estimate reflects a slight decrease in workyears as a result of the absorption of the part-time program into the permanent position ceiling. The 1980 plan includes 150 workyears which will be used to support the following programs at the approximate levels shown below:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
College cooperative training.....	54
Summer employment.....	27
Youth opportunity.....	48
Other temporary employment.....	<u>21</u>
Total.....	<u>150</u>

c. Reimbursable detailees.....	125	144	137	69
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Reimbursable detailees are assigned to NASA from DOD to support the Center in the field of solid rocket motors and in the use of the Neutral Buoyancy Simulator. The simulator is used in the development of operational procedures and the evaluation of design concepts to assure flight hardware will function in space (effort supports development, design, instrumentation, and engineering techniques for Spacelab Transfer Tunnel, STS Power Module, Shuttle Payload Bay and Solar Array Systems). This effort provides mutual benefits to NASA and DOD by providing NASA with special talents and by keeping DOD personnel current on manned space flight technology. The decreased cost in 1979 from the budget estimate to the current estimate is due to the release of one Navy diver supporting the Neutral Buoyancy Simulator activity. In 1980 two Air Force detailees will be released which results in the lower funding requirement.

	1978	<u>1979</u>		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
d. Overtime and other compensation .....	787	792	785	786

The decrease from the 1979 budget estimate to the 1979 current estimate reflects the use of Government housing for the Spacelab resident office personnel in support of the European Space Agency, offset by increased overtime activity in the Shuttle testing programs and the effect of the October 1978 pay raise. The 1980 costs are essentially the same as 1979.

2. Benefits .....	<u>10,876</u>	<u>10,702</u>	<u>11,221</u>	<u>11,205</u>
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The distribution of these costs by major categories is as follows:

Category of Cost

Civil Service Retirement Fund .....	7,211	7,076	7,418	7,361
Employee life insurance .....	450	445	476	476
Employee health insurance .....	2,066	1,901	2,133	2,158
Workmen's compensation .....	1,040	1,113	1,059	1,075
FICA .....	18	39	51	51
Incentive awards .....	81	84	84	84
Severance pay.....	<u>10</u>	<u>44</u>	<u>---</u>	<u>---</u>
Total .....	<u>10,876</u>	<u>10,702</u>	<u>11,221</u>	<u>11,205</u>

The increases in 1979 are primarily due to the October 1978 pay raise partially offset by manpower reductions in 1979. The 1980 decreases are due to continuing manpower reductions offset by the two extra days and the reduced reimbursable activity.

B. <u>Supporting Costs</u> .....	<u>362</u>	<u>371</u>	<u>539</u>	<u>568</u>
1. Transfer of personnel .....	218	196	217	246

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 increase shown from 1979 budget to the 1979 current estimate is due to increased temporary living expenses and real estate transaction costs. The 1980 increase reflects the return of the Spacelab personnel supporting the European Space Agency.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
2. Personnel training.....	144	175	322	322

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 from the training and educational programs conducted at MSFC, include: enhancement of scientific and engineering leadership in the scientific community; maintenance of a high degree of professional competency within 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 1979 reflects the return to the 1977 operating level which is necessary to support on-going programs and new directions for the MSFC work force. The training program for 1980 is planned at the same level of effort as 1979.

<u>TRAVEL</u>				
11. <u>TRAVEL</u> .....	<u>2,326</u>	<u>2,382</u>	<u>2,492</u>	<u>2,684</u>
<u>Basis of Fund Requirements</u>				
A. Program Travel.....	2,172	2,157	2,288	2,463
B. Scientific and Technical Meeting Travel.....	24	30	26	28
C. Management and Operations Travel.....	<u>130</u>	<u>195</u>	<u>178</u>	<u>193</u>
Total, Travel....	<u>2,326</u>	<u>2,382</u>	<u>2,492</u>	<u>2,684</u>

	1978	<u>1979</u>		1980
	<u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
		(Thousands of Dollars)		
A. <u>Program Travel</u> .....	<u>2,172</u>	<u>2,157</u>	<u>2,288</u>	<u>2,463</u>

Program travel is directly related to the accomplishment of the Center's mission and is approximately 92 percent of the total MSFC travel. Travel requirements include those for on-going programs such as the Space Shuttle Main Engine, External Tank and Solid Rocket Booster, STS Operations, Spacelab, Inertial Upper Stage, Space Telescope, High Energy Astronomy Observatory, Teleoperator Retrieval Systems, space science and applications payloads and basic and supporting research and technology. Travel for Spacelab, Spacelab Payloads and Space Telescope will require both domestic and European travel. The increased level in the 1979 current estimate and the 1980 estimate reflects a higher level of program activity than previously planned. The increase in the 1980 level over the 1979 level is also effected by the return of employees assigned to the European resident offices.

B. <u>Scientific and Technical Meeting Travel</u> .....	<u>24</u>	<u>30</u>	<u>26</u>	<u>28</u>
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Scientific and Technical Meeting travel permits employees to participate in meetings and technical seminars with representatives of the aerospace community. This participation allows them to benefit from exposure to technological advances outside MSFC, 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 NASA.

C. <u>Management and Operations Travel</u> .....	.....	<u>130</u>	<u>195</u>	<u>178</u>	<u>193</u>
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Management and Operations travel is required for the direction and coordination of general management matters. It includes travel by managers in such areas as personnel, financial management, and procurement activities and travel of the Center's top management to NASA Headquarters, other NASA Centers, and local transportation.

#### FACILITIES SERVICES

The Marshall Space Flight Center (MSFC) occupies over 1,841 acres under Department of the Army permit in a complex of science and engineering laboratories, special development and test facilities.

This complex encompasses 3,683,985 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 5,000 to 5,500 personnel. Many of the test facilities are utilized on more than one shift or during off-peak hours.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
111. <u>FACILITIES SERVICES</u> .....	<u>11,775</u>	<u>10,598</u>	<u>11,849</u>	<u>12,395</u>
<u>Basis of Fund Requirements</u>				
A. <u>Maintenance and Related Services</u>				
1. Facilities.....	2,465	1,290	1,984	2,190
2. Equipment.....	<u>210</u>	<u>94</u>	<u>172</u>	<u>182</u>
Subtotal.....	2,675	1,384	2,156	2,372
B. <u>Custodial Services</u> ....	<u>3,155</u>	<u>2,682</u>	<u>2,899</u>	<u>3,077</u>
C. <u>Utilities Services</u> ....	<u>5,945</u>	<u>6,532</u>	<u>6,794</u>	<u>6,946</u>
Total, Facilities Services...	<u>11,775</u>	<u>10,598</u>	<u>11,849</u>	<u>12,395</u>
A. <u>Maintenance and Related Services</u> ...	<u>2,675</u>	<u>1,384</u>	<u>2,156</u>	<u>2,372</u>
1. Facilities.....	2,465	1,290	1,984	2,190

This activity involves a total of 235 facilities (buildings, structures, and trailers) with 3.7 million square feet of floor area. Also involved are 1,841 acres of land area, 1 million square yards of surfaced area, and several special structures and systems.

The increase from the 1979 budget estimate is due to 1978 experience. The funding for 1980 reflects approximately the same level of services as in 1979.

	1978	1979		1980
	<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. Maintenance of buildings and grounds..... 1,579

The estimate includes 32 workyears of support contractor effort and reimbursements to the Army (Redstone Arsenal) for facility maintenance and related services for such items as electrical distribution lines and paved surfaces.

b. Supplies and Materials..... 611

This estimate provides for the acquisition of building materials, electrical materials, electronic materials, general maintenance materials, general operating materials, general service materials, metals, gauges, pipes, valves, and fittings.

2. Equipment ..... 210                      94                      172                      182

This activity includes six workyears of support contractor effort and involves maintenance and repair of over 3,675 items of building equipment at MSFC. The 1979 current estimate reflects 1978 experience. The 1980 level remains approximately the same as in 1979,

B. Custodial Services..... 3,155                      2,682                      2,899                      3,077

Custodial Services includes janitorial services, security services, fire protection, trash removal, sanitary landfill operations, pest control activities, and related supplies and materials. The increase in 1980 provides for negotiated support contractor wage increases.

1. Janitorial Services..... 1,606

This activity provides service to about three million square feet of facility space and trash removal from approximately 125 separate locations. Work is performed through a support contractor with a level of effort of 110 workyears.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
2. Security and Fire <del>Protection</del> .....				1,449

Services are provided by a support contractor with a level of effort of 39 workyears and through the Army (Redstone Arsenal). Included are 24-hour security coverage of MSFC property, law enforcement, motor vehicle control and registration, as well as fire protection.

3. Minor Requirements .....				22
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Services are related to landfill operations and "as needed" pest control.

C. <u>Utilities Services</u> .....	<u>5.945</u>	<u>6,532</u>	<u>6.794</u>	<u>6,946</u>
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The Army (Redstone Arsenal) provides electricity, steam, water, and sewage disposal services to MSFC on a reimbursable basis, and the estimates, therefore, are included in this activity. Also included are four workyears of effort to operate and maintain 12 separate steamboilers for facilities not on the central system: the environmental control systems, and to provide a nonduty hour focal point for emergencies. The increase in 1980 provides for increased utility rates partially offset by reduced consumption. The cost of purchased commodities is shown in the following table:

1. Electricity (100,000 mW/Hrs.) .....				3,500
2. Propane (48,000 gals.) .....				21
3. Fuel oil (657,000 gals.) .....				284
4. Steam (383,000 K/lbs.) .....				2,394
5. Water and sewage.....				572

TECHNICAL SERVICES

	<u>1978</u>	<u>1979</u>		<u>1980</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)		
IV. <u>TECHNICAL SERVICES</u> .....	<u>5,636</u>	<u>6,418</u>	<u>5,728</u>	<u>5,588</u>
<u>Basis of Fund Requirements</u>				
A. <u>Automatic Data Processing</u>				
1. Equipment .....	823	803	800	812
2. Operations .....	<u>2,509</u>	<u>3,521</u>	<u>2,810</u>	<u>2,706</u>
Subtotal .....	<u>3,332</u>	<u>4,324</u>	<u>3,610</u>	<u>3,518</u>
B. <u>Scientific and Technical Information</u>				
1. Library .. ..	807	761	715	720
2. Education and information.....	<u>144</u>	<u>126</u>	<u>134</u>	<u>142</u>
Subtotal.....	<u>951</u>	<u>887</u>	<u>849</u>	<u>862</u>
C. <u>Shop Support and Services</u> .....	<u>1,353</u>	<u>1,207</u>	<u>1,269</u>	<u>1,208</u>
Total, Technical Services.....	<u>5,636</u>	<u>6,418</u>	<u>5,728</u>	<u>5,588</u>
A. <u>Automatic Data Processing</u> .....	<u>3,332</u>	<u>4,324</u>	<u>3,610</u>	<u>3,518</u>

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. Included are 129 workyears of support contract effort.

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
1. Equipment .....	823	803	800	812

Maintenance is provided under separate contracts for central site computers and associated equipment. Equipment maintained includes two large Univac 1108 systems, CalComp Disc secondary storage system for the Univac 1108 system, and a key-to-disc which collects, controls, organizes, and edits raw data for input into the Univac 1108 system. This effort is being maintained at approximately the current level of funding.

2. Operations .....	2,509	3,521	2,810	2,706
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This function 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 two large Univac 1108 systems, seven Univac 9300 Remote Job Entry terminals, one IBM 1401, and two FR-80 Electronic plotters. Also included is associated auxiliary support equipment such as film processors, Xerox microfiche printers, Xerox forms copiers, and punch card accounting machines (PCAM). Also included are the operation of two large magnetic tape libraries containing a combined total of 60,000 reels; receipt, control, and distribution of program and data processing products; and testing and cleaning of magnetic tapes.

Also included in the operation costs are program design and development, and development of data base management, configuration management, and accounting software systems. Support is also provided for developing engineering drawings and parts management systems. Costs remain essentially level from year-to-year, however, the amount is substantially less than the 1979 budget level due to the programmatic operations taking over approximately 44 workyears of effort.

B. <u>Scientific and Technical Information</u> .....	<u>951</u>	<u>887</u>	<u>849</u>	<u>862</u>
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This activity provides for the operation of the Redstone Scientific Information Center library at MSFC and support to the Center in various scientific and technical information services.

1. Library .....	807	761	715	720
------------------	-----	-----	-----	-----

Scientific information and library services are provided to MSFC employees and associated contractor personnel through the Redstone Scientific Information Center (RSIC) operations. The RSIC contains a central

collection of 234,000 books and journals, 3,000 periodicals, 1,000,000 documents on microfilm and 400,000 technical papers. Operation of the RSIC by the Army is under direction of a joint MSFC/Army Redstone Scientific Information Board with costs shared. The 1980 estimate provides for the same level of service as in 1979.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		Budget <u>Estimate</u>	Current <u>Estimate</u>	
		(Thousands of Dollars)		
2. Education and information.....	144	126	134	142

The funds provide for the preparation of reproducible pages for publication of technical manuscripts and related documents. The annual volume of work under this contract is an estimated 12 thousand manuscript pages. Also included is MSFC's share of the operation of the MSFC Visitor Information Center located at the Alabama Space and Rocket Center. This effort is being maintained at approximately the current level of funding.

C. <u>Shop Support and Service</u> .....	<u>1,353</u>	<u>1,207</u>	<u>1,269</u>	<u>1,208</u>
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Twenty-seven workyears of support contractor effort provide the Center with support in the areas of graphics, models and design, construction, and management of exhibits. Related supplies, materials and equipment are also included in this activity. Graphic materials are prepared for use in such presentations as senior management meetings. The decrease from 1979 reflects the reduction of eight workyears of support contractor effort.

1. Instrumentation support.....	26
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This category provides funds for gauge calibration services work procured from the Army (Redstone Arsenal). Included are microwave, radio frequency, and optical and acoustic instrumentation calibration.

2. Photographic services.....	446
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Consists of procurement of off-site commercial still photographic and motion picture production services. Still photographic services include printing and processing of color and black and white prints, slides, vugraphs, and copy camera photography. Motion picture production services include script writing; film editing; sound recording; and printing and processing of sound motion pictures. Approximately 138,000 still photo units and 240,000 feet of motion picture service are needed annually.

	<u>1978</u> Actual	<u>1979</u>		<u>1980</u> Budget Estimate
		Budget Estimate	Current Estimate	
		(Thousands of Dollars)		
3. Graphics .....				736

Twenty-seven workyears of support contractor effort required for the preparation of charts, graphs, vugraphs and similar visuals for administrative and operational requirements are included in this activity. Approximately 35,000 work units are completed annually. Also includes the design, construction, and management of exhibits in connection with MSFC's Public Affairs activity.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>8,070</u>	<u>7,046</u>	<u>7,884</u>	<u>8,256</u>
	<u>Basis of Fund Requirements</u>			
A. Administrative Communications.....	2,380	2,044	2,529	2,603
B. Printing and Reproduction.....	451	380	475	487
C. Transportation.....	2,016	1,777	2,196	2,325
D. Installation Common Services.....	<u>3,223</u>	<u>2,845</u>	<u>2,684</u>	<u>2,841</u>
Total, Management and Operations.....	<u>8,070</u>	<u>7,046</u>	<u>7,884</u>	<u>8,256</u>
A. <u>Administrative Communications</u> .....	<u>2,380</u>	<u>2,044</u>	<u>2,529</u>	<u>2,603</u>

Communications support for MSFC, which includes 25 workyears of support contractor effort, consists of local telephone service, long distance telephone service, and various kinds of other nontelephone communications.

1. Local telephone service.....	802
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The MSFC Central Exchange provides instruments and lines at the Center for local telephone service. This effort is being maintained at the current level of funding.

<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u>
	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

2. Long distance telephone service..... 998

Provides for MSFC use of the GSA operated long distance Federal Telecommunications System telephone network. Costs result 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. Also included are such items as long distance commercial tolls, Western Union leased equipment for transmitting and receiving telegraphic messages and the Autodin network for ordering supplies and materials and sending and receiving classified information.

3. Nontelephone communications..... 803

These funds provide for 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, overseas telegrams and cable system upkeep and equipment storage by the Army. Twenty-five workyears of support contractor effort is required to provide around-the-clock institutional communications capability, including installation, operation, maintenance and repair of 2,200 capital equipment items; 797,280 operating feet of cable; handling 90,000 telephone calls by operators on three switchboards; receiving/transmitting teletype messages; making 6,000 telephone directory changes; processing 3,000 video tapes and 875 engineering drawings. The decrease from 1979 to 1980 is due primarily to the reclassification of postage costs to Installation Common Services which is offset somewhat by negotiated support contractor wage rate increases.

B. Printing and Reproduction..... 451      380      475      487

A portion of MSFC's printing/reproduction requirements are met by an on-site reproduction plant operated by MSFC personnel. This reproduction plant produces approximately 18,000,000 units of reproduction work each year. In addition to the on-site reproduction plant, MSFC must also purchase from the Government Printing Office, Army and private firms about 24,000,000 units of printing each year. This purchased printing is either an overflow requirement that cannot be handled within the on-site workload, or is such a type that cannot be handled with the limited capability of the on-site equipment. Included in the cost of printing and reproduction are four support contractor workyears of effort. The increase from 1979 to 1980 reflects negotiated support contractor wage increases and the full year effect of increased costs for procured printing services.

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
C. <u>Transportation</u> .....	<u>2,016</u>	<u>1,777</u>	<u>2,196</u>	<u>2,325</u>

Transportation functions at MSFC include 56 workyears of support contractor effort for operation and maintenance of vehicles and aircraft, and transportation of things. Included in this category is the maintenance of 418 general purpose vehicles, 108 general and special purpose trailers and vehicles, 290 pieces of equipment such as "A" frame cranes, "H" frame cranes, cranes, tractors, generators, and welders; intermediate inspections at 6,000 miles or six months; and major inspections at 12,000 miles or twelve months. Freight charges for shipment by both surface and air transportation of materials and equipment are also included. The increase from the 1979 budget estimate to the current estimate reflects 1978 experience and current price levels.

The increase in funds from 1979 to 1980 is due mainly to increased costs of support contracts.

D. <u>Installation Common Services</u> .....	<u>3,223</u>	<u>2,845</u>	<u>2,684</u>	<u>2,841</u>
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This category includes 38 workyears of support contractor effort and provides support to Center Management and staff activities, medical services, and various other installation support services. The decline in the funding level from 1978 to 1979 is due primarily to the one-time procurement in 1978, of some mechanical, electrical, and office equipment.

The increase in 1980 is due to increased wage rates in the medical contract, increased cost of maintenance and repair of equipment, and increased postage costs.

1. Center management and staff <del>functions</del> .....				46
Includes Patent Counsel Services, Tort Claims and Equal Opportunity activities.				
2. Medical <del>services</del> .....				728

Provides occupational medicine and environmental health services totaling 18 workyears of support contract effort 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.

	1978	1979		1980
	Actual	Budget Estimate	Current Estimate	Budget Estimate
		(Thousands of Dollars)		
<b>3. Installation support services.....</b>				2,067

Maintenance and repair of office equipment, equipment rental, acquisition of supplies and materials and miscellaneous services are included in this activity.

a. Maintenance and repair of equipment.....	481
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Maintenance and repair of office equipment includes the maintenance and repair services for office machines and equipment (i.e., typewriters, calculators, time stamp equipment, etc.); maintenance and repair services for photographic and reproduction equipment (i.e., enlargers, cameras, exposure controls, print copiers, projectors, power supplies, tape recorders, stroboflash, film viewer, motion analyzer, copiers, copy camera, processor camera, super diazo, etc.).

b. Rental of equipment.....	185
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Rental of equipment such as Xerox machines at the resident office at Canoga Park, California and Visual Search Microfilm Files located at MSFC, and other reproduction equipment are included in this category.

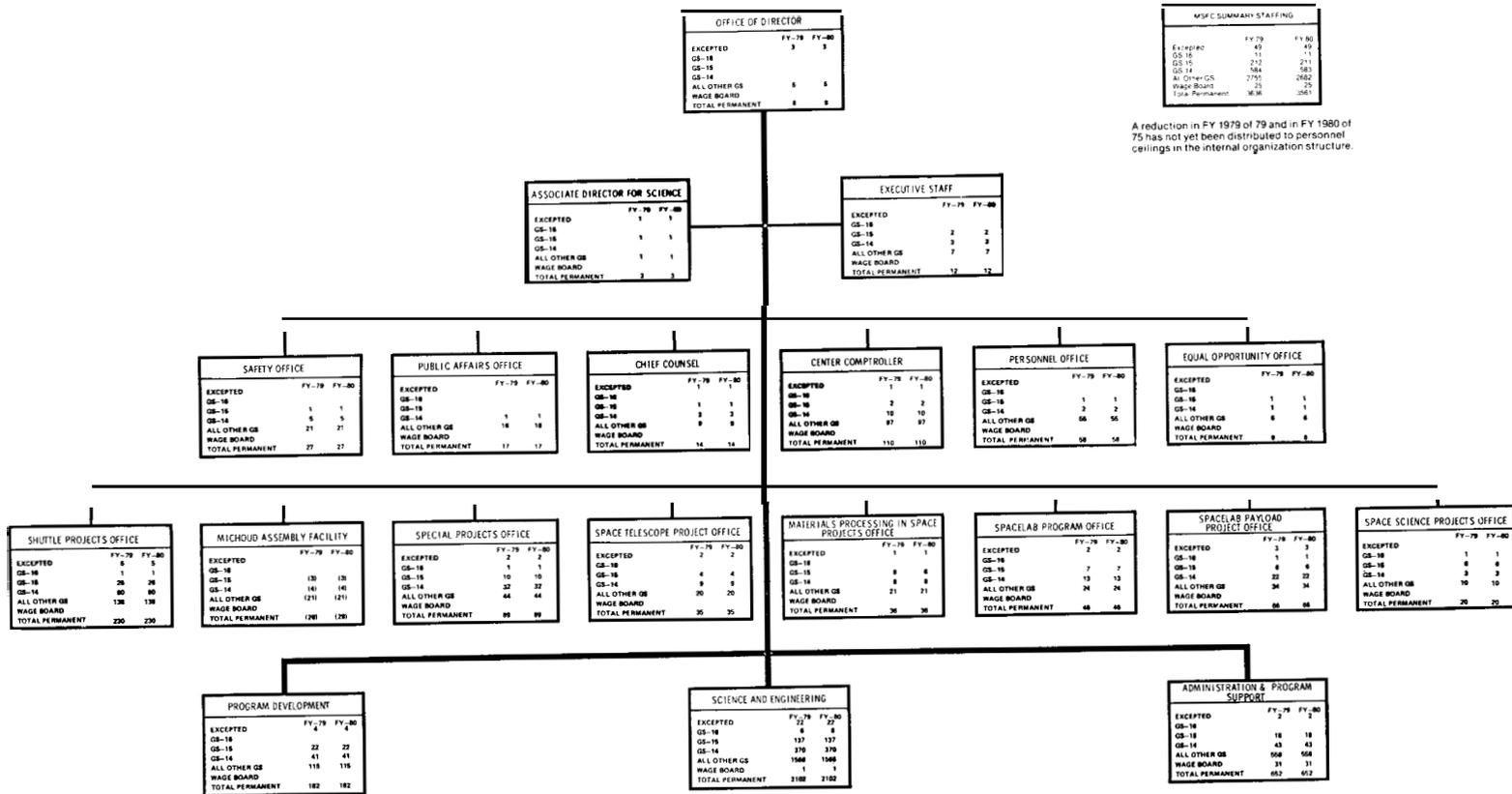
c. Supplies, materials, and equipment.....	447
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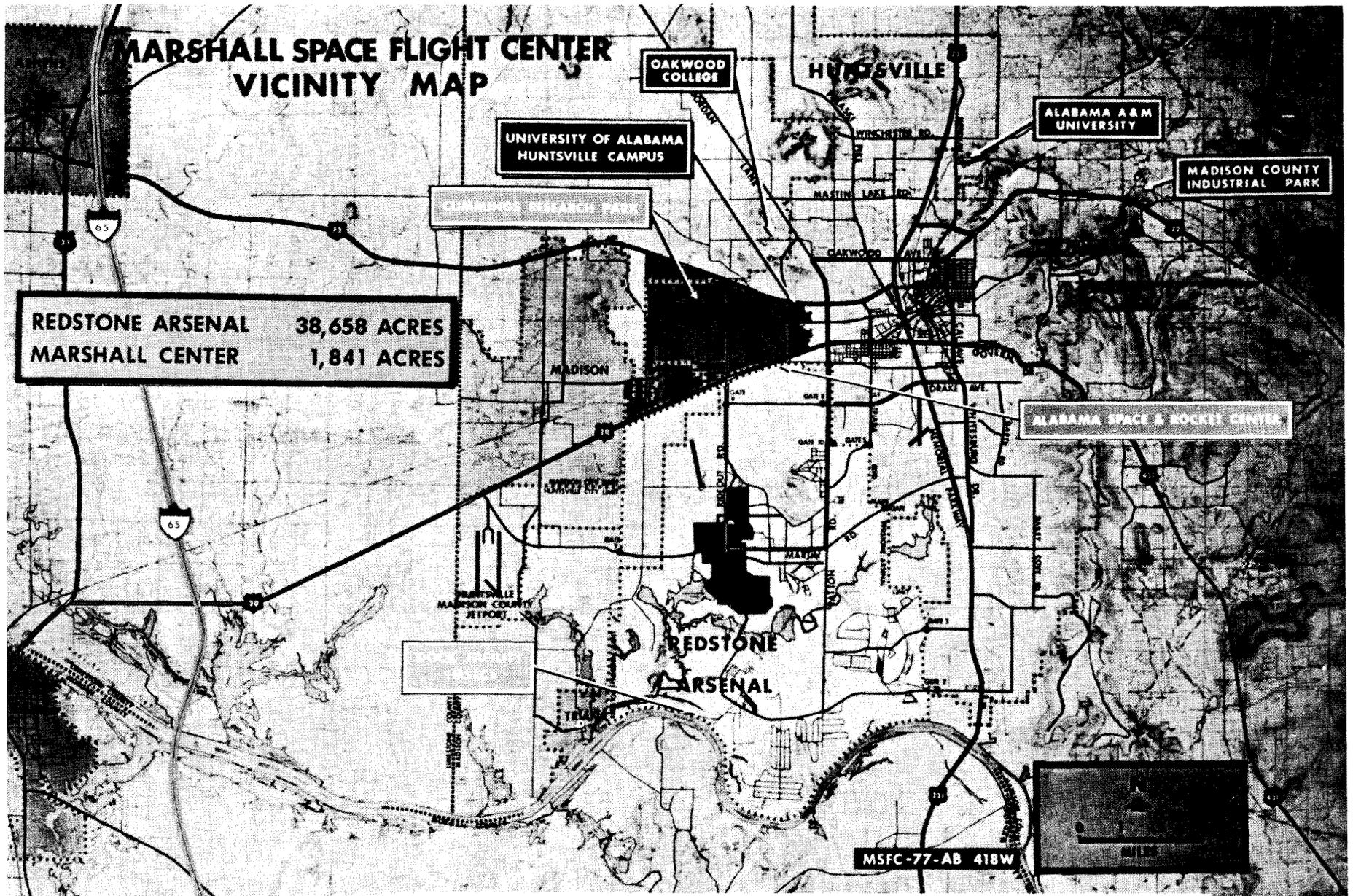
Acquisition of primarily office type supplies and equipment.

d. Miscellaneous services.....~	954
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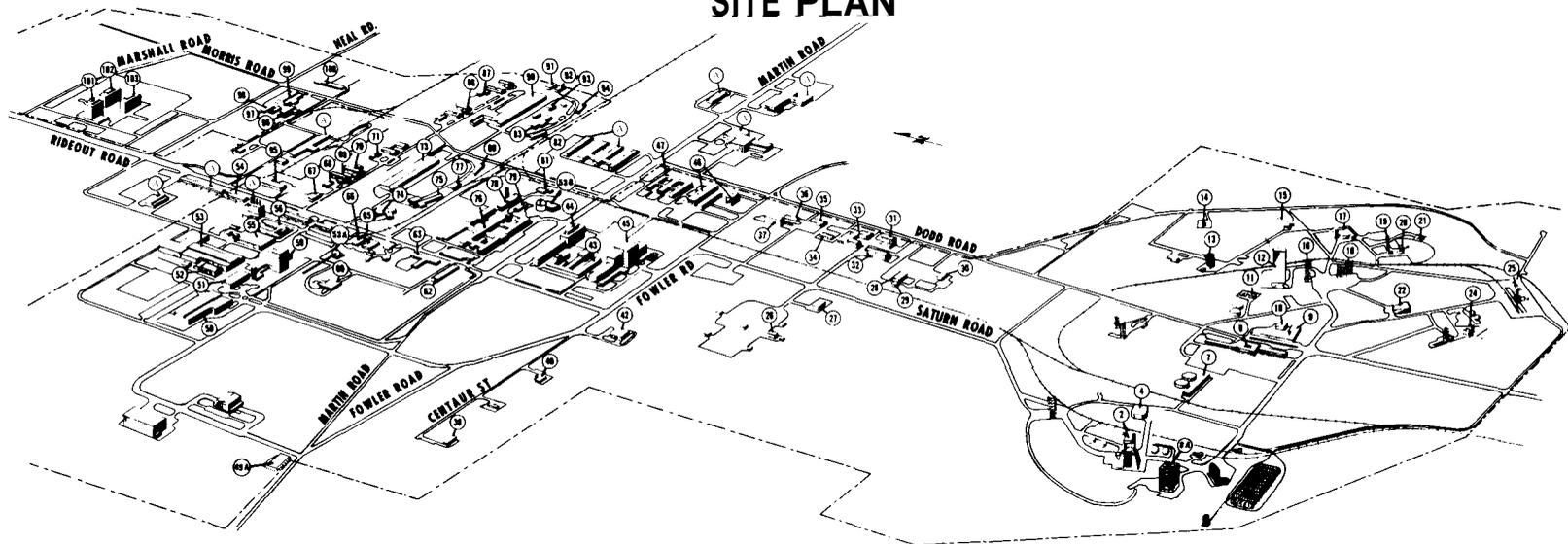
This estimate includes services such as miscellaneous troop service charges for military detailees assigned to MSFC; disposal of toxic wastes; inspection of hazardous cargo prior to entry to Redstone Arsenal; receipt, storage, and issue services for hazardous materials such as explosives, pyrotechnics and solid rocket motors. Minor contracts include laundry service, furniture repair, potassium cyanide disposal and logistics support which include 20 workyears of support contract effort. Postage costs are also included.

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





# MARSHALL SPACE FLIGHT CENTER SITE PLAN



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

- 4628
- 4629
- 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
- 49A 4740 WATER POLLUTION CONTROL FACILITY
- 50 4708 ENGINEERING AND DEVELOPMENT LABORATORY
- 51 4760 SURFACE TREATMENT FACILITY
- 52 S-47 NEUTRAL BUOYANCY FACILITY
- 53 4705 FABRICATION AND MACHINE SHOP
- 53A 4775 HIGH REYNOLDS FACILITY
- 53B 4667 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
- 65 032 BISONIC WIND TUNNEL FACILITY
- 66 033 IMPULSE BASE FLOW FACILITY
- 67 4306 OFFICE BUILDING
- 68 4312 OFFICE BUILDING
- 69 4311 SHOCK TUNNEL FACILITY
- 70 4313 SHOP BUILDING
- 71 4332 ENVIRONMENTAL TEST LABORATORY
- 73 4471 STORAGE AND OFFICE BUILDING
- 74 4485 OFFICE BUILDING
- 75 4491 OFFICE AND LABORATORY BUILDING
- 76 4487 LABORATORY AND OFFICE BUILDING
- 77 S-4479 STORAGE SHED
- 78 4476 ENVIRONMENTAL TEST FACILITY
- 79 S-4436 AUTOMATION CHECKOUT BUILDING
- 80 4492 ELECTRICAL SYSTEMS LABORATORY BUILDING
- 81 4495 HAZARWUS OPERATIONS LABORATORY
- 4493 SHOP AND STORAGE BUILDING

- 83 4483 VEHICLE MAINTENANCE SHOP
- 86 4353 PHOTO LAB
- 87 4372 MILLIMETER WAVELENGTH BUILDING
- 90 4481 SPACE SCIENCES LABORATORY
- 91 S-4498 STORAGE BUILDING
- 92 S-4499 STORAGE BUILDING
- 93 4482 TRANSPORTATION SUPPORT BUILDING
- 94 4494 CEMER ACTIVITIES BUILDING

## TEST

- 2 4670 PROPULSION & STRUCTURAL TEST FACILITY
- 4 4674 BLOCKHOUSE
- 7 4667 PUMP HOUSE
- 8 4666 OFFICE BUILDING
- 8A 4699 STRUCTURAL TEST FACILITY

## EAST AREA

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

- 12 4550 STRUCTURAL TEST FACILITY
- 13 4522 PROPULSION SYSTEMS COMPONENT TEST STAND
- 14 4530 PROPULSION SYSTEMS COMPONENT TEST STAND
- 15 4501 SHOP AND LABORATORY BUILDING
- 16 4557 STRUCTURAL TEST FACILITY
- 17 4583 TEST AND DATA RECORDING FACILITY
- 18 4548 PROPULSION SYSTEMS COMPONENT TEST FACILITY
- 19 S-4539 TEST STAND SUPPORT BUILDING
- 20 4540 MODEL PROPULSION SYSTEMS TEST STAND (ACOUSTIC)
- 21 4541 TEST STAND CONTROL BUILDING
- 22 4570 BLOCKHOUSE AND CABLE TUNNELS
- PROPULSION SYSTEMS TEST STAND
- PROPULSION AND STRUCTURAL TEST FACILITY

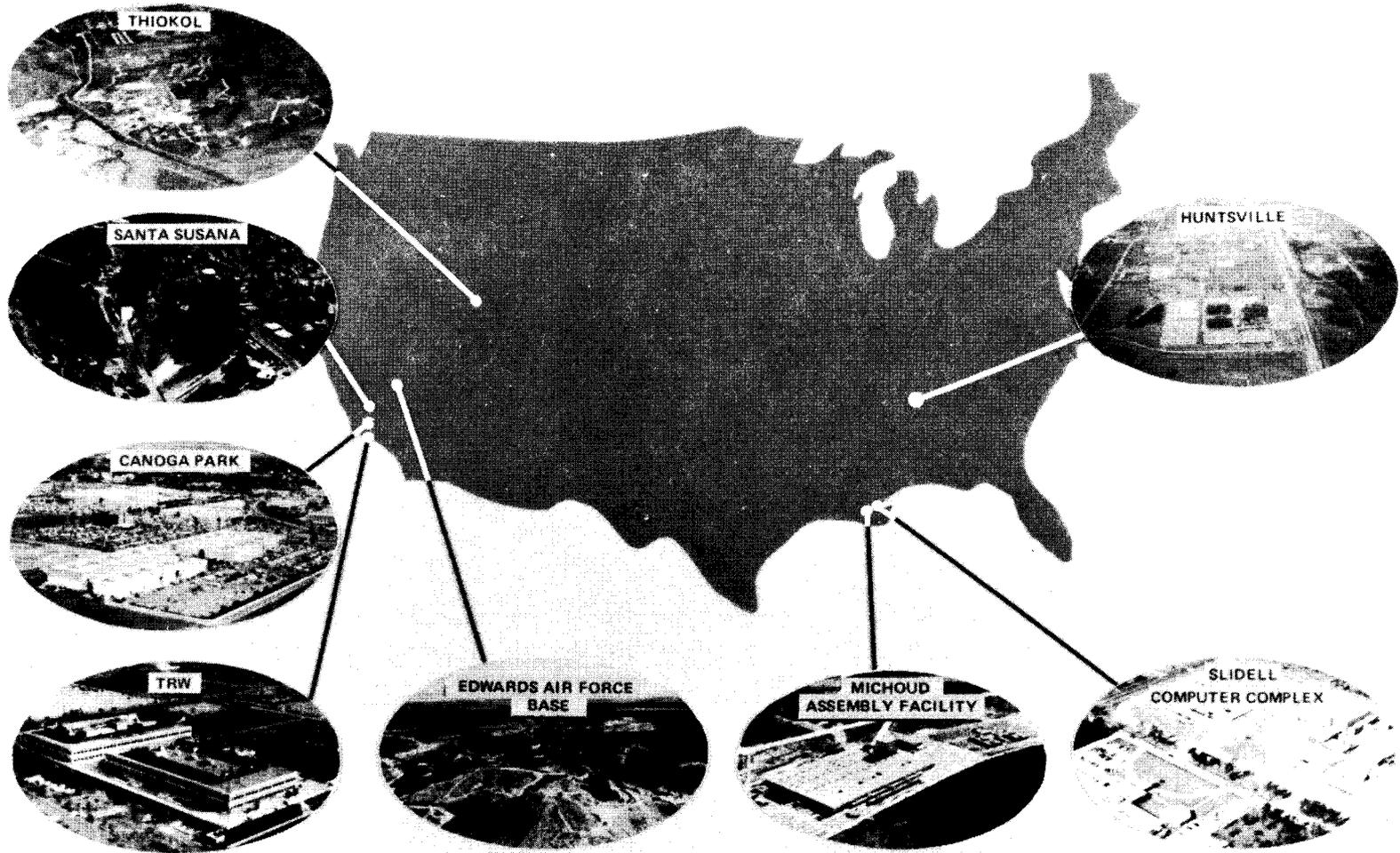
## TEST SUPPORT AREA

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



MARSHALL SPACE FLIGHT CENTER

PROGRAM FACILITIES



AERIAL VIEW OF – MSFC – HUNTSVILLE, ALABAMA

ADMINISTRATIVE COMPLEX

SPACE SCIENCES LABORATORY

ELECTRONICS & CONTROL LAB

STRUCTURES & PROPULSION LAB

LOAD TEST ANNEX

SCIENCE & ENGINEERING AREA - MSFC, HUNTSVILLE



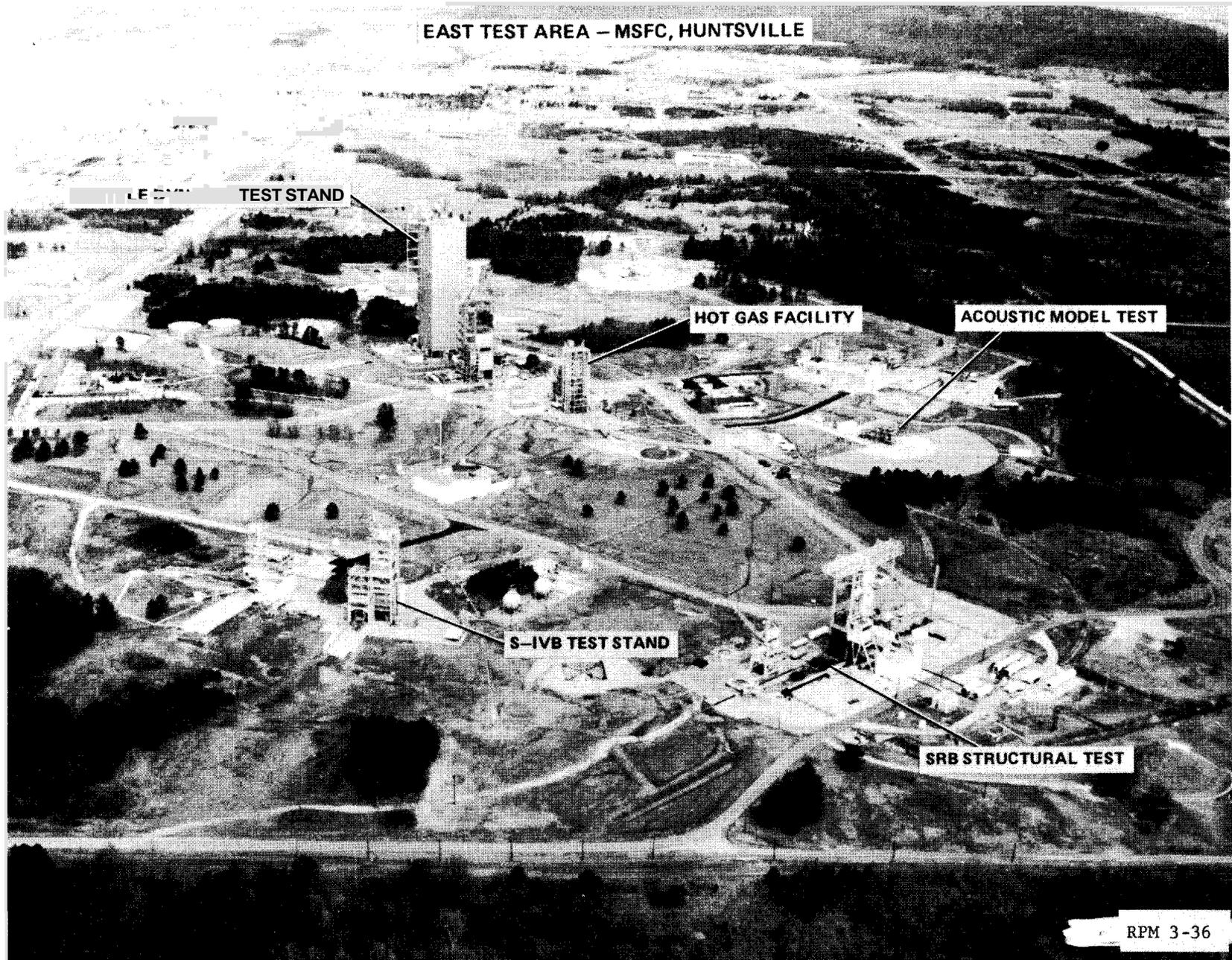
TEST LABORATORY

MATERIALS & PROCESS LABORATORY

TEST LABORATORY

SYSTEMS DYNAMIC LABORATORY

**EAST TEST AREA – MSFC, HUNTSVILLE**



**TEST STAND**

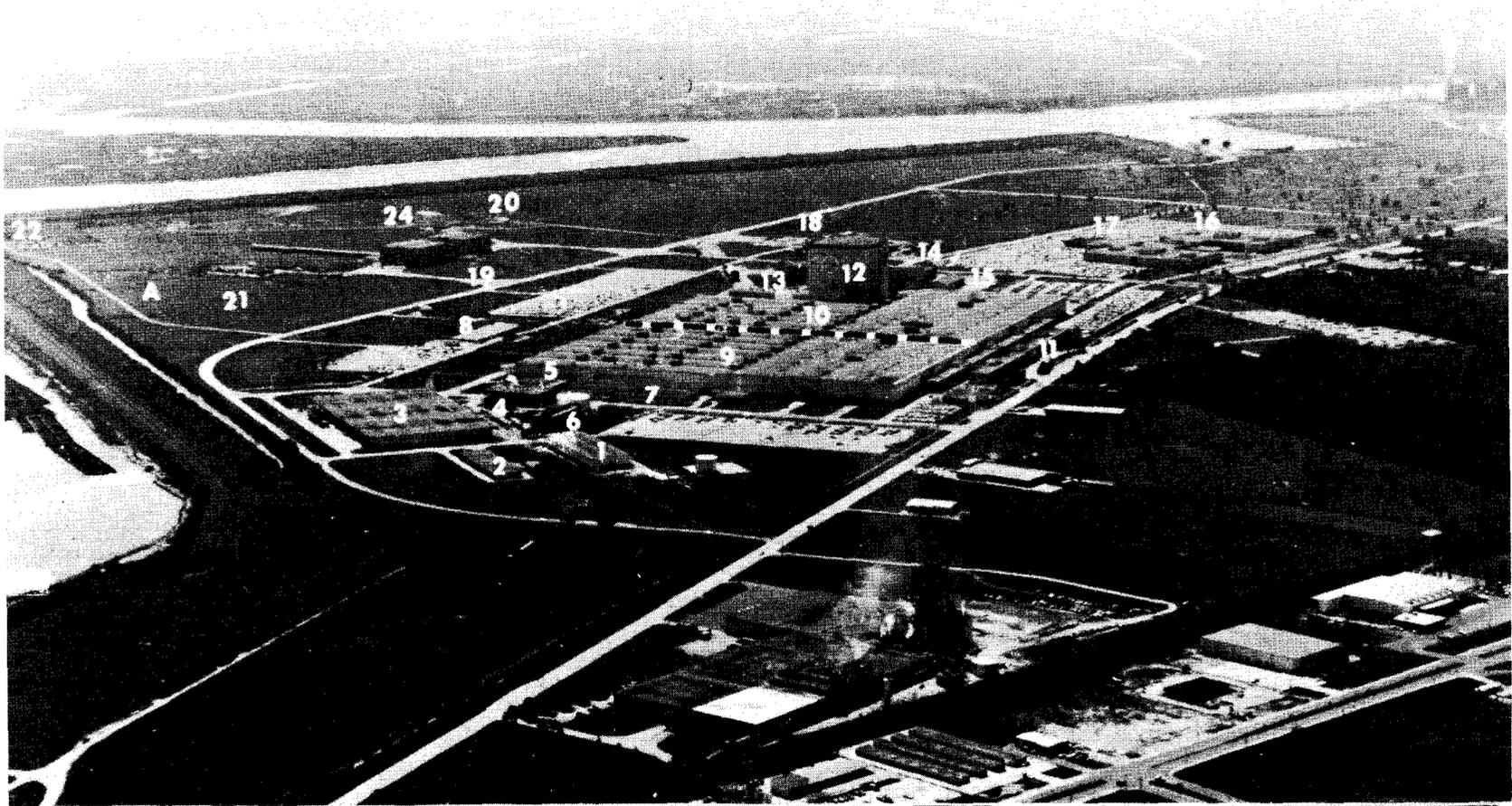
**HOT GAS FACILITY**

**ACOUSTIC MODEL TEST**

**S-IVB TEST STAND**

**SRB STRUCTURAL TEST**

## MICHOUD ASSEMBLY FACILITY



- |                              |                                  |                                 |
|------------------------------|----------------------------------|---------------------------------|
| 1. MAINTENANCE SUPPLY        | 9. FABAREA                       | 17. CAFETERIA                   |
| 2. HAZARDOUS MATLS STORAGE   | 10. FABAREA                      | 18. CCNTRACTOR 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     |

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1980 ESTIMATES

NATIONAL SPACE TECHNOLOGY LABORATORIES

DESCRIPTION

The National Space Technology Laboratories is 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 Intracoastal Waterway. Capital investment for the National Space Technology Laboratories as of September 30, 1978, was \$307,261,000.

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. NSIL is NASA's prime static test facility for large liquid propellant rocket engines and propulsion systems. The redesignation of this facility as NSTL in 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 development testing of the ground test version of the Shuttle Propulsion System, the Main Propulsion Test Article. NSIL conducts applied research, develops techniques, demonstrates and transfers to the user community applications of NASA-developed technology in the fields of remote sensing, satellite communication, environmental sciences, and other selected applications programs. NSTL manages the installation and, through interagency agreements, provides service support and full utilization of all facilities including collocated elements of other executive agencies engaged in compatible research, development, and operational activities. These 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 development and acceptance testing of the Space Shuttle Main Engines and the development testing of the Shuttle's main propulsion system.

Space Applications - Conducts applied research, develops techniques, demonstrates and transfers to the user community applications of NASA-developed technology in such fields of remote sensing, satellite communication and environmental sciences.

SUMMARY OF RESOURCES REQUIREMENTS

	<u>FUNDS</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>	
		<u>1978</u> <u>Actual</u>	<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)		<u>Current</u> <u>Estimate</u>
I. Personnel and Related Costs .....		2,648	2,823	3,083	3,151
II. Travel.....		84	65	92	99
III. Facilities Services.....		---	350	1,094	1,173
IV. Technical Services.....		---	50	41	41
V. Management and Operations.....		---	200	217	225
Total, funds requirements.....		<u>2,732</u>	<u>3,488</u>	<u>4,527</u>	<u>4,689</u>

Distribution of Permanent Positions by Programs

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
<u>Direct Positions</u>				
<u>Space Transportation Systems</u> .....	<u>5</u>	---	<u>5</u>	<u>5</u>
Space shuttle .....	5	---	5	5
<u>Space and Terrestrial Applications</u> .....	<u>38</u>	<u>40</u>	<u>40</u>	<u>39</u>
Space applications .....	<u>38</u>	<u>40</u>	<u>40</u>	<u>39</u>
Subtotal, Direct Positions.....	<u>43</u>	<u>40</u>	<u>45</u>	<u>44</u>

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
<u>Center Management and Operations Support Positions</u> .....	59	64	59	59
Total, permanent positions .....	<u>102</u>	<u>104</u>	<u>104</u>	<u>103</u>

PROGRAM DESCRIPTION

SPACE TRANSPORTATION SYSTEMS

5 Permanent Positions (Civil Service)

In 1980 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 and the ground test version of the Shuttle propulsion system, the Main Propulsion Test Article.

SPACE AND TERRESTRIAL APPLICATIONS

39 Permanent Positions (Civil Service)

In 1980 the National Space Technology Laboratories' Earth Resources Laboratory's program will continue:

a. To conduct research investigations in the application of remotely sensed data, stressing interests and needs of potential user agencies. 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, and to devise cost-effective methods of transferring those techniques to the user agencies.

b. To conduct applications demonstration projects in cooperation with Federal, state, regional and local government agencies and private industry to promote the effective transfer of applications technology as well as to reduce systems costs, increase adaptation to the users systems, and improve compatibility with other information sources and products routinely used by the user organization.

c. To systematically transfer, primarily to state and local governments in the 17 state region in the midwest, south and southeast, the ability to effectively use Landsat data for their resource management and planning decisions through the Southern Regional Remote Sensing Applications Center.

d. To conduct research, develop applications and transfer technology to the user community 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 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as that support or services being provided to all National Space Technology Laboratories organizations which cannot be directly identified to a benefitting program or project. The civil service personnel involved are:

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

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Centerwide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation, supplies, etc.
- Medical care of employees
- Photographic and graphic support
- Safety

PERSONNEL AND RELATED COST

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
I. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>2.648</u>	<u>2.823</u>	<u>3.083</u>	<u>3.151</u>

Basis of Fund Requirements

	<u>1978</u> <u>Actual</u>	1979		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		Budget Estimate	Current Estimate	
		(Thousands of Dollars)		
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent Positions .....	2,327	2,484	2,680	2,768
b. Nonpermanent .....	49	62	101	79
c. Overtime and compensation.. ..	<u>5</u>	<u>7</u>	<u>8</u>	<u>8</u>
Subtotal, Compensation. ....	2,381	2,553	2,789	2,855
2. <u>Benefits</u> .....	<u>242</u>	<u>254</u>	<u>271</u>	<u>278</u>
Subtotal, Compensation and Benefits. ....	<u>2,623</u>	<u>2,807</u>	<u>3,060</u>	<u>3,133</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel .....	10	11	15	10
2. Personnel training .....	<u>15</u>	<u>5</u>	8	<u>8</u>
Subtotal, Supporting Costs .....	<u>25</u>	<u>16</u>	<u>23</u>	<u>18</u>
Total, Personnel and Related Costs.. ..	<u>2,648</u>	<u>2,823</u>	<u>3,083</u>	<u>3,151</u>
A. <u>Compensation and Benefits</u> .. ..	<u>2,623</u>	<u>2,807</u>	<u>3,060</u>	<u>3,133</u>
1. <u>Compensation</u> .....	<u>2,381</u>	<u>2,553</u>	<u>2,789</u>	<u>2,855</u>
a. Permanent positions .....	2,327	2,484	2,680	2,768

The funds shown will support 103 permanent positions in 1980. The current estimate for 1979 reflects an increase over the 1979 budget estimate due to the October 1978 pay increase.

Basis of Cost for Permanent Positions

In 1980 the cost of permanent positions will be \$2,768,000, an increase of \$88,000 over 1979. The increase results from the following:

Cost of permanent positions in 1979.....	2,680
Cost increase in 1980 .....	+131
Within grade advances and career development	
Full year effect of 1979 actions.....	+22
Partial year effect of 1980 actions.....	+25
Full year effect of October 1978 pay increase.....	+3
Full year effect of 1979 personnel increase.....	+22
Two extra workdays.....	+20
Decrease in reimbursements.....	+39
Cost of decreases in 1980.....	-43
Turnover savings and abolished positions.....	-29
Full year effect of 1979 actions.....	--
Partial year effect of 1980 actions.....	-14
Cost of permanent positions in 1980.. .....	<u>2,768</u>

	1978	1979		1980
<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Estimate</u>	<u>Budget</u>
	<u>Estimate</u>	<u>Estimate</u>		<u>Estimate</u>
	(Thousands of Dollars)			

b. Nonpermanent positions

1. cost.....	49	62	101	79
2. Workyears.....	7	7	12	9

The increase from the 1979 budget estimate to the 1979 current estimate is due to the establishment of a part-time employment program, and the addition of two youth opportunity program positions. The 1980 estimate reflects a slight decrease as a result of absorption of the part-time program into the permanent position ceiling. The 1980 estimate will support the following programs at the levels indicated below:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training programs .....	4
Youth opportunity programs. ....	2
Other temporary employment.....	3
 Total. ....	 <u>9</u>

	1978 <u>Actual</u>	1979		1980
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>
		(Thousands of Dollars)		
c. Overtime and other compensation.....	5	7	8	8

The 1980 estimate of overtime is necessary to meet management and administrative requirements in **such** areas as procurement and financial management.

2. <u>Benefits</u> . ....	<u>242</u>	<u>254</u>	271	278
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The following table reflects the personnel benefits by major category:

Category of Costs

Civil Service Retirement Fund. ....	175	183	196	201
Employee life insurance.....	11	14	12	13
Employee health insurance. ....	50	51	57	58
FICA.. ..	1	1	1	1
Incentive awards.....	5	<u>5</u>	5	<u>5</u>
 Total.. ..	 <u>242</u>	 <u>254</u>	 <u>271</u>	 <u>278</u>

The increase from the 1979 budget estimate to the 1979 current estimate is a result of the October 1978 pay raise increase. The increase in 1980 is due to the full year effect of the 1978 pay raise.

	1978 <u>Actual</u>	<u>1979</u>		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands	<u>Current Estimate</u> of Dollars)	
B. <u>Supporting Costs</u> .....	<u>25</u>	16	23	18
1. Transfer of personnel. ....	10	11	15	10
<p style="margin-left: 40px;">The amounts estimated for 1979 and 1980 are based on the 1978 experience and planned personnel turnover.</p>				
2. Personnel training .....	15	5	8	8

The personnel training costs are primarily for "Upward Mobility" training for women and minorities, and EEO "Counsel Training". The increase in the 1979 current estimate over the 1979 budget estimate is due to the greater demand for upward mobility training.

TRAVEL

11. <u>TRAVEL</u> .....	<u>84</u>	<u>65</u>	<u>92</u>	<u>99</u>
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Basis of Fund Requirements

A. Program Travel... ..	53	33	55	58
B. Scientific and Technical Meeting Travel. ....	8	---	14	15
C. Management and Operations Travel. ....	<u>23</u>	32	23	26
Total, Travel .....	<u>84</u>	<u>65</u>	<u>92</u>	<u>99</u>
A. <u>Program Travel</u> . ....	<u>53</u>	<u>33</u>	55	58

Program travel requirements are directly related to the accomplishment of the Center's mission, and will mainly be in support of the Space and Terrestrial Applications Office. The increase from the 1979 budget estimate to the 1979 current estimate is to support the Earth Resources Laboratory. The increase in 1980 reflects an increase in travel costs due to the expansion of the Regional Applications program activity in the Earth Resources Laboratory.

	1978	<u>1979</u>		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
B. <u>Scientific and Technical Meeting Travel</u> .....	8	---	14	15

Scientific and technical meeting travel will permit 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 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. The increase from the 1979 budget estimate to the 1979 current is due to increased travel related to the Earth Resources Laboratory.

C. <u>Management and Operations Travel</u> .....	23	<u>32</u>	23	26
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Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; and local transportation. The decrease from the 1979 budget to the 1979 current reflects 1978 actual experience. The increase in 1980 is attributable to travel involving management matters concerning the Earth Resources Laboratory.

#### FACILITIES SERVICES

The National Space Technology Laboratories (NSTL) covers 138,807 acres and consists of a complex of facilities which include laboratories, office, and rocket engine test facilities.

The complex encompasses about 1,064,511 gross square feet of building space including seven major buildings. Also included are five major technical facilities. This physical plant supports an average daily Center population of 2,800 to 3,000 personnel. Many of the test facilities are utilized on schedules involving more than one shift and/or frequently during off-peak hours.

111. <u>FACILITIES SERVICES</u> .....	<u>---</u>	<u>350</u>	<u>1,094</u>	<u>1,173</u>
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#### Basis of Fund Requirement

A. <u>Maintenance and Related Services</u>				
1. Facilities. ....	<u>---</u>	100	100	<u>100</u>
Subtotal. ....	---	100	100	100

	1978	1979		1980
	<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>Custodial Services</u> .....	---	<u>250</u>	<u>242</u>	<u>246</u>
C. <u>Utilities</u> .....	---	---	<u>752</u>	<u>827</u>
Total, Facilities Services. ....	<u>---</u>	<u>350</u>	<u>1,094</u>	<u>1,173</u>

A. <u>Maintenance and Related Services</u> .. ..	---	100	100	<u>100</u>
1. <u>Facilities</u> .....	---	100	100	100

Provides modifications and alterations of facilities for normal recurring movements of personnel and equipment of the Earth Resources Laboratory.

B. <u>Custodial Services</u> .....	---	250	242	246
------------------------------------	-----	-----	-----	-----

Provides security guard services, janitorial services and fire protection to the Earth Resources Laboratory personnel by the National Space Technology Laboratories institutional support services contractor.

C. <u>Utilities</u> .....	<u>---</u>	<u>---</u>	<u>752</u>	<u>827</u>
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Provides for the purchase of the two utility commodities; the 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. These utilities were previously funded by the R&D appropriation. The estimated requirements for these utilities are as follows:

1. Electricity (12,560 mW/Hs) .....				465
2. Natural gas (181,000 K cu ft) .....				362

TECHNICAL SERVICES

IV. TECHNICAL SERVICES .....	<u>---</u>	<u>50</u>	<u>41</u>	<u>41</u>
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Basis of Fund Requirements

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A <u>Automatic Data Processing</u>				
1 Operations	---	35	35	35
B <u>Scientific and Technical Information</u>				
1. Library.....	---	<u>15</u>	<u>6</u>	<u>6</u>
Total, Technical Services.....	---	<u>50</u>	<u>41</u>	<u>41</u>
A. <u>Automatic Data Processing</u> .....	---	<u>35</u>	<u>35</u>	<u>35</u>
Provides for the supplies, materials and software programs in support of the Earth Resources Laboratory				
B. <u>Scientific and Technical Information</u> .....	---	<u>15</u>	<u>6</u>	<u>6</u>
Provides for the books, periodicals and other technical reports required by the Earth Resources Laboratory				
The 1979 decrease reflects reassessment of requirements.				
<u>MANAGEMENT AND OPERATIONS</u>				
V. <u>MANAGEMENT AND OPERATIONS</u> .....	---	<u>200</u>	2	<u>225</u>
<u>Basis of Fund Requirements</u>				
A <u>Administrative Communications</u>	---	35	25	25
B. <u>Printing and Reproduction</u> .....	---	45	45	47

	1978 <u>Actual</u>	<u>1979</u>		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
		(Thousands of Dollars)		
C Transportation.....	---	35	55	56
D Installation Common Services.....	---	85	92	97
Total, Management and Operations.....	<u>---</u>	<u>200</u>	<u>217</u>	<u>225</u>

A. Administrative Communications..... --- 35 25 25  
 Provides for the local telephone service for the Earth Resources Laboratory.

B. Administrative Printing..... --- 45 45 47  
 Provides for printing and reproduction services in support of the Earth Resources Laboratory personnel.

C. Transportation..... --- 35 55 56  
 Provides for the rental of the GSA vehicles required to support the operations of the Earth Resources Laboratory. The increase in 1979 current estimate from the 1979 budget estimate reflects a reassessment of support requirements.

D. Installation Common Services..... --- 85 92 97

Provides supplies, materials and equipment for the Earth Resources Laboratory. The increase in 1979 current estimate from the 1979 budget estimate is due to increased requirements for supplies and materials.

NSTLSUMMARY STAFFING		
	FY 79	FY 80
Excepted	1	1
GS-16	1	1
GS-15	5	5
GS-14	10	9
All Other GS	87	a7
Wage Board	0	0
Total Permanent	104	103

A reduction in FY 1979 of 2 and in FY 1980 of 1 has not yet been distributed to personnel ceilings in the internal organization structure.

OFFICE OF THE MANAGER		
	FY 79	FY 80
Excepted	1	1
GS-16	1	1
All other GS	<u>2</u>	<u>2</u>
TOTAL PERMANENT	4	4

CHIEF COUNSEL		
	FY 79	FY 80
GS-15	1	1
All other GS	<u>1</u>	<u>1</u>
TOTAL PERMANENT	2	2

EXECUTIVE STAFF		
	FY 79	FY 80
GS-14		
All other GS	<u>6</u>	<u>6</u>
TOTAL PERMANENT	6	6

RESOURCES & FINANCIAL MANAGEMENT OFFICE		
	FY 79	FY 80
GS-14	1	1
All other GS	<u>18</u>	<u>18</u>
TOTAL PERMANENT	19	19

PROCUREMENT & CONTRACTS OFFICE		
	FY 79	FY 80
GS-14	1	1
All other GS	<u>11</u>	<u>11</u>
TOTAL PERMANENT	12	12

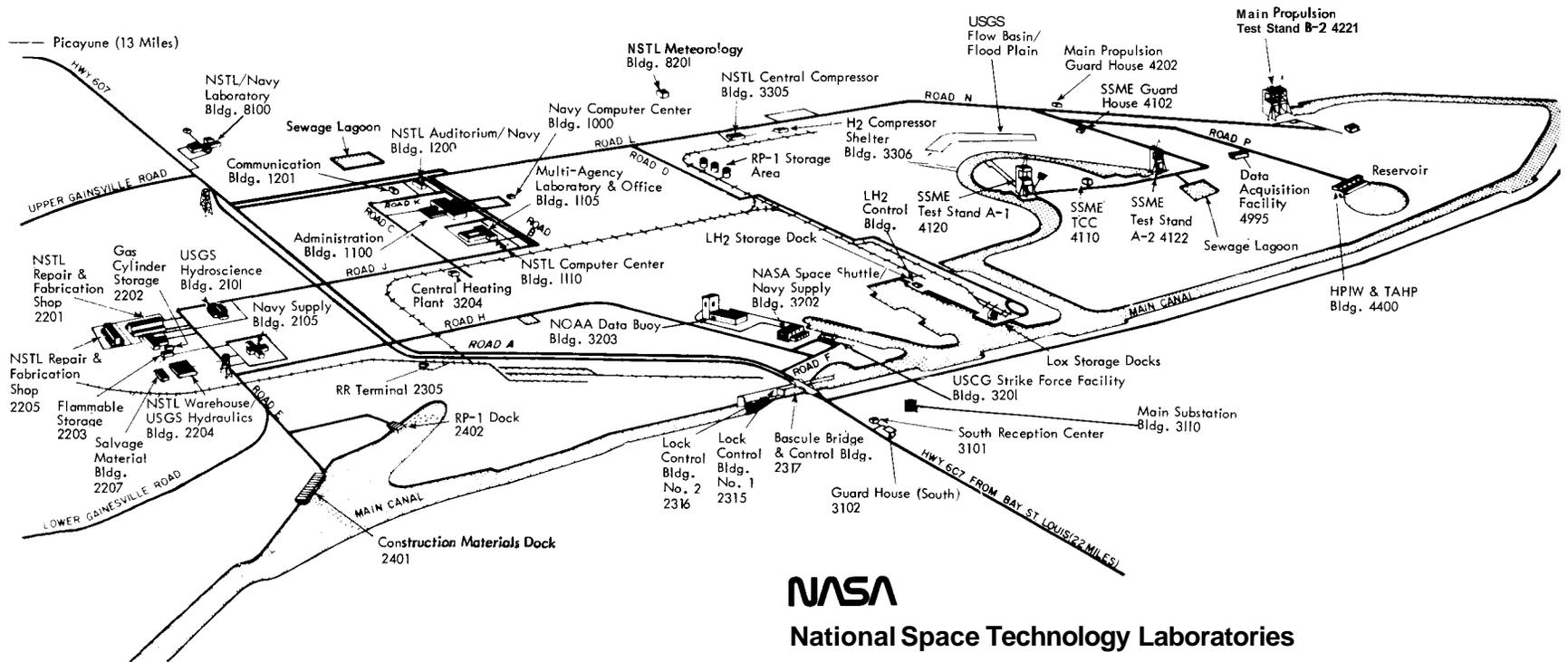
FACILITIES ENGINEERING OFFICE		
	FY 79	FY 80
GS-14	1	1
All other GS	<u>8</u>	<u>8</u>
TOTAL PERMANENT	9	9

INSTALLATIONS OPERATIONS OFFICE		
	FY 79	FY 80
GS-14	2	2
All other GS	<u>12</u>	<u>12</u>
TOTAL PERMANENT	14	14

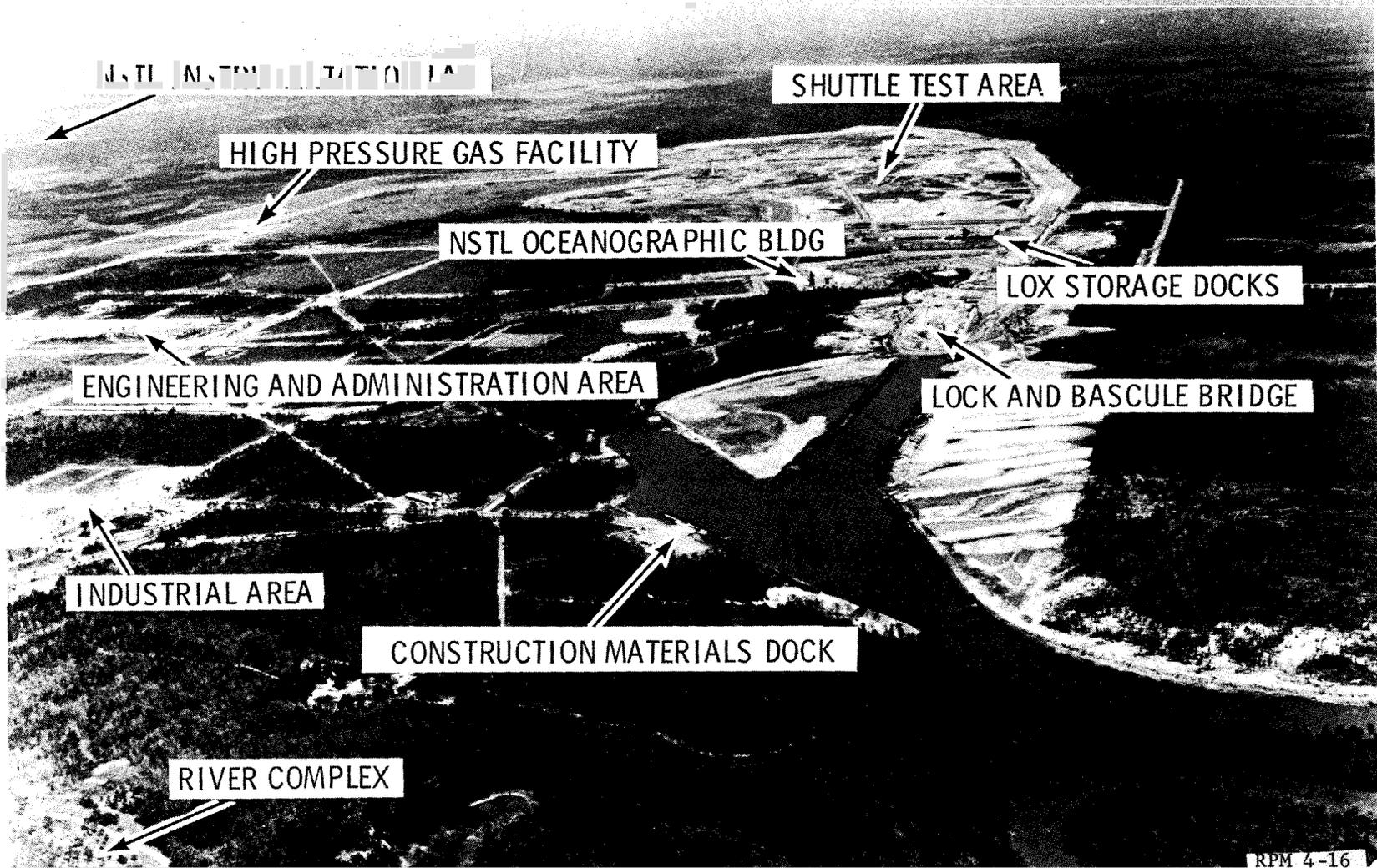
EARTH RESOURCES LABORATORY		
	FY 79	FY 80
GS-15	4	4
GS-14	5	5
All other GS	<u>31</u>	<u>31</u>
TOTAL PERMANENT	40	40



# NSTL LOCATION PLAN



# NATIONAL SPACE TECHNOLOGY LABORATORIES-AERIAL VIEW



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1980 ESTIMATES

GODDARD SPACE FLIGHT CENTER

DESCRIPTION

The Goddard Space Flight Center, located 15 miles northeast of Washington, DC., at Greenbelt, Maryland, is situated on a 554-acre main site. Three additional nearby plots of 640 acres comprise the remote site area and contain the Goddard Antenna Test Range, the Goddard Optical Facility, the Propulsion Research Facility, the Magnetic Fields Component Test Facility, the Attitude Control Test Facility, and the Network Training and Test Facility. The total capital investment for the Goddard Space Flight Center, including tracking stations and contractor-held facilities at various locations as of September 30, 1978, was \$701,089,000.

The majority of the Goddard Center's personnel are located at Greenbelt, Maryland; other personnel are located at 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, 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 Goddard Center 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. The principal and supporting roles are:

PRINCIPAL

Earth Orbital Spacecraft Development and Flight Operations - for space science and applications, includes spacecraft propulsion and supporting technology such as low cost structural evaluation and reliability demonstration, advanced guidance systems and space power systems. Major emphasis is on automated, standard spacecraft systems, free flyers, experiment development and integration, and the planning and conducting of associated flight operations.

Tracking and Data Acquisition Systems and Support Operations - planning, developing and implementing the tracking network, data processing and analysis, communications, and mission control systems and facilities. Planning and conducting support of earth orbit spacecraft. Includes flight control, tracking, data acquisition, communications, and information processing and analysis. Network planning and implementation support for Shuttle, including Orbital Flight Tests (OFT). (Tracking and data acquisition responsibilities include orbital phase acquisition of all mission types such as manned, deep space, etc.).

Spacelab Payloads - developing, analytically integrating and processing data for Spacelab payloads in astrophysics, solar terrestrial physics, astronomy, and assigned applications roles.

Space Physics and Astronomy Payloads and Science - developing the technical discipline base, including astronomical sensors; developing and implementing flight experiments, including space physics and experimentation for planetary missions.

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

Upper Atmospheric Research - developing and applying analytical techniques, evaluating advanced instrumentation concepts for atmospheric constituent analysis, and developing concepts for future flight missions.

Information Systems Technology - developing and maintaining a technology base.

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), payload carrier development, development acquisition. (Most GSFC sounding rocket activities involve the higher performance, more complex vehicle support systems. Most activities involving lower performance vehicle systems are assigned to Wallops Flight Center (WFC)).

Launch Vehicle Procurement - for Space Science and Space Applications-oriented missions. Current focus on sounding rockets and Delta.

#### 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.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
I. Personnel and Related Costs.....	102,718	104,343	108,433	110,150
II. Travel.....	2,308	2,476	2,481	2,672
III. Facilities Services.....	9,897	9,895	9,560	10,288
IV. Technical Services.....	2,169	2,046	2,246	2,325
V. Management and Operations .....	<u>6,761</u>	<u>5,379</u>	<u>5,510</u>	<u>5,762</u>
Total, fund requirements.....	<u>123,853</u>	<u>124,139</u>	<u>128,230</u>	<u>131,197</u>

Distribution of Permanent Positions by Program

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
<u>Direct Positions</u>				
<u>Space Transportation Systems... ..</u>	<u>132</u>	<u>126</u>	<u>119</u>	<u>112</u>
Space shuttle.....	35	47	33	33
Space flight operations... ..	11	10	16	17
Expendable launch vehicles.....	86	69	70	62
<u>Space Science.....</u>	<u>1,111</u>	<u>1,066</u>	<u>1,108</u>	<u>981</u>

	1978 Actual	1979		1980
		Budget Estimate	Current Estimate	Budget Estimate
<u>Space Science.....</u>	<u>1,111</u>	<u>1,066</u>	<u>1,108</u>	<u>981</u>
Physics and astronomy.....	1,051	1,013	1,051	931
Planetary exploration.....	60	53	57	50
<u>Space and Terrestrial Applications.....</u>	<u>784</u>	<u>836</u>	<u>802</u>	<u>924</u>
Space applications... ..	775	826	793	915
Technology utilization.....	9	10	9	9
<u>Aeronautics and Space Technology.....</u>	<u>87</u>	<u>64</u>	<u>71</u>	<u>66</u>
Space research and technology.....	86	64	71	66
Energy technology.....	1	---	---	---
<u>Space Tracking and Data Systems.....</u>	<u>612</u>	<u>612</u>	<u>612</u>	<u>602</u>
Tracking and data acquisition.....	612	612	612	602
Subtotal, direct positions.....	2,726	2,704	2,712	2,685
<u>Center Management and Operations Support Positions....</u>	<u>849</u>	<u>844</u>	<u>756</u>	<u>755</u>
Total, permanent positions.....	<u>3,575</u>	<u>3,548</u>	<u>3,468</u>	<u>3,440</u>

## PROGRAM DESCRIPTION

### SPACE SHUTTLE

33 Permanent Positions (Civil Service)

The objective of the Space Shuttle activities at Goddard Space Flight Center is to plan and implement the equipment systems, communications data, voice circuits, and operational procedures required for support during the Orbital Flight Test phase, and the subsequent operational phase of the Shuttle program.

### SPACE FLIGHT OPERATIONS

17 Permanent Positions (Civil Service)

The objective of the Goddard activities in this area is to provide the technical support and data to effectively integrate Goddard free-flyer payloads into the Space Transportation System. During 1980, Goddard will perform a variety of studies, utilizing Goddard's scientific and technical base, to better develop the Shuttle Payload requirements and interface for the Goddard free-flyer payloads. The first Shuttle Orbital Flight Test for the Office of Space Science and the first Spacelab mission for the Office of Space and Terrestrial Applications are planned to be launched in 1980.

### EXPENDABLE LAUNCH VEHICLES

62 Permanent Positions (Civil Service)

The Goddard Space Flight Center 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 and for a wide range of reimbursable missions for other Government agencies, domestic commercial users, and international users. The Delta program is managed to provide for production of the launch vehicles required for approved missions, to provide the necessary operations support, to maintain production capability for projected missions and to provide for 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.

### PHYSICS AND ASTRONOMY

931 Permanent Positions (Civil Service)

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

Goddard Astrophysics activities have the objectives of: accomplishing laboratory and flight scientific research to increase human knowledge of the earth's space environment, the stars, and other objects; and providing advanced technical development of experiments and spacecraft components for future astrophysics missions.

To this end, Goddard has organized its activities to 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.

During 1980, Goddard's investigators will be actively involved in development of instruments and analysis of data for several major Physics and Astronomy missions; the High Energy Astronomy Observatory, the Space Telescope, the International Solar Polar Mission and the Solar Maximum Mission.

The spacecraft development will be completed and assembly started on the Dynamic Explorer. Additionally, instruments will continue to be fabricated and delivered for testing and evaluation. Government furnished equipment (GFE) for the spacecraft will be delivered to the spacecraft contractor and will include NASA Standard Tape Records, the NASA Standard Near-earth Transponder, the NASA Standard Tracking and Data Relay Satellite System (TDRSS) Transponder, and the Standard ground support equipment for these items.

In 1980, 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 (ISEE) series will provide unusual opportunities to study the dynamic interactions of solar wind and the earth's magnetosphere from various points in space.

In 1980, other Explorer effort will continue. It is anticipated that we will move into development of one or more of the following Explorer missions: Active Magnetospheric Tracer Experiment, Cosmic Background Explorer, or Extreme Ultraviolet Explorer.

Goddard will provide the management and support of NASA Domestic and International Sounding Rocket Programs. The project involvement stems from the conception through launch and data analysis in support of research within Galactic Astronomy, High Energy Astrophysics, Solar Physics, Plasma Physics, Aeronomy, Meteorology, Planetary Astronomy, and the applications of material space processing sciences. During 1980, we plan to introduce sounding rocket technology to the Shuttle via the mode of Experiments of Opportunity (EOP). 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. The highlight of the year is anticipated to be the 1980 African Solar Eclipse Rocket, to be launched from San Marco off the coast of Kenya. Continued support for the Balloon scientific communities is planned, as well as the Aircraft and Climate environmental observations. Again in 1980, we anticipate the accomplishment of the development and the implementation of a logistic and technical consultation services for the Shuttle's self-contained Payload containers.

PLANETARY EXPLORATION

50 Permanent Positions (Civil Service)

The Goddard science activity within the Planetary Exploration program is designed to emphasize the physics of interplanetary space and planetary environments. To this end, Goddard will, in 1980, maintain as strong and viable a research group as is required to carry out this role.

During 1980, Goddard investigators will be actively involved in the development of two instruments, the Neutral Mass Spectrometer and the Photopolarimeter Radiometer for Project Galileo. These instruments will measure chemical composition and the physical properties of clouds in the atmosphere of Jupiter. Goddard will also be involved in the data analysis activity of various instruments on Voyager and Pioneer Venus.

SPACE APPLICATIONS

915 Permanent Positions (Civil Service)

The Goddard Space and Terrestrial Applications program for 1980 spans this Center's broad roles and missions mandate. Included for 1980 are activities in the following discipline areas: Resource Observations, Environmental Observations, and Communications.

Goddard engages in three major types of activities in these areas: A. Space Research and Technology; B. Flight Projects; and C. Application Demonstrations. These activities may be characterized as follows:

A. The Space Research and Technology effort in general is directed toward solving major problems in the above-mentioned major applications disciplines. It stresses continuity of applied research, from the assessment of these problems, to conceptual instrument design and testing, mission and 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 prediction;
2. The dynamics of the earth to provide improved understanding of geodynamics and earthquake processes;
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 resources for better monitoring, assessment, and management;
5. The use of better and advanced future communication systems; and
6. The environment of the earth's atmosphere and hydrosphere which is important for the future well being of all of us.

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, winds as well as soil moisture essential for water resources modeling and agriculture yield prediction, new instruments for ocean color measurements important for ocean studies and pollution determination, new high precision laser and 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 at Goddard for 1979 and 1980 include:

1. Operational weather satellite missions for the National Oceanic and Atmospheric Administration.
  - a. NOAA-B - scheduled for launch during the last quarter of 1979.
  - b. NOAA-C - environmental testing is expected to be completed in the second quarter of 1980.
  - c. NOAA-E Bus - structural modifications for incorporation of Search and Rescue components will be completed and delivery of the Bus will occur in the second quarter 1980.
  - d. Geostationary Operational Environmental Satellite (GOES-D) - to be launched in the last quarter of 1980.
2. Landsat and Nimbus satellites extended operations - will continue to provide remotely sensed resources observations and environmental observations to a worldwide applications research science community.
3. Landsat-D - fabrication, assembly and test of the Thematic Mapper and Multispectral Scanner System instruments, observatory modules, systems and subsystems will continue, and delivery of all observatory components and subassemblies to the mission system contractor for integration and test of the first space segment will be completed by the end of 1980.
4. Magsat:
  - a. Launch is scheduled for the last month of 1979.
  - b. Orbital operations and data analysis will occur in 1980.
5. Applications Explorer Missions (AEM-B)/Stratospheric Aerosol and Gas Experiment (SAGE) - will continue to transmit measurements data on stratospheric aerosols and the ozone.

6. Earth Radiation Budget Experiment - proposal evaluation and award of a contract to the mission contractor, and monitoring of the design and fabrication of the instrument package are the main areas of emphasis in 1980.
7. Spinning Solid Upper Stages (SSUS-A) - to be launched in the last quarter of 1980.

C. Applications demonstration activities involve the formulation, analysis, and distribution of applications data received from satellites for which Goddard 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 (HCMM) 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. Other examples will be 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. A major activity is the transfer of Landsat data application technology to state and local government organizations, and private industry. Goddard, with the Eastern Regional Sensing Applications Center, has responsibility for remote sensing technology in 17 states.

#### TECHNOLOGY UTILIZATION

9 Permanent Positions (Civil Service)

At Goddard, Technology Utilization activities are directed toward the application of space technology to public and private sector needs. Foremost among the technology applications projects in 1980 are the following:

1. New technology identification, evaluation, and publication.
2. Dissemination methods and techniques.
3. Public sector technology applications projects.

#### SPACE RESEARCH AND TECHNOLOGY

66 Permanent Positions (Civil Service)

The objectives of the Goddard Space Flight Center in Space Research and Technology program activities is to provide results appropriate to space mission capability enhancement. Past efforts have produced many worthwhile advances in space system capability, reliability and effectiveness. During 1980, areas of increasing attention include cryogenics for space flight, information systems, sensors, and laser ranging.

The Tracking and Data Acquisition program at Goddard is broken into two main areas: operation of the Spaceflight Tracking and Data Network (STDN); and mission control, sensor data processing, and computation support for flight projects.

The STDN is operated in direct support of NASA's earth orbiting scientific and applications satellites and manned spaceflight programs. In addition, NASA authorizes the Network to provide 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 (NASCOM) provides all operational communications required by NASA. Facilities of this Network link the stations of the STDN and will make it possible for the Tracking and Data Relay Satellite (TDRSS) to operate as a part of the overall tracking and data acquisition complex for which NASA has responsibility.

The TDRSS will provide for 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 TDRSS. With the demonstration of a successful TDRSS, a number of STDN ground stations will be closed. However, some of the current number will be maintained to provide for launch and high altitude orbit support that cannot be provided by the TDRSS.

During 1980, the STDN is projecting support for approximately 43 missions including: Space Transportation System (STS) 1 and 2, High Energy Astronomy Observatory, Fleet Satellite Communications-4, International Sun-Earth Explorer 1, 2, and 3, International Ultraviolet Explorer, Magsat, Solar Maximum Mission, and Stratospheric Aerosol and Gas Experiment.

Mission and Data Operations provide support 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 1980, increasing emphasis will 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 1980's a new era will begin, and the practice of "customizing" support capabilities will be phased out.

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

For operational computing two major efforts will be undertaken. The first will be to put in place a new metric data handling system in order to provide an improved central point of metric data reception from the Space Flight Tracking and Data Network; and, the second is to size the computational requirements for the Shuttle era and provide a new computing capability for flight dynamics, including attitude computations, and command management.

As stated before, emphasis will be placed on end-to-end data concepts; and, in addition, a major effort will be required to develop and implement a new capability to process and distribute Spacelab payload data.

During this transitional phase from "customized" to multimission support, the need to provide day-to-day mission control, operational computing, and information processing support will continue to be met with a core group of civil servants and an increasing use of contractor support through the "mission contracting" concept.

#### CENTER MANAGEMENT AND OPERATIONS SUPPORT

755 Permanent Positions (Civil Service)

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

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

Management Support - includes a wide range of activities generally categorized as activities of a general and administrative nature which are required to operate and maintain the installation. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, and resource control and management information systems and analysis.

Operations Support - this is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are: maintenance and operation of all buildings and facilities, data processing and computer support, reliability and quality assurance, Centerwide security and protection, fire protection, custodial services, logistics support including transportation, supplies, etc., medical care of employees, and photographic and graphic support.

PERSONNEL AND RELATED COSTS

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
I. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>102,718</u>	<u>104,343</u>	<u>108,433</u>	<u>110,150</u>
<u>Basis of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions .....	92,141	93,060	97,064	98,441
b. Nonpermanent .....	656	850	831	776
c. Overtime and other compensation. ....	<u>626</u>	<u>751</u>	<u>738</u>	<u>741</u>
Subtotal, Compensation.....	93,423	94,661	98,633	99,958
2. <u>Benefits</u> .....	<u>8,576</u>	<u>8,904</u>	<u>8,960</u>	<u>9,290</u>
Subtotal, Compensation and Benefits.....	<u>101,999</u>	<u>103,565</u>	<u>107,593</u>	<u>109,248</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel... ..	165	145	192	208
2. Personnel training.....	554	633	648	694
Subtotal, Supporting Costs.....	<u>719</u>	<u>778</u>	<u>840</u>	<u>902</u>
Total, Personnel and Related Costs.....	<u>102,718</u>	<u>104,343</u>	<u>108,433</u>	<u>110,150</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
1. <u>Compensation</u> .....	<u>93,423</u>	<u>94,661</u>	<u>98,633</u>	<u>99,958</u>
a. Permanent positions .....	92,141	93,060	97,064	98,441

The estimate for 1980 will support 3,440 permanent positions, a reduction of 28 from the number of positions supported in the 1979 current level. The increase from the 1979 budget estimate to the 1979 current estimate is due to the October 1978 pay raise, partially offset by a reduction in the civil service workforce.

Basis of Cost for Permanent Positions - 1980

The estimate for permanent compensation (starting from prior year cost) is based upon the position structure at the start of the year, as modified by the addition of new positions and abolishment of existing positions, within grade advances, career development, and the October 1978 pay increase. After those modifications, the year-end position structure is established and the cost effect for the year is calculated based on the estimated period that these modifications are in effect. The cost of permanent positions in 1980 will be \$98,441,000, an increase of \$1,377,000 over 1979. This increase is calculated as follows:

Cost of permanent positions in 1979.....	97,064
Cost increases in 1980.....	+3,547
Within grade advances and career development:	
Full year effect of 1979 actions.....	+1,209
Partial year effect of 1980 actions.....	+1,151
Full year effect of October 1978 pay raise.....	+106
Two extra workdays in 1980.....	+731
Change in reimbursables.....	+350
Cost decreases in 1980.....	-2,170
Turnover savings and abolished positions:	
Full year effect of 1979 actions.....	-1,172
Partial year effect of 1980 actions.....	-998
Cost of permanent positions in 1980.....	<u>98,441</u>

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
b. Nonpermanent positions				
1. cost.....	656	850	831	776
2. Workyears. ....	77	106	84	79

The decrease in 1979 from the budget estimate to the current estimate is due to a reduction of 22 workyears. This reduction is offset by the effect of the October 1978 pay raise. The reduction in 1980 is due to the absorption of the part-time program into the permanent position ceiling. The 1980 estimate reflects the full year effect of the October 1978 pay raise and will support the following programs at the levels indicated below:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training programs.....	33
Summer programs.....	6
Youth opportunity programs.....	17
Other temporary employment .....	<u>23</u>
Total.....	<u>79</u>

c. Overtime and other compensation .....	626	751	738	741
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Overtime at Goddard is required to meet peak operational requirements where additional hours of work 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 reduction in 1979 is due to 1978 experience partially offset by the October 1978 pay raise. The level of effort in 1980 is the same as 1979.

2. Benefits.....	<u>8,576</u>	<u>8,904</u>	<u>8,960</u>	<u>9,290</u>
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The increase from the 1979 budget estimate to the 1979 current estimate and the 1980 estimate reflects the October 1978 pay raise, partially offset by the reduction in the permanent civil service workforce.

	1978 <u>Actual</u>	1979		1980
		<u>Budget Estimate</u>	<u>Current Estimate</u>	<u>Budget Estimate</u>

(Thousands of Dollars)

The following table indicates the cost of personnel benefits by the major categories:

<u>Category of Costs</u>	1978 <u>Actual</u>	1979 <u>Budget Estimate</u>	1979 <u>Current Estimate</u>	1980 <u>Budget Estimate</u>
Civil Service Retirement Fund.....	6,450	6,514	6,794	6,990
Employees life insurance.....	313	391	342	388
Employees health insurance.....	1,452	1,749	1,562	1,657
Workman's compensation.....	92	92	92	92
FICA.....	20	23	22	25
Incentive awards.....	125	126	125	125
Other benefits.....	6	9	8	13
Severance pay.....	118	---	15	---
<u>Total.....</u>	<u>8,576</u>	<u>8,904</u>	<u>8,960</u>	<u>9,290</u>
B. <u>Supporting Costs</u> .....	<u>719</u>	<u>778</u>	<u>840</u>	<u>902</u>
1. Transfer of personnel.....	165	145	192	208

The category includes the reimbursement to employees of movements of household goods to the employees new duty station and other relocation expenses. The increase in 1979 from the budget estimate to the current estimate is based primarily on 1978 experience. The number of moves in 1980 is planned at the 1979 level.

2. Personnel training.....	554	633	648	694
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The personnel training costs are based on continuation of current training programs and the need to reorient skills of employees into areas compatible with the direction of current space program and Goddard's role in the program. The increase in 1979 and 1980 is a result of the move into the Tracking and Data Relay Satellite System (TDRSS) era at GSFC. As TDRSS becomes operational, more people will have to be retrained for new jobs.

TRAVEL

	<u>1978</u> Actual	<u>1979</u>		<u>1980</u> Budget Estimate
		Budget Estimate	Current Estimate	
(Thousands of Dollars)				
II. <u>TRAVEL</u> .....	<u>2,308</u>	<u>2,476</u>	<u>2,481</u>	<u>2,672</u>
<u>Basis of Fund Requirements</u>				
A. Program Travel... ..	1,950	2,095	2,119	2,285
B. Scientific and Technical Meeting Travel.....	231	232	231	247
C. Management and Operations Travel.....	<u>127</u>	<u>149</u>	<u>131</u>	<u>140</u>
Total, Travel.....	<u>2,308</u>	<u>2,476</u>	<u>2,481</u>	<u>2,672</u>
<u>A. Program Travel</u> .....	<u>1,950</u>	<u>2,095</u>	<u>2,119</u>	<u>2,285</u>

Program travel is essential to the accomplishment of the Center's mission, particularly with regard to the Physics and Astronomy, Space and Terrestrial Applications, Tracking and Data Acquisition, and Space Flight 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. Travel to support the Space Science, Space Tracking and Data Systems and Space Transportation Systems programs should continue in 1980 at approximately the same level experienced in 1979. Program travel in the Space and Terrestrial Applications programs is increasing, specifically, due to the Applications Explorer Mission (AEM-6), the Stratopsheric Aerosol and Gas Experiment (SAGE), and the Applications Technology Satellite (ATS).

B. <u>Scientific and Technical Meeting Travel</u> .....	<u>231</u>	<u>232</u>	<u>231</u>	<u>247</u>
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Scientific and technical meeting travel permits employees to participate in meeting 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. Space and Terrestrial Applications programs are the primary users of travel in this area. The level of travel in this category is expected to remain approximately the same as planned for 1979.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</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> .....	127	149	131	140

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 level of travel in 1980 is expected to remain approximately the same as planned for 1979.

FACILITIES SERVICES

Goddard Space Flight Center (GSFC) is located on a 554-acre main site and on a 640-acre remote site area with a complex of laboratory and office-type buildings as well as test facilities. This complex encompasses 2,258,099 gross square feet of building space including 17 major buildings. Also included are seven major technical facilities. 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.

111. <u>FACILITIES SERVICES</u> .....	<u>9,897</u>	<u>9,895</u>	<u>9,560</u>	<u>10,288</u>
<u>Basis of Fund Requirements</u>				
A. <u>Rental of Real Property</u> .....	<u>754</u>	<u>795</u>	637	<u>647</u>
B. <u>Maintenance and Related Services</u>				
1. <u>Facilities</u> .....	1,710	1,371	1,482	1,504
2. <u>Equipment</u> .....	<u>38</u>	<u>14</u>	<u>15</u>	<u>16</u>
<u>Subtotal</u> .....	<u>1,748</u>	<u>1,385</u>	<u>1,497</u>	<u>1,520</u>
C. <u>Custodial Services</u> .....	<u>2,379</u>	<u>1,750</u>	<u>1,842</u>	<u>1,972</u>
D. <u>Utility Services</u> .....	<u>5,016</u>	<u>5,965</u>	<u>5,584</u>	<u>6,149</u>
<u>Total, Facilities Services</u> .....	<u>9,897</u>	<u>9,895</u>	<u>9,560</u>	<u>10,288</u>

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
A. <u>Rental of Real Property</u> .....	754	795	637	<u>647</u>
<p>This provides space for personnel at certain tracking stations and the Goddard Institute of Space Sciences (GISS) in New York City, as well as storage and warehouse space for equipment, supplies and materials. The decrease in 1979 from the budget estimate to the current estimate is due to a reduction in actual space rented. The area requirements in 1980 are approximately the same as those rented in 1979.</p>				
B. <u>Maintenance and Related Services</u> .....	<u>1,748</u>	<u>1,385</u>	<u>1,497</u>	<u>1,520</u>
1. <u>Facilities</u> .....	1,710	1,371	1,482	1,504

The 1978 actual and 1979 current estimate are higher than the 1979 budget estimate because of increases in the level of maintenance at GSFC due to the exceptionally harsh winter of last year. The majority of the maintenance involves repair of sidewalks and curbs, repaving of roads and roof repairs. Some of the emergency maintenance scheduled in 1978 has been deferred until 1979. It is estimated that 1980 levels will be comparable to 1979.

This activity provides in 1980 for the continuation of the same level of effort as in 1979. The major services included are:

a. Maintenance and operation..... 458

These funds provide general buildings maintenance including painting, inspection, and mechanical and electrical maintenance.

b. Ground maintenance..... 167

Provides for mowing, cultivation, mulching, fertilizing and care of trees and shrubs.



	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
D. <u>Utilities Services</u> .....	5,016	5,965	5,584	6,149

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. Electricity is purchased from Potomac Gas and Electric Company, natural gas from Washington Gas Light Company and fuel oil from a local supplier, Water and sewage is provided by the Washington Suburban Sanitary Commission. Included is \$237,000 for utility system maintenance, \$326,000 for utilities provided to leased buildings, and \$5,586,000 for the purchase of utilities services as follows:

1. Electricity (94,000 MW/Hrs) .....	4,351
2. Natural Gas (165,000 K cu. ft.)... ..	601
3. Fuel Oil (1 million gals.) .....	353
4. Water and Sewage .....	281

TECHNICAL SERVICES

IV. <u>TECHNICAL SERVICES</u> .....	<u>2,169</u>	<u>2,046</u>	<u>2,246</u>	<u>2,325</u>
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Basis of Fund Requirements

A. Automatic Data Processing

1. Equipment .....	255	276	276	280
2. Operations .....	<u>1,000</u>	<u>893</u>	<u>1,010</u>	<u>1,070</u>
Subtotal.....	<u>1,255</u>	<u>1,169</u>	<u>1,286</u>	<u>1,350</u>

	1978	1979		1980
	<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>B. <u>Scientific and Technical Information</u></b>				
1. Library .....	405	553	568	576
2. Education and Information.....	<u>297</u>	<u>102</u>	<u>213</u>	<u>217</u>
Subtotal.....	702	655	<u>781</u>	<u>793</u>
<b>C. <u>Shop Support and Services</u>.....</b>				
	212	<u>222</u>	179	182
Total, Technical Services.....	<u>2,169</u>	<u>2,046</u>	<u>2,246</u>	<u>2,325</u>
<b>A. <u>Automatic Data Processing</u> .....</b>				
	<u>1,255</u>	<u>1,169</u>	<u>1,286</u>	<u>1,350</u>

This funding provides accounting and management information to satisfy requirements of NASA and GSFC management. Included is support of GSFC business data functions.

1. Equipment .....	255	276	276	280
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The maintenance costs (\$114,000) of all GSFC-owned administrative ADP equipment and the lease costs (\$166,000) of all leased administrative ADP hardware are included in this estimate. Leased equipment includes Xerox 1200 printer, Sycor terminal system, various other terminals, and other peripheral equipment. Maintenance services are provided for the IBM 360/50 (main business computer), memory disc drives, terminals, and associated equipment. Costs remain essentially level from year-to-year.

2. Operations .....	1,000	893	1,010	1,070
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The systems supported include Institutional Management, Financial and Accounting, Procurement, and Personnel Management. The increase in 1979 from the budget estimate to the current estimate, and the increase from 1979 to 1980 is due to support contractor wage increases. The current estimate in 1979 and 1980 are more reflective of 1978 experience. Computer programming, keypunching operators, and other support personnel are provided for 36 workyears at a cost of \$804,000. Supplies, materials, and software programs are included as operational costs for provision of administrative ADP information (\$266,000).

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
B. <u>Scientific and Technical Information</u> .....	<u>702</u>	<u>655</u>	<u>781</u>	<u>793</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.

1. Library.....	405	553	568	576
-----------------	-----	-----	-----	-----

Cataloging, reference, acquisition, and translating services, and distribution of books and publications in the operation of the GSFC library are funded in this estimate. This includes over 65,000 books, 45,000 journals, plus almost one million microfiche copies of aerospace documents.

2. Education and information.....	297	102	213	217
-----------------------------------	-----	-----	-----	-----

This estimate includes funds for exhibit management and refurbishment, spacemobile operation, demonstrational models, workshops and symposia, and educational and informational materials. Funding was added in 1979 for the Visitor's Center exhibits and special weather/climate films, which was not originally included in the 1979 budget estimate.

C. <u>Shop Support and Services</u> .....	212	<u>222</u>	<u>179</u>	<u>182</u>
---	-----	------------	------------	------------

Support is provided in the areas of safety, photo services, graphics, and publications. Fire protection system maintenance and related supplies and equipment; film and print processing, photographic supplies and repair of photographic equipment; art work services and related supply and equipment costs; and materials and equipment maintenance for compilation of documents comprise this category. The level of funding for 1980 is essentially unchanged from 1979.

MANAGEMENT AND OPERATIONS

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands	<u>Current</u> <u>Estimate</u> of Dollars)	
V. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>6.761</u>	<u>5,379</u>	<u>5,510</u>	<u>5,762</u>
<u>Basis of Fund Requirements</u>				
A. Administrative Communications..	2,261	2,475	2,264	2,299
B. Printing and Reproduction .....	331	384	311	316
C. Transportation .....	1,458	1,652	1,690	1,845
D. Installation Common Services..	<u>2,711</u>	<u>868</u>	<u>1,245</u>	<u>1,302</u>
Total, Management and Operations .....	<u>6.761</u>	<u>5.379</u>	<u>5,510</u>	<u>5,762</u>
A. <u>Administrative Communications</u> .....	<u>2,261</u>	<u>2,475</u>	<u>2,264</u>	<u>2,299</u>

Provides for local telephone service, long distance telephone service, and other non-telephone communications. The decrease from the 1979 budget estimate to the current estimate is due to the recategorization of postage into the Installation Common Services function. The same level of support is projected for 1980 as in 1979.

1. Local telephone services. .... 1,240

Covers 3,600 PBX internal lines and 5,800 telephone instruments at GSFC; there are 13 tielines for Baltimore-area communications. An additional 225 General Services Administration (GSA) centrex lines are used for computer data operations.

2. Long distance telephone service. .... 938

a. Federal Telecommunications System use will approximate 700,000 calls in 1980, at a level based on the 1978 actual.

	<u>1978</u> <u>Actual</u>	<u>1979</u> Budget      Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		<u>1980</u> <u>Budget</u> <u>Estimate</u>
b. Tolls or commercial long distance costs are included.				
3. Non-Telephone communications.....				121
a. Teletype costs including the GSA Automatic Records System (ARS).				
b. Also included is a United Press International Wire Service for the Public Affairs Office.				
B. <u>Printing and Reproduction</u> .....	<u>331</u>	<u>384</u>	<u>311</u>	<u>316</u>

This estimate provides the funding for an onsite printing plant operated by GSFC personnel. This printing plant produces approximately 17,000,000 units of printing each year. In addition to this onsite 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 require- that cannot be handled because of the onsite workload and items that cannot be handled with the onsite equipment. Types of printing accomplished by offsite private firms are multiple-copy forms, multicolor work, and forms for computer use. The decrease in 1979 from the budget to the current estimate is due to a reduction of xerox maintenance costs. Costs are essentially level from 1979 to 1980.

C. <u>Transportation</u> .....	<u>1,458</u>	<u>1,652</u>	<u>1,690</u>	<u>1,845</u>
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Involves 51 workyears of support contractor effort for the operation of Center transportation and storage areas, and other miscellaneous services. Also included are supplies and equipment for vehicle maintenance, gasoline, contracted services for vehicle maintenance, and special vehicle rental. The 1980 increase is caused by the full year effect of negotiated support contractor wage rates.

1. Contractor support provides the following services:
  - a. Operation of Transportation Center--33 workyears for drivers, dispatchers, supervisory personnel; provide pickup and delivery of purchased items and stock items, mail delivery, shuttle transportation, issuance of motor pool vehicles.
  - b. Packing and crating--one workyear for preparing shipments.
  - c. Rigging--three workyears for rigging equipment for relocation on the Center for shipment elsewhere.
  - d. Tape storage--six workyears to operate central magnetic tape depository.

e. Storage and warehousing--seven workyears to operate receiving areas for supplies, stock issuance, and warehousing and storage function.

f. Moving and hauling--one workyear for moving equipment and furniture on emergency basis.

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
D. <u>Installation Common Services</u> .....	<u>2,711</u>	<u>868</u>	<u>1,245</u>	<u>1,302</u>

Supports Center management and staff activities, provides medical services, and covers various installation support services. The increase in 1979 from the 'budget estimate to the current estimate is due to the addition of postage previously included in the communications function. Also the medical support service contractor increased by three workyears to provide radiological services at GSFC. The 1980 level of effort remains the same as in 1979.

1. Center management and staff..... 164

Includes patent searches and applications; steno services, handbook revisions, Equal Opportunity programs; and general administrative supplies, materials, equipment, and equipment maintenance (microfilm, copiers, special typewriters) for staff offices.

2. Medical Services..... 661

Provides support in Occupational Medicine and Environmental Health. Eighteen support contractor workyears are required for onsite support.

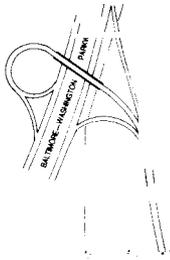
a. Occupational medicine..... 414

This activity consists of operation of the GSFC onsite health unit and medical services for GISS employees in New York. Fifteen workyears provide emergency care onsite, annual physical exams for GSFC employees, fitness programs, immunizations, and counseling. Annual physical exams are provided for approximately 3,400 employees at the Center. The necessary supplies, materials and equipment for operation of the health unit are included.

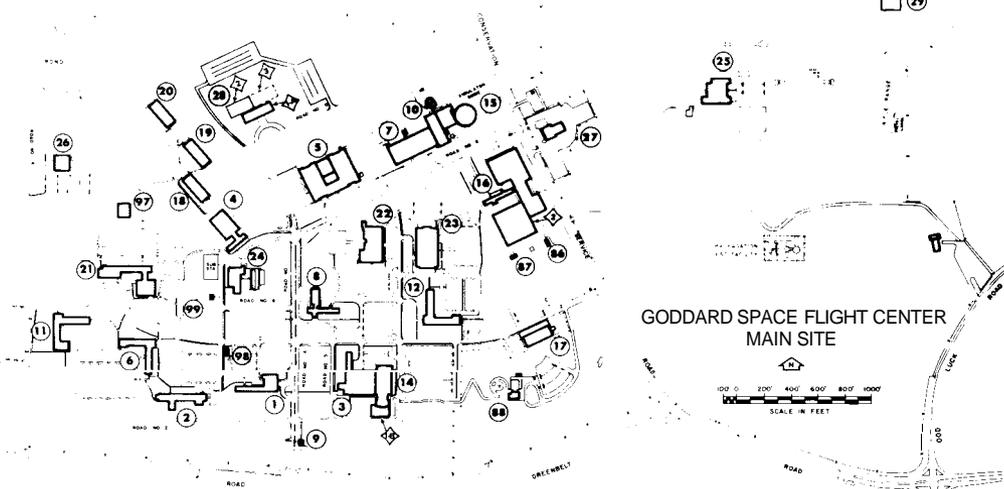
	<u>1978</u>	<u>1979</u>		<u>1980</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
b. Environmental health.....				247
<p>Environmental health consists of industrial hygiene and an environmental health lab at a total of three workyears for detection and correction of health hazards. Necessary supplies, materials, and equipment are included.</p>				
3. Installation support services.....			.....	477
<p>This estimate includes all administrative support items not specifically identified elsewhere. Among these are the purchase of office furniture and operating supplies issued from stock; maintenance of all Center labor-saving devices; materials for mailroom and warehouse operation; and postage costs.</p>				
a. Office supplies.....				129
<p>General office supplies, furniture, and operating supplies for warehouse and mailroom, such as pallets and gas cylinders are included in this estimate.</p>				
b. Maintenance of general administrative equipment.....				72
<p>This funding provides maintenance of copiers, time stamps, electronic calculators, electric typewriters, calculators, and adding machines; as well as cylinder and electric file maintenance.</p>				
c. Postage... ..				276







**GODDARD SPACE FLIGHT CENTER  
FISCAL YEAR 1980 ESTIMATES  
LOCATION PLAN**



- 1 SPACE PROJECTS BUILDING
- 2 RESEARCH PROJECTS LABORATORY
- 3 CENTRAL FLIGHT CONTROL & RANGE OPERATIONS BUILDING
- 4 GENERAL PURPOSE FACILITY BUILDING
- 5 INSTRUMENT CONSTRUCTION & INSTALLATION LABORATORY
- 6 SPACE SCIENCES LABORATORY
- 7 PAYLOAD TESTING FACILITY
- 8 SATELLITE SYSTEMS BUILDING
- 9 MAIN GATE HOUSE
- 10 ENVIRONMENTAL TESTING LABORATORY
- 11 APPLIED SCIENCES LABORATORY
- 12 TRACKING & TELEMETRY LABORATORY
- 14 SPACECRAFT OPERATIONS FACILITY
- 15 LAUNCH PHASE SIMULATOR
- 16 DEVELOPMENT OPERATIONS BUILDING
- 17 MULTIPURPOSE BUILDING
- 18 BUSINESS OPERATIONS BUILDING
- 19 MULTI-PURPOSE BUILDING
- 20 GEOCHEMISTRY BUILDING
- 21 METEOROLOGICAL SYSTEMS DEVELOPMENT LABORATORY
- 22 MECHANICAL TEST FACILITY & QUALITY ASSURANCE LABORATORY
- 23 DATA INTERPRETATION LABORATORY
- 24 CENTRAL HEATING & REFRIGERATION PLANT
- 25 NETWORK TRAINING & TEST FACILITY
- 26 NASA SPACE SCIENCE DATA CENTER
- 27 MOBILE EQUIPMENT SUPPORT FACILITY
- 28 TECHNICAL PROCESSING FACILITY
- 29 FREQUENCY STANDARD AND TEST FACILITY
- 86 DAY CARE CENTER BUILDING
- 87 GAS CYLINDER STORAGE BUILDING
- 88 VISITOR'S CENTER
- 97 PLANT MAINTENANCE SUPPORT FACILITY
- 96 GEWASTORE
- 99 NASA CAREER DEVELOPMENT CENTER

- 14 TECHNICAL PROCESSING FACILITY - FY78 PROJECT
- 18 NETWORK CONTROL CENTER FACILITY - FY78 PROJECT
- 2 MODIFICATIONS & ADDITIONS FOR LOGISTIC & SUPPLY FUNCTIONS - FY79 PROJECT
- 3 SPACELAB DATA PROCESSING FACILITY - FY80 PROJECT

**GODDARD SPACE FLIGHT CENTER  
GREENBELT, MARYLAND**



## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1980 ESTIMATES

#### WALLOPS FLIGHT CENTER

##### DESCRIPTION

Wallops Flight Center includes three separate areas on the Atlantic Coast of Virginia's Eastern Shore: the main base, the Wallops Island launching site, and the Wallops mainland site. The administrative offices, range control center, support shops, and main telemetry buildings are located on the main base. Wallops Island is about seven miles southeast of the main base and is connected to the mainland by a causeway and bridge. The island is about five miles long and one-half mile wide at its widest point. Located on the island are rocket storage buildings, blockhouses, assembly shops and launch sites. The Wallops mainland site is a one-half mile strip west of the island which houses the radar and optical tracking sites.

Wallops Flight Center, totalling 6,166 acres, consists of 1,833 acres on the main base, 3,085 acres on Wallops Island, 108 acres on the mainland tracking site, and 1,140 acres of marsh land. The total capital investment, including fixed assets in progress and contractor-held facilities at various locations as of September 30, 1978, was \$136,678,000.

##### CENTER ROLES AND MISSIONS

Wallops Flight Center prepares, assembles, launches, and tracks space vehicles and acquires scientific information from them. Wallops also has developed, maintains, and operates a research airport in support of NASA's aeronautical research programs which include projects associated with airport-aircraft interface, air traffic control, avionics systems technology, final approach and landing systems, airport configuration, high speed turn-off techniques, airport environmental studies, noise reduction technology, and general aviation research focused on aircraft spin characteristics, cross-wind landings, pilot performance, and procedures and aides at uncontrolled airports and airspace. Its facilities are utilized by the scientists and engineers from the laboratories and research centers of NASA, other governmental agencies, colleges and universities, and the worldwide scientific community. Center personnel assist these scientific research teams with their projects and develop, as necessary, special types of instrumentation and equipment to complete the mission.

The principal and supporting roles are:

PRINCIPAL

Sounding Rocket Development, Procurement and Operations - developing and procuring sounding rockets and carrying out all phases of operations, from mission and flight planning to landing and recovery. Payload carrier development, telemetry, experiment management support to other institutions, launch operations, and tracking and data acquisition are included.

Balloon Program - managing, monitoring, scheduling, and technical analysis of balloon activities conducted for NASA, the Office of Naval Research and the National Science Foundation.

SUPPORTING

Sounding Rocket Payload Carrier Development and Experiment Management Support - provided in the applications disciplines of weather and climate.

Aeronautical Flight Test Support - provide flight test support for Langley Research Center's aeronautical flight test programs, including tracking and data acquisition.

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	<u>1978</u>	<u>1979</u>		<u>1980</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.. .. .	9,978	10,313	10,521	10,749
11. Travel. .... .	316	348	372	406
111. Facilities Services. .... .	2,796	2,959	3,100	3,398
IV. Technical Services. .... .	405	449	346	524
V. Management and Operations .. .	<u>1,525</u>	<u>1,136</u>	<u>1,154</u>	<u>1,253</u>
Total, fund requirements .. .	<u>15.020</u>	<u>15.205</u>	<u>15.493</u>	<u>16.330</u>

Distribution of Permanent Positions by Program

	<u>1978</u>	<u>1979</u>		<u>1980</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 Transportations Systems</u> .....	<u>4</u>	<u>6</u>	<u>3</u>	---
Space flight operations .....	---	2	---	---
Expendable launch vehicles.. ..	4	4	3	---
<u>Space Science</u> .....	<u>70</u>	<u>67</u>	<u>70</u>	<u>67</u>
Physics and astronomy .....	70	67	70	67
<u>Space and Terrestrial Applications</u> .....	<u>56</u>	<u>45</u>	<u>53</u>	<u>56</u>
Space applications .....	55	44	52	55
Technology utilization.....	1	1	1	1
<u>Aeronautics and Space Technology</u> .....	<u>34</u>	<u>27</u>	<u>34</u>	<u>34</u>
Aeronautical research and technology .....	34	27	34	34
<u>Space Tracking and Data Systems</u> .....	<u>109</u>	<u>98</u>	<u>107</u>	<u>108</u>
Tracking and data acquisition .....	<u>109</u>	<u>98</u>	<u>107</u>	<u>108</u>
Subtotal, direct positions .....	273	243	267	265
<u>Center Management and Operations Support Positions</u> .. ..	<u>134</u>	<u>165</u>	<u>131</u>	<u>130</u>
Total, permanent positions .....	<u>407</u>	<u>408</u>	<u>398</u>	<u>395</u>

## PROGRAM DESCRIPTION

### PHYSICS AND ASTRONOMY

67 Permanent Positions (Civil Service)

#### Sounding Rocket Program

The objective of this program is to support space research, using low cost sounding rockets, in the fields of Solar Physics, Galactic Astronomy, Fields and Particles, and Ionospheric Physics. Wallops Flight Center provides flight systems support, launch range support, and support to experiments utilizing sounding rockets.

In 1980, the Wallops Launch Range will provide launch activities and ground instrumentation/support of the launches at Wallops Flight Center and at the Poker Flats Research Range near Fairbanks, Alaska, plus expedition type support to other areas. The Wallops Flight Center launch range is equipped with launchers capable of handling sounding rockets of all sizes. The Poker Flats Research Range is jointly supported by Wallops Flight Center and the Defense Nuclear Agency, which has limited capability, although its facilities can be supplemented by the mobile equipment from Wallops Flight Center.

#### Balloon Program

The objective of this program is to support space research, using low cost balloon platforms, in the fields of Solar Physics, Galactic Astronomy, Stratospheric Composition and Aeronomy.

In 1980, Wallops Flight Center will provide ground instrumentation support, technical, and flight hardware support to experimenters in the balloon program.

The majority of the flights are conducted from the National Scientific Balloon Facility site at Palestine, Texas, or the United States Air Force site at Holloman, New Mexico; however, some flights are supported from remote sites in the northern United States, Canada, Alaska, Australia, New Zealand, Argentina and Brazil.

### SPACE APPLICATIONS

55 Permanent Positions (Civil Service)

#### Environmental Observation

In 1980, the Wallops Flight Center civil service personnel will continue to conduct the Meteorological Rocket Network project. The objectives of this project are:

1. To investigate the processes which characterize the physical state of the strato-mesosphere region of the atmosphere and to determine interactions within this layer of the atmosphere and with the troposphere.

2. To provide data for climatology of the upper atmosphere.
3. To provide in-situ measurement data which are used to calibrate satellite remote sensors.

Through the Meteorological Rocket Networks project, Wallops Flight Center manages NASA's participation in the Cooperative Meteorological Rocket Network (CMRN), the Experimental Inter-American Meteorological Rocket Network (EXAMETNET) and the Eastern-Western Hemisphere Meteorological Rocket Network.

In Ocean Processes, where the primary emphasis is being placed, investigations in the broad areas of sea state measurement, surface currents, ocean topographical mapping, and their supporting ground truth, studies are in progress.

In 1980, the Wallops Flight Center civil service personnel will be involved in investigating the feasibility of determining ocean surface currents from satellites and aircraft measurement of the local surface wave structure; investigating the "sea state bias effect" in satellite altimetry to develop methods of correcting the error; determining the mean sea surface of geoid; evaluating and determining the inadequacies of existing predictive and descriptive synoptic ocean circulation models and investigating the impact of utilizing synoptic altimeter data as input to the models; and developing techniques of using altimeter pulse wave form data for the determination of sea state.

#### Balloon Program

The objective of this program is to support the Space and Terrestrial Applications program using low cost balloon platforms in the field of stratospheric composition, meteorology and aeronomy.

#### TECHNOLOGY UTILIZATION

1 Permanent Positions (Civil Service)

In 1980, this civil servant will carry out the Technology Utilization program at WFC, and be involved in (1) expediting application of new technology, (2) encouraging the use of NASA technology in other sectors, and (3) understanding more fully the technology transfer process and its impact.

#### AERONAUTICAL RESEARCH AND TECHNOLOGY

34 Permanent Positions (Civil Service)

In 1980, the Wallops Flight Center airport will be involved in conducting research tests of various aircraft and helicopters 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, vertical and short takeoff and landing flight vehicles, helicopter stabilization, 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 acquired from the aircraft and automotive tests will ultimately assist in the development of safer, more flexible transportation systems.

TRACKING AND DATA ACQUISITION

108 Permanent Positions (Civil Service)

Tracking and data acquisition activities provide both fixed and mobile equipment for tracking, data acquisition, and communications. These activities will encompass the acquisition of new systems, modifications and updating of existing systems and the operation, maintenance, and repair of these instrumentation systems. Included are highly precise instrumentation radars, analog and digital telemetry systems, precise range timing systems, range inter-communication systems, radio communication systems, tracking laser systems, digital data transmission systems, command and control systems, and digital data processing systems. These instrumentation systems are used in support of both aeronautical and rocket launched flight projects. These flight projects are conducted at Wallops Flight Center or at off-range locations in various parts of the world, depending upon the scientific experiment requirements. The sounding rocket programs supported at Wallops will cover all of the atmospheric and space disciplines in which research is undertaken, utilizing a family of launch vehicles varying in size and power from the small meteorological rockets to the 72-foot Scout with orbital capability. In 1980, more than 300 sounding rockets are to be launched from Wallops Island and remote sites around the world, carrying experiments in the fields of Aeronomy, Energetic Particles, Ionospheric Physics, Meteorology, and Solar Physics.

Of particular interest is the current effort to measure the effect of aerosols on the protective layer of ozone in the upper atmosphere which filters out harmful solar radiation.

CENTER MANAGEMENT AND OPERATIONS SUPPORT

130 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as the support of services being provided to all Wallops Flight Center organizations which cannot be directly identified to a benefitting R&D 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 and Safety.

Management Support

Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control and management information systems and analysis.

Operations Support

This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Center-wide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation, supplies, etc.
- Medical care of employees
- Photographic and graphic support

PERSONNEL AND RELATED COSTS

	1978	<u>1979</u>		1980
	<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>9,978</u>	<u>10,313</u>	<u>10,521</u>	<u>10,749</u>
	<u>Basis of Fund Requirements</u>			
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.....	8,698	8,964	9,096	9,299
b. Nonpermanent.....	173	208	251	251
c. Overtime and other compensation.....	<u>160</u>	<u>157</u>	<u>173</u>	<u>173</u>
Subtotal, Compensation.....	9,031	9,329	9,520	9,723

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
		<u>Estimate</u>	<u>Estimate</u>	
2. Benefits. ....	900	943	956	981
Subtotal, Compensation and Benefits.. ....	<u>9,931</u>	<u>10,272</u>	<u>10,476</u>	<u>10,704</u>
 B. <u>Supporting Costs</u>				
1. Transfer of personnel .....	11	6	10	10
2. Personnel training .....	<u>36</u>	<u>35</u>	<u>35</u>	<u>35</u>
Subtotal, Supporting Costs.....	<u>47</u>	<u>41</u>	<u>45</u>	<u>45</u>
Total, Personnel and Related Costs.....	<u>9,978</u>	<u>10,313</u>	<u>10,521</u>	<u>10,749</u>
 A. <u>Compensation and Benefits</u> .....				
1. <u>Compensation</u> . ....	9,931	10,272	10,476	10,704
a. Permanent Positions. ....	<u>9,031</u>	<u>9,329</u>	<u>9,520</u>	<u>9,723</u>
	8,698	8,964	9,096	9,299

The funds shown above will support 395 permanent positions in 1980. The cost increase from the 1979 budget estimate to the 1979 current estimate is due to the October 1978 pay raise, partially offset by the reduction in civil service positions.

Basis of Cost for Permanent Positions

In 1980, the cost of permanent positions will be \$9,299,000 an increase of \$203,000 from 1979. This increase results from the following calculation:

Cost of permanent positions in 1979.....		9,096
Cost increase in 1980.....		+355
Within grade advances and career development:		
Full year effect of 1979 actions.....	+76	
Partial year effect of 1980 actions.....	+75	
Full year effect of 1979 pay increases.....	+45	
Two extra paid days in 1980.....	+71	
Decrease in reimbursements.....	+88	
Cost decrease in 1980.....		-152
Turnover savings and abolished positions:		
Full year effect of 1979 actions..	-114	
Partial year effect of 1980 actions.....	-38	_____
Cost of permanent positions in 1980.....		<u>9,299</u>

Other Compensation Costs

b. Nonpermanent positions

1. cost....	173	208	251	251
2. Workyears.....	22	29	32	29

The increase from the 1979 budget estimate to the 1979 current estimate is due to cost of the October 1978 pay raise, an increase in the cooperative training program and the implementation of the experimental part-time program. The 1980 plan includes 29 workyears which is about the same as 1979 except for the absorption of the part-time program into the permanent position ceiling and will support the following programs at the levels indicated below:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training programs.....	14
Summer programs.....	5
Opportunity programs..	8
Other temporary employment.....	<u>2</u>
Total.....	<u>29</u>

	<u>1978</u>	<u>1979</u>		<u>1980</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. Overtime and other compensation.....	160	157	173	173

Overtime funds are required at Wallops primarily to meet operational requirements of the sounding rocket programs of the Physics and Astronomy and Space Applications programs. Many factors beyond the Center's control, such as launch schedules, weather holds, and range clearance problems necessitate work beyond normal hours to operate the launch facilities, provide instrumentation support, and conduct tracking and data acquisition activities required to assure mission success. The increase from the 1979 budget estimate to the 1979 current is due to the October 1978 pay raise and the Eclipse Program requirements.

2. <u>Benefits</u> .....	<u>900</u>	<u>943</u>	<u>956</u>	<u>981</u>
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Following are the amounts of contribution by category:

Category of Costs

Civil Service Retirement Fund.....	616	636	655	669
Employee life insurance.....	40	43	43	44
Employee health insurance.....	223	241	237	247
Workmen's Compensation.....	13	13	13	13
FICA.....	3	5	3	3
Incentive awards..	4	2	4	4
Other benefits..	<u>1</u>	<u>3</u>	<u>1</u>	<u>1</u>
Total.....	<u>900</u>	<u>943</u>	<u>956</u>	<u>981</u>

The current estimate for 1979 is increased over the budget estimate due to the October 1978 pay raise, partially offset by the reduction in civil service positions. The 1980 increase reflects the full year effect of the pay raise and higher cost for health insurance, which are partially offset by the savings from the manpower reductions.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
B. <u>Supporting Costs</u> .....	<u>47</u>	<u>41</u>	<u>45</u>	<u>45</u>
1. Transfer of personnel.....	11	6	10	10

The transfer of personnel costs in 1979 and 1980 will cover the expenses for one permanent change of station move planned each year.

2. Personnel training.....	36	35	35	35
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The estimates for personnel training provide for costs of the Wallops Flight Center engineering technician apprentice program. Because of its remote location, Wallops historically has had difficulty recruiting qualified engineers and engineering technicians. Estimates remain essentially level from year to year.

TRAVEL

11. <u>TRAVEL</u> .....	<u>316</u>	<u>348</u>	<u>372</u>	<u>406</u>
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Basis of Fund Requirements

A. Program Travel.....	148	164	196	210
B. Scientific and Technical Meeting Travel.....	44	46	47	51
C. Management and Operations Travel.....	<u>124</u>	138	<u>129</u>	<u>145</u>
Total, Travel.....	<u>316</u>	<u>348</u>	<u>372</u>	<u>406</u>

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
A. <u>Program Travel</u> .....	<u>148</u>	164	196	210

Program travel is directly related to the accomplishment of the Center's mission and reflects the continuing effort in the procurement and launch activities, the sounding rocket development program, the balloon program, and the aeronautical flight test program. The increase from the 1979 budget estimate to the 1979 current estimate is due to increased travel requirements as a result of the eclipse expedition in February 1979 and more planned foreign travel.

B. <u>Scientific and Technical Meeting Travel</u> .....	44	46	<u>47</u>	51
---	----	----	-----------	----

Scientific and technical meeting 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 WFC, as well as to present both accomplishments and problems to their associates. Many of the meetings are working panels convened to solve certain problems for the benefit of the Government.

C. <u>Management and Operations Travel</u> .....	<u>124</u>	<u>138</u>	<u>129</u>	<u>145</u>
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Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters, and other NASA Centers; and local transportation. The increase in 1980 reflects the provision for cost of negotiated wage increases in the intra-center transportation contract.

#### FACILITIES SERVICES

wallops Flight Center involves 6,166 acres and a complex of facilities which mainly consist of research, airport, and launch operations facilities. This complex encompasses 1,053,264 gross square feet of building space including three major buildings. Also included are three major technical facilities. This physical plant supports an average daily on-Center population of 900 to 1,100 personnel housed on site. Many of the test facilities are utilized on schedules involving more than on shift and/or frequently during off-peak hours.

	1978	1979		Budget
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Estimate</u>
		(Thousands of Dollars)		
III. <u>FACILITIES SERVICES</u> .....	<u>2,796</u>	<u>2,959</u>	<u>3,100</u>	<u>3,398</u>
<u>Basis of Fund Requirements</u>				
A. <u>Maintenance and Related Services</u>				
1. Facilities .....	871	966	946	1,072
2. Equipment .....	<u>47</u>	<u>48</u>	<u>48</u>	<u>52</u>
Subtotal .....	918	1,014	994	1,124
B. <u>Custodial Services</u> .....	<u>604</u>	<u>653</u>	<u>669</u>	<u>718</u>
C. <u>Utilities Services</u> .....	<u>1,274</u>	<u>1,292</u>	<u>1,437</u>	<u>1,556</u>
Total, Facilities Services .....	<u>2,796</u>	<u>2,959</u>	<u>3,100</u>	<u>3,398</u>
A. <u>Maintenance and Related Services</u> .....	<u>918</u>	<u>1,014</u>	<u>994</u>	<u>1,124</u>
1. Facilities .....	871	966	946	1,072

This activity, requiring 38 workyears of effort, provides for the maintenance, repair and alteration of over 300 buildings and one million square feet of building space on 6,166 acres of land. The corrosive environment at Wallops Flight Center, caused by its proximity to the ocean, requires frequent maintenance and repair of exterior surfaces, roofing, utility distribution systems, mechanical doors, hardware and building equipment. The increase in 1980 over 1979 is for negotiated support contractor wage increases. Major types of support in this area are:

	<u>1978</u>	<u>1979</u>		<u>1980</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. Ground maintenance.....				377
Approximately 18 workyears provide for maintenance of lawns, trees and shrubs, and for snow removal.				
b. Maintenance and operations.....				349
Twenty workyears provide for the maintenance and operation of over 300 buildings.				
c. Supplies and equipment.....				346
Provides for the replacement of supplies necessary to the operation of the Wallops facility.				
2. Equipment.....	<u>47</u>	<u>48</u>	<u>48</u>	<u>52</u>
Provides for the maintenance of miscellaneous equipment at the Center.				
B. <u>Custodial Services</u> .....	<u>604</u>	<u>653</u>	669	<u>718</u>
Provides for 44 workyears of support service contractor effort for janitorial services, firefighting and ambulance service, and plant security. Also provides for refuse removal, pest control and other miscellaneous services. The increases in 1979 and in 1980 are for negotiated support contractor wage increases.				
1. Janitorial Services.....				288
Twenty workyears provide for the cleaning of buildings.				
2- Firefighting and plant security.....				350
Twenty-four workyears provide for firefighting, ambulance, and security guard service.				

	1978	1979		1980
	<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. Miscellaneous .....				80
Provides for refuse removal, pest control, laundry and other miscellaneous services.				
C. <u>Utilities</u> .....	1,274	1,292	1,437	1,556
<p>The only purchased utilities at Wallops Flight Center are electricity and fuel oil to operate the heating plant. This funding also provides for 10 support contract workyears to operate and maintain the heating plant. Since the 1979 budget estimate, utility consumption figures have been revised. The increase in 1979 from the budget to the current estimate is due to increased utility rates. The activity consumption decreased during the same period. In 1980, there is a further decrease in consumption offset by increasing rates. The increase in 1980 is due to utility rate and negotiated support service contract wage increases. The purchased utilities are as follows:</p>				
1. Electricity (16,400 MWH) .....				715
2. Fuel Oil (1,382 K Gal.) .....				635
<u>TECHNICAL SERVICES</u>				
IV. <u>TECHNICAL SERVICES</u> .....	<u>405</u>	<u>449</u>	<u>346</u>	<u>524</u>
<u>Basis of Fund Requirements</u>				
A. <u>Automatic Data Processing</u>				
1. Equipment .....	40	11	10	14
2. Operations .....	<u>99</u>	69	<u>108</u>	<u>118</u>
Subtotal .....	<u>139</u>	<u>80</u>	<u>118</u>	<u>132</u>

	<u>1978</u>	<u>1979</u>		<u>1980</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)		
<u>B. Scientific and Technical Information</u>				
1. Library.....	82	108	92	104
2. Education and information.....	<u>23</u>	<u>223</u>	<u>32</u>	<u>175</u>
Subtotal.....	105	<u>331</u>	<u>124</u>	<u>279</u>
<u>C. Shop Support and Services.....</u>				
Total, Technical Services	<u>161</u>	<u>38</u>	<u>104</u>	<u>113</u>
Total, Technical Services	<u>405</u>	<u>449</u>	<u>346</u>	<u>524</u>
<u>A. Automatic Data Processing.....</u>				
	139	80	118	132

Provides for administrative data processing including equipment maintenance, programming and operation. Seven workyears of support contractor effort are budgeted for this activity. The increase from the 1979 budget estimate to the 1979 current estimate reflects the level of operations effort provided in 1978. The increase in 1980 is to provide for higher equipment maintenance cost and negotiated support contract wage increases.

1. Equipment..... 14

Provides for annual maintenance of remote terminals and peripheral equipment used for administrative data processing.

2. Operations..... 118

Seven workyears provide programming and operation of equipment used for processing of necessary business data such as payroll and other fiscal records, procurement, and personnel and supply data.

	1978	1979		1980
	<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 Information</u> .....	<u>105</u>	331	<u>124</u>	<u>279</u>

Includes the purchases of books, supplies, and materials for, and the operation of the Wallops Flight Center Technical Library. It also provides for public information services, and for the exhibits, and operation of a visitor information center. The 1980 estimate provides for the new visitor information center.

1. Library .....

Three workyears are used to operate the library. The procurement of books, subscriptions, supplies and materials are also covered.

2. Education and Information .....

One workyear of support contractor effort is used to provide tour guide services for visitors. Provision is also made for the cost of exhibits and the operation of the soon to be constructed Visitor Information Center (VIC) at Wallops Flight Center and for miscellaneous other public information services. The completion of the VIC will take place in 1980.

C. <u>Shop Support and Services</u> .....	<u>161</u>	<u>38</u>	<u>104</u>	<u>113</u>
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Three workyears of support contractor effort will be used to provide engineering and fabrication support for facility planning and alteration. The increase from the 1979 budget estimate to the 1979 current estimate reflects a re-evaluation of engineer support required.

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
V. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>1,525</u>	<u>1,136</u>	<u>1,154</u>	<u>1,253</u>
<u>Basis of Fund Requirements</u>				
A. Administrative Communications.....	123	149	126	136
B. Printing and Reproduction.....	77	75	84	86
C. Transportation.....	69	79	73	80
D. Installation Common Services.....	<u>1,256</u>	<u>833</u>	<u>871</u>	<u>951</u>
Total, Management and Operations.....	<u>1,525</u>	<u>1,136</u>	<u>1,154</u>	<u>1,253</u>
A. <u>Administrative Communications</u> .....	<u>123</u>	<u>149</u>	<u>126</u>	<u>136</u>

Provides for the operation of the Wallops Flight Center's main switchboard and teletype facility, for the cost of leased lines and long distance tolls, and for maintenance services. The decrease from the 1979 budget estimate to the 1979 current estimate is due to the transferring of postage from the administrative communications function to the installation common services function. The increase from 1979 to 1980 is to cover the cost of negotiated support contract wage increases.

1. Local telephone service..... 130

Five workyears are required to operate the Wallops Flight Center main switchboard and teletype facility. Provision is also made for maintenance and repair services. The increase from 1979 to 1980 is due to negotiated contractor wage increases partially offset by a decrease of 1 workyear.

2. Long distance telephone service..... 6

Covers the cost of leased lines and long distance tolls.

	<u>1978</u> <u>Actual</u>	<u>1979</u> <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		<u>1980</u> <u>Budget Estimate</u>
B. <u>Printing and Reproduction</u> .....	<u>77</u>	<u>75</u>	<u>84</u>	<u>86</u>
<p>Provides for five workyears of support service contractor effort to operate the printing and reproduction facility at Wallops Flight Center. Costs are essentially level from year to year. The increase from the 1979 budget estimate to the 1979 current estimate reflects a continuation of 1978 cost rates for a full year.</p>				
C. <u>Transportation</u> .....	<u>69</u>	<u>79</u>	<u>73</u>	<u>80</u>
<p>Includes the cost of commercial off-base services and repairs to the government owned motor vehicle fleet; the maintenance and repair of the Wallops Flight Center Queen Air aircraft; and freight and related transportation costs.</p>				
1. Transportation of things .....				3
<p>Covers the cost of freight charges, and costs related to local moves, i.e., drayage and parcel post.</p>				
2. Maintenance and repair of vehicles... ..				30
<p>Provides for commercial services and repairs to the government-owned motor vehicle fleet.</p>				
3. Maintenance and repair of aircraft.....				47
<p>Provides for approximately one workyear of contractor effort and for parts and supplies required to maintain the Wallops Flight Center Queen Air aircraft.</p>				

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
D. <u>Installation Common Services</u> .....	<u>1,256</u>	<u>833</u>	<u>871</u>	951

Provides for medical services, rental of copying machines, supplies, materials and equipment used for administrative purposes, supply management, materials handling and postage. The increase from the 1979 budget estimate to the 1979 current estimate reflects the transferring of postage from administrative communications to this function. The increase from 1979 to 1980 is for negotiated support contract wage increases and higher prices for supplies and equipment.

1. Medical Services..... 26

Provides for the part-time services of a medical doctor's support of the Wallops Flight Center Occupational Health Program.

2. Machine Rental..... 156

Covers the rental of copying equipment.

3. Supplies and Equipment..... 317

Provides for supplies, materials and equipment necessary for the administrative functions at Wallops Flight Center.

4. Supply Management..... 421

Twenty two workyears provide for moving and materials handling and operating the supply system at Wallops Flight Center.

5. Postage..... 31

Covers the cost of the Center's postal bill.

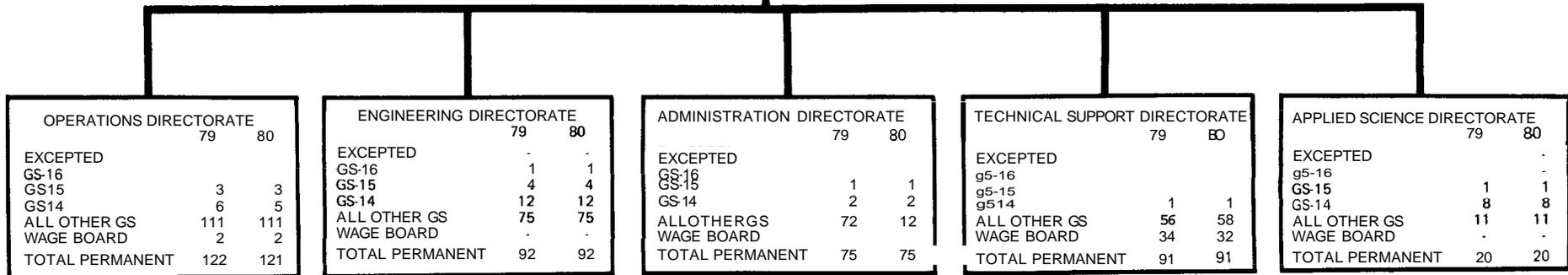
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Wallops Flight Center

SUMMARY STAFFING		
	79	80
EXCEPTED	2	2
GS-16	1	1
	12	11
	28	27
ALL OTHER GS	314	313
WAGE BOARD	41	41
TOTAL PERMANENT	398	395

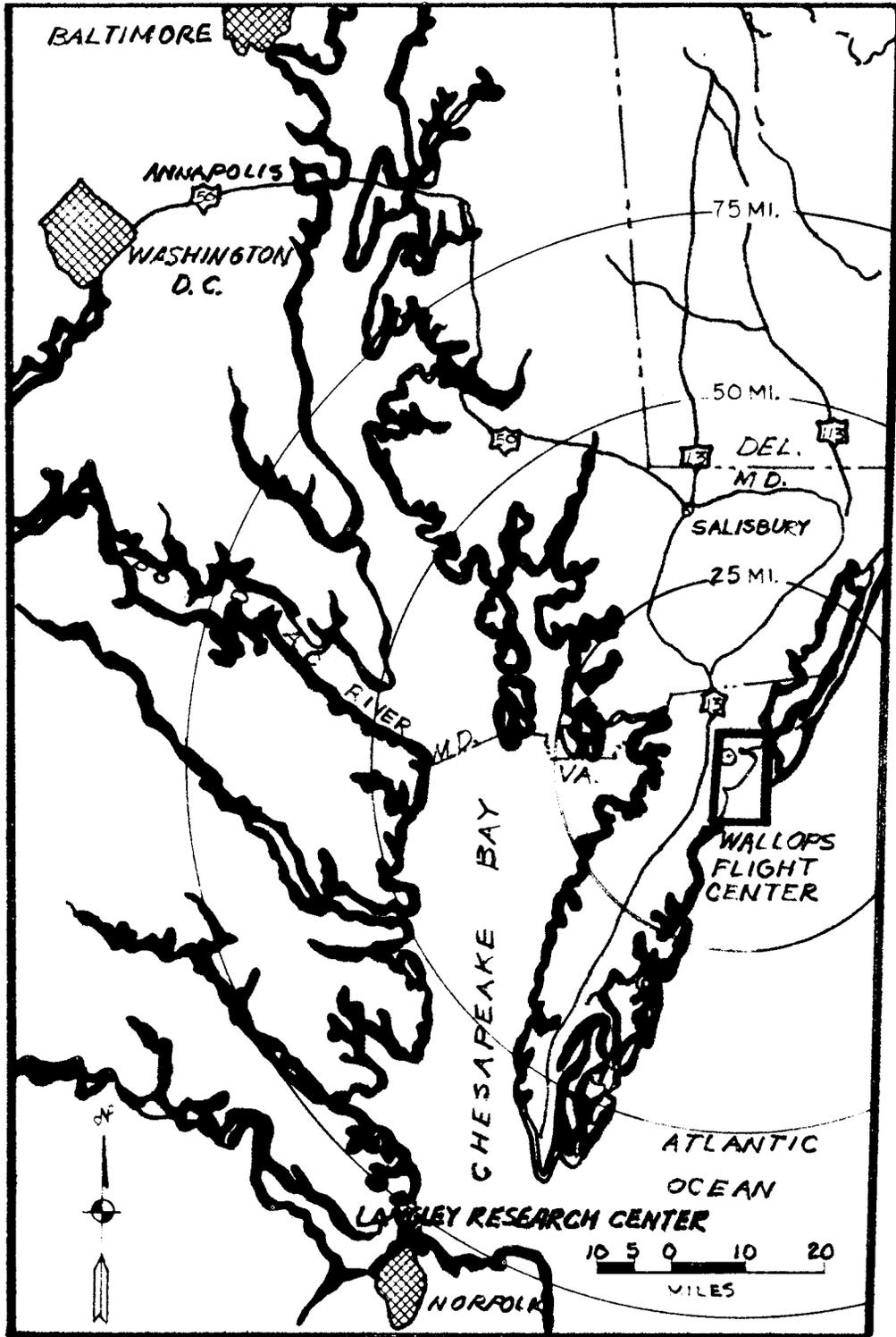
DIRECTOR		
	79	80
EXCEPTED	2	2
GS-16		
GS-15	3	3
GS-14	-	-
ALL OTHER GS	3	3
WAGE BOARD		
TOTAL PERMANENT	8	8

A REDUCTION IN FY 1979 OF 9 AND IN FY 1980 OF 3 HAS NOT YET BEEN DISTRIBUTED TO PERSONNEL IN THE INTERNAL ORGANIZATION STRUCTURE.



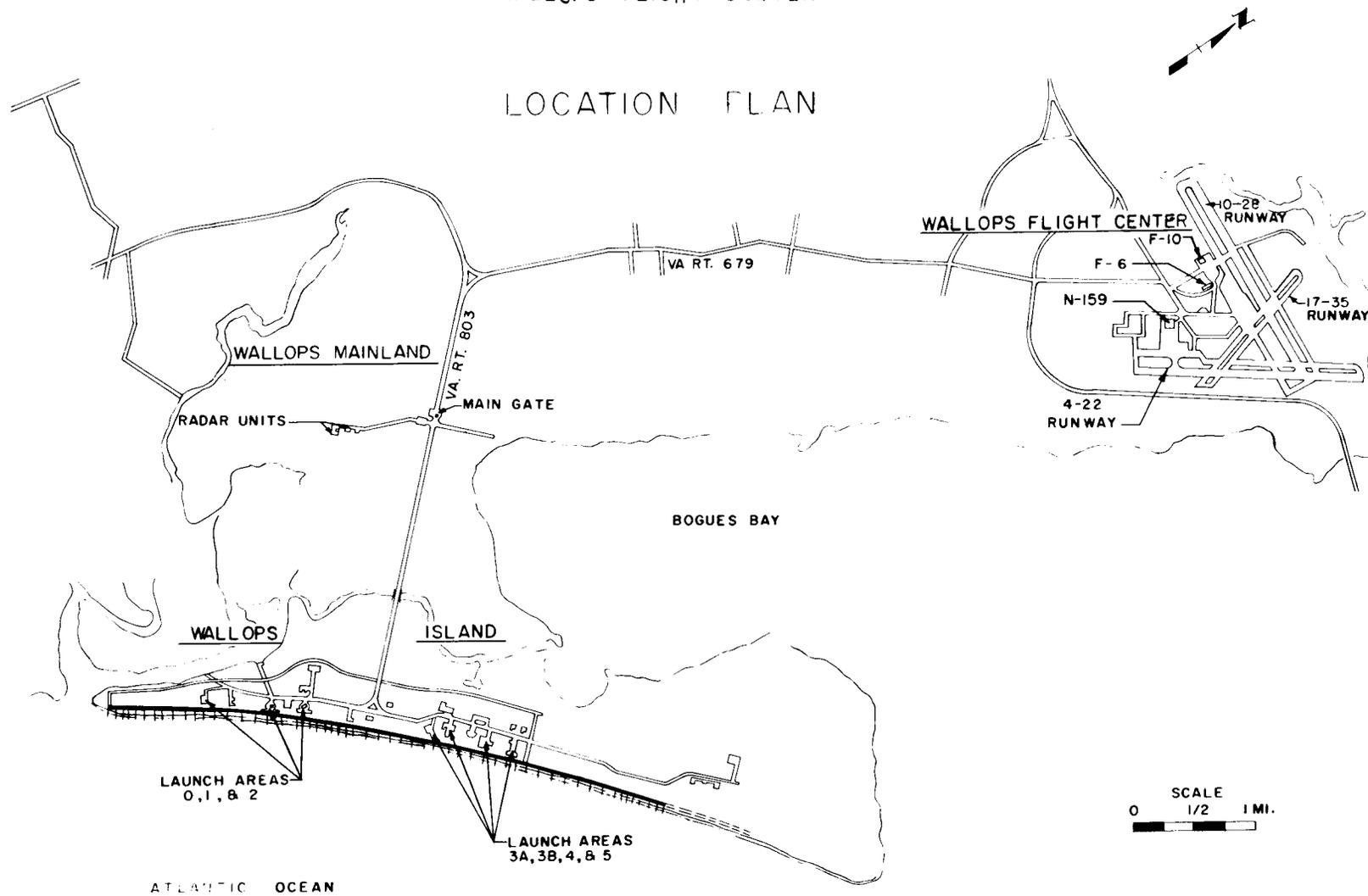
# —WALLOPS— FLIGHT CENTER LOCATION

RPM 8-22



WALLOPS FLIGHT CENTER

LOCATION PLAN









RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1980 ESTIMATES

AMES RESEARCH CENTER

DESCRIPTION

The Ames Research Center (ARC) 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 is the U.S. Army Research and Technology Laboratory. Personnel from this laboratory work closely with Ames personnel on research of mutual interest. The capital investment at the ARC, including fixed assets in progress and contractor-held facilities at various locations, as of September 30, 1978 was \$377,163,000.

CENTER ROLES AND MISSIONS

The programs at the Ames Research Center involve research and development in the fields of aeronautics, space science, life science, and space technology, as well as applications to national needs of the new science and technology growing out of the aerospace program. Specifically, the Center's major program responsibilities are concentrated in: short-haul aircraft technology, rotorcraft technology, flight simulation, computational fluid dynamics, planetary probes, airborne sciences and applications, aeronautics and biological space life sciences. In addition to these major program responsibilities, the Center provides support for military programs, and various civil aviation projects. The principal and supporting roles are:

PRINCIPAL

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

Short-Haul Aircraft Technology - developing a technology base for facilitating incorporation of short-haul aircraft into overall air transportation systems.

Rotorcraft Technology - developing a technology base for improving efficiency and flexibility for both civil and military use.

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.

Flight Simulation - improving the state of the art to permit more effective use of simulators in aircraft design and validation-of-flight simulation.

Military Support - provision of technical support to military aviation in areas consistent with other ARC aeronautics roles and unique ARC capacities.

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

Planetary Probes - developing thermal protection systems required for planetary atmosphere entry probes and managing probe development.

Planetary Mission Operations and Data Analysis - completing mission operations and data analysis for the currently approved Pioneer series.

Life Sciences:

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.

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

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

SUPPORTING

Space Transportation Passenger Selection Criteria - development and evaluation of medical criteria for non-crew passenger selection.

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

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	<u>1978</u>	<u>1979</u>		<u>1980</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 Cost	48,214	49,377	52,584	53,514
II Travel.....	1,101	1,230	1,218	1,313
III Facilities Services.....	5,093	5,309	4,475	7,439
IV. Technical Services.....	421	407	486	909
V. Management and Operations.....	<u>2,701</u>	<u>2,689</u>	<u>2,598</u>	<u>2,664</u>
Total, fund requirements.....	<u>57,730</u>	<u>59,212</u>	<u>63,761</u>	<u>65,839</u>

Distribution of Permanent Positions by Program

	<u>1978</u>	<u>1979</u>		<u>1980</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</u>	---	3	---	---
Space flight operations...	---	3	---	---
<u>Space Science</u> .....	370	369	368	324
Physics and astronomy.....	125	102	125	90
Planetary exploration.....	107	116	105	96
Life sciences.....	138	151	138	138

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
<u>Space and Terrestrial Applications</u> .....	<u>78</u>	75	<u>77</u>	112
Space applications .....	72	69	72	107
Technology utilization. ....	6	6	5	5
<u>Aeronautics and Space Technology</u> .....	<u>801</u>	797	802	801
Aeronautical research and technology .....	645	618	655	658
Space research and technology .....	155	179	147	143
Energy technology .....	<u>1</u>	<u>---</u>	<u>---</u>	<u>---</u>
Subtotal, direct positions .....	1,249	1,244	1,247	1,237
<u>Center Management and Operations Support Positions...</u> .....	<u>420</u>	<u>433</u>	<u>419</u>	<u>416</u>
Total, permanent positions. ....	<u>1,669</u>	<u>1,677</u>	<u>1,666</u>	<u>1,653</u>

PROGRAM DESCRIPTION

PHYSICS AND ASTRONOMY

90 Permanent Positions (Civil Service)

Ames concentrates its physics and astronomy activities in the field of infrared astronomy, taking the agency lead in this discipline.

In 1980, the civil service personnel will provide support for the airborne astronomy program which includes a C-141 aircraft--the Kuiper Airborne Observatory--as well as a Lear Jet aircraft, and measurements using selected instruments on the Ames U-2 aircraft. These aircraft are operated by Ames as flying astronomical observatories with the bulk of the observing accomplished by various University research teams. Ames supports these facilities with its in-house science competence and with its in-house capability to operate research aircraft.

Infrared astronomy observations from space platforms avoid obscuration caused by the Earth's atmosphere. Ames has responsibility for instruments to accomplish these observations including development of the telescope portion of the Infrared Astronomical Satellite (IRAS) and definition of an advanced instrument for use on Spacelab missions.

## PLANETARY EXPLORATION

96 Permanent Positions (Civil Service)

These civil service personnel are required in 1980 to accomplish the ongoing programs in support of agency goals in planetary exploration. This program consists of a continuing series of project management activities, backed by the scientific expertise of principal investigators from Ames, other NASA Centers and the University community. 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 missions.

In 1980 the civil service personnel will continue to provide project management and scientific support for: (1) Pioneers 6-9, 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 completely unexplored regions of the solar system); (3) Pioneer Venus, launched in 1978; and (4) the Galileo project, approved in 1978, a natural outgrowth of the Pioneer Venus atmospheric probes. Ames has responsibility for the Probe portion of this mission.

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

Ames principal investigators and their coworkers maintain an active program of laboratory and theoretical studies to develop basic atmospheric modeling concepts, to obtain the necessary physical data on a molecular scale to interpret the spacecraft observations, and to develop new and 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.

## LIFE SCIENCES

138 Permanent Positions (Civil Service)

In 1980, 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 non-human 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. Examples of specific 1980 activities follow:

Space flight simulation studies will continue, with testing of 55- to 65-year-old female subjects in 1980, in the program to understand and develop countermeasures for the physiological stresses of Shuttle flight so that spaceflight can eventually be made available to all interested people regardless of age or sex. The value of biofeedback training for minimizing space motion sickness symptoms will be intensively investigated.

Full development of non-human biological experiments selected and approved for flight on life sciences Spacelab missions is expected. Specimen holding units for Spacelab will be in final test just prior to delivery in early 1981. Analysis of the data and specimens from the next joint US/USSR Cosmos biosatellite, to be flown in late 1979, will occur.

Low-cost manufacturing techniques will be demonstrated for advanced space suit limb and joint components as part of the advanced life support systems research program.

Research in the origin and distribution of life and life-related molecules will be highlighted by: the formulation of a testable model for photochemical synthesis of organic compounds in Jupiter's atmosphere; the experimental testing of computer-generated models of primitive self-replicating systems; and the demonstration of the analytical capability of a miniaturized gas chromatograph for analyses of simulated Saturn and Jupiter atmospheres.

#### SPACE APPLICATIONS

#### 107 Permanent Positions (Civil Service)

The Center provides a research and applications development capability in support of the Agency's Space Applications program.

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

The Center fulfills this role by: (1) defining, developing, and evaluating potential satellite sensors, data acquisition and processing techniques, and associated communications technology; (2) conducting an active and continuing broad program of applied research and developments of remote and in-situ sensing technology for earth resources applications; (3) conducting applications demonstration projects in cooperation with Federal, state, regional and local government agencies and private industry to promote the effective transfer of applications technology as well as to reduce system costs, increase adaptation to the users systems, and improve compatibility with other information sources and products routinely used by the using organization; and (4) systematically transferring, primarily to state and local governments in the 14 western states including Alaska and Hawaii, the ability to effectively use Landsat data for their resource management and planning decisions through the Western

Regional Remote Sensing Applications Center. Ames controls a variety of aircraft, some of which serve as national and international facilities for research in astronomy, geophysics, meteorology, and resources observations; others acquire data for remote sensing projects and provide a mechanism for integration of spaceborne, airborne, and ground-based data acquisition and processing systems.

Both the high altitude (U-2) and medium altitude (CV-990) aircraft provide significant support to LANDSAT (underflight data), Nimbus-7 (Ocean Color Scanner radiometer), and Heat Capacity Mapping (Heat Capacity Mapping radiometer) satellite programs.

The Ames upper atmospheric 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 to 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.

#### TECHNOLOGY UTILIZATION

5 Permanent Positions (Civil Service)

The Technology Utilization program at Ames is a community undertaking involving the part-time efforts of scientists and engineers in many disciplines and in many Center organizations working under the leadership and coordination of a small full-time Technology Utilization Office staff. This program transfers knowledge developed from the NASA programs to industry and the public sector.

#### AERONAUTICAL RESEARCH AND EC

658 Permanent Positions (Civil Service)

In 1980, the content of the Ames program in aeronautics is characterized in terms of three elements: Generic Research and Technology, Vehicle Specific Technology (Short-haul, Rotorcraft) and aeronautical support to other agencies and to industry. These three elements form a coherent and interdependent program to meet the Vertical Short Take-Off and Landing (VSTOL) and rotorcraft milestones of reduced aircraft noise, improved terminal area safety and efficiency and improved performance.

#### Generic Research and Technology:

The Generic Research and Technology program at Ames has as its principal focus in the areas of computational aerodynamics, experimental methods, avionics, and safety. The program is concentrated in the disciplines of aerodynamics and aeroelasticity, 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 and propulsive flows and to measure experimental aircraft configurational parameters. In 1980, research programs

in flight dynamics will define the important interrelationships between vehicle dynamics, stability and control, and handling qualities in the regime of hover, and in transition from vertical to horizontal flight, for advanced VSTOL aircraft and rotorcraft. In guidance and control, the use of optimal control theory in conjunction with dynamic modeling of aircraft and ground-based guidance aids will provide new insight into the definition of air traffic control algorithms, particularly for the terminal area.

In 1980, the human factors program will provide the knowledge relevant to defining a more efficient aviation system through the better match of man and computer information transfer and decision making responsibility.

#### Vehicle Specific Technology Short-Haul:

The Vehicle Specific Technology at Ames is focused on short-haul aircraft, both civil and military; Rotorcraft, VSTOL and Short-Range Conventional Take-Off and Landing (CTOL) aircraft. These aircraft have generally similar characteristics including: a dependence on propulsive lift (in addition to aerodynamic lift), a 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. In 1980, the aeromechanics portion of the program will include small-scale and large-scale wind tunnel testing of advanced rotor concepts and complete configuration modeling and ground-based simulation, and flight research utilizing a spectrum of vehicles acquired as part of the decision to consolidate full-scale hardware testing at Ames. 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 ARC. The program includes wind tunnel and simulation investigations to achieve a significantly improved short-haul transport aircraft concept and compatible low cost avionics.

#### Other Agency and Industry Support :

The Ames Research Center has traditionally received requests from other agencies from the industry 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 VSTOL aircraft technology developments. The Army Research and Technology Laboratories of the U.S. Army Aviation Research and Development Command (AURADCOM) is located at Ames. The Aeromechanics Laboratory, the primary investigator of Army helicopter 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.

## SPACE RESEARCH AND TECHNOLOGY

143 Permanent Positions (Civil Service)

In 1980, the number of civil service personnel requested will provide a Space Research and Technology program which encompasses both fundamental research and project support. The basic research focuses on entry technology and materials research. The project work supports the Space Shuttle, Galileo, Infrared Astronomical Satellite (IRAS) and the Orbiter Experiment program (OEX).

In 1980, 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 in order 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 inter-actions (corrosion). Research is also being conducted in the advanced electronics and materials area 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 1980, the Shuttle project will be supported with wind tunnel tests of models 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, to define systems for precision pointing and control of telescopes and to advance the technology required to cool the detectors to below 10 degrees Kelvin for support of the Infrared Astronomy Satellite (IRAS) project. Ames Research Center is supporting two space shuttle orbiter experiments. The first is to design, develop and conduct 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. The second is to conduct OEX thermal protection experiments to study advanced materials and to evaluate possible cost and weight reductions for the thermal protection system for Shuttle and Advanced Space Transportation Systems.

## CENTER MANAGEMENT AND OPERATIONS SUPPORT

416 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as that support or services being provided to all Ames Research Center organizations which cannot be directly identified to a benefiting 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, energy management and safety.

Management Support

Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control and management information systems and analysis.

Operations Support

This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment, and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Administrative data processing and computer support
- Centerwide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation, supplies, etc.
- Medical care of employees

PERSONNEL AND RELATED COSTS

	<u>1978</u>	<u>1979</u>		<u>1980</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>48.214</u>	<u>49.377</u>	<u>52.584</u>	<u>53.514</u>

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
<u>Basis of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions .....	42,515	43,291	46,306	47,175
b. Nonpermanent .....	583	748	858	800
c. Reimbursable detailees .....	83	313	132	168
d. Overtime and other compensation .....	422	427	436	436
Subtotal, Compensation .....	43,603	44,779	47,732	48,579
2. <u>Benefits</u> .....	4,241	4,370	4,557	4,655
Subtotal, Compensation and Benefits .....	47,844	49,149	52,289	53,234
B. <u>Supporting Costs</u>				
1. Transfer of personnel .....	157	33	100	85
2. Personnel training .....	213	195	195	195
Subtotal, Support Costs .....	370	228	295	280
Total, Personnel and Related Costs .....	48,214	49,377	52,584	53,514
A. <u>Compensation and Benefits</u> .....	47,844	49,149	52,289	53,234
1. <u>Compensation</u> .....	43,603	44,779	47,732	48,579
a. Permanent Positions .....	42,515	43,291	46,306	47,175

The funds will support 1,653 permanent positions in 1980, a reduction of 13 positions from the 1979 level. The increase from the 1979 budget estimate to the current estimate is due to the October 1978 pay raise, partially offset by savings from the reduction of 11 permanent positions.

Basis of Cost for Permanent Positions

In 1980 the cost of permanent positions will be \$47,175,000. The increase from 1979 results from the following:

Cost of permanent positions in 1979.....	46,306
Cost increase in 1980.....	+1,262
Within grade advances and career development:	
Full year effect of 1979 actions.....	+394
Partial year effect of 1980 actions.....	+392
Full year effect of 1979 pay raise.....	+134
Two extra paid days in 1980.....	+342
Cost decreases in 1980.....	-393
Turnover savings and abolished positions:	
Full year effect of 1979 actions.....	-214
Partial year effect of 1980 actions.....	-179
Cost of permanent positions in 1980.....	<u>47.175</u>

	<u>1978</u>	<u>1979</u>		<u>1980</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. Nonpermanent positions

1. cost.....	583	748	858	800
2. Workyears.....	74	85	98	93

The increase from the 1979 budget estimate to the 1979 current estimate is due to the inclusion of a non-baccalaureate cooperative training program and apart-time employment program. The decrease from the 1979 estimate to the 1980 estimate is due to the absorption of the part-time permanent program into the permanent position ceiling. The 1980 plan includes 93 workyears which will support the following programs :

Distribution of Nonpermanent Workyears

<u>Program</u>	<u>Workyears</u>
Cooperative training programs... ..	27
Summer programs.....	15
Youth opportunity programs.....	28
Other temporary employment.....	<u>23</u>
 Total.....	 <u>93</u>

The increase from the 1979 budget estimate is due to the inclusion of a non-baccalaureate cooperative training program and a part-time employment program.

	<u>1978</u>	<u>1979</u>		<u>1980</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. Reimbursable detailees.....	83	313	132	168

The military personnel detailed to the Ames Research Center on a reimbursable basis are individuals experienced in aeronautics, rotorcraft technology and related fields. The decrease from the 1979 budget estimate to the 1979 current estimate reflects the phase-out of five GSA detailees who provided computer programming support. The increase in 1980 is due to full-year payment of four detailees phased in during 1979 for the rotorcraft program.

d. Overtime and other compensation.....	422	427	436	436
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Overtime and night differential are used primarily for off-shift operation of major wind tunnel facilities such as the Unitary Plan Wind Tunnel System, the 40- by 80-Foot Subsonic Wind Tunnel, and the 6- by 6-Foot Supersonic Wind Tunnel. The slight increase from the 1979 budget estimate is due to the operation of new experimental aircraft and modification of the 40- by 80-Foot Subsonic Wind Tunnel.

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
		(Thousands of Dollars)		
2. <u>Benefits</u> .....	4,241	4,370	4,557	4,655

Following are the amounts of contribution by category:

<u>Category of Costs</u>	1978 <u>Actual</u>	1979 <u>Budget Estimate</u>	1979 <u>Current Estimate</u>	1980 <u>Budget Estimate</u>
Civil Service Retirement Fund .....	2,990	3,112	3,231	3,291
Employee life insurance .....	172	187	183	190
Employee health insurance .....	821	821	884	915
Workmen's compensation .....	205	205	216	216
FICA .....	18	16	18	18
Incentive Awards. ....	<u>35</u>	<u>29</u>	<u>25</u>	<u>25</u>
 Total. ....	 <u>4,241</u>	 <u>4,370</u>	 <u>4,557</u>	 <u>4,655</u>

The increase from the 1979 budget estimate to the 1979 current estimate is due to the October 1978 pay raise and higher health benefit contributions, which are partially offset by the savings from the reduction of 11 permanent positions. The increase in 1980 over 1979 is related to the increase in personnel compensation and is partially offset by the savings due to the manpower reductions.

B. <u>Supporting Costs</u> .....	370	228	295	280
1. Transfer of personnel .....	157	33	100	85

The increase from the 1979 budget estimate to the 1979 current estimate is due to personnel transferring to Ames with the rotorcraft project.

2. Personnel training .....	213	195	195	195
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The 1980 estimate for training costs will be at the 1979 level.

TRAVEL

11. <u>TRAVEL</u> .....	<u>1,101</u>	<u>1,230</u>	<u>1,218</u>	<u>1,313</u>
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Basis of Fund Requirements

	<u>1978</u> <u>Actual</u>	1979		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
A. Program Travel. ....	796	865	858	927
B. Scientific and Technical Meeting Travel.....	111	135	135	145
C. Management and Operations Travel.....	<u>194</u>	<u>230</u>	<u>225</u>	<u>241</u>
Total, Travel .....	<u>1,101</u>	<u>1,230</u>	<u>1,218</u>	<u>1,313</u>
 A. <u>Program Travel</u> .....	 <u>796</u>	 865	 858	 927

Program travel is required for the accomplishment of the Center's mission and is the largest part of the Ames travel budget, accounting for 71 percent of travel costs for 1980. Travel for program purposes is required for the continuing efforts in space research, aircraft technology, flight simulation, fluid mechanics, airborne science and applications, and space life sciences.

The increase in 1980 over the 1979 current estimate is required for support of the Infrared Astronomy Satellite (which will require travel to Europe), Galileo, Western Regional Applications Program (covering 14 states including Hawaii and Alaska), increased C-141 flights, acquisition of additional rotorcraft from Langley Research Center, the participation in the Kosmos launch, and the monitoring of various contractors' performance in the construction of the 80- by 120-Foot Wind Tunnel test section.

B. <u>Scientific and Technical Meeting Travel</u> .....	111	<u>135</u>	<u>135</u>	145
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Scientific and technical meeting 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 ARC, as well as to present both accomplishments and problems to their associates. Many of the meetings are made up of working panels convened to solve certain problems for the benefit of the Government. The level of travel in 1980 is expected to increase to provide for the presentation of additional aeronautical papers to the scientific community.

	1978	1979		1980
	<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 Travel</u> .....	<u>194</u>	<u>230</u>	<u>225</u>	<u>241</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 activities; and travel of the Center's top management to NASA Headquarters, other NASA Centers, and contractor plants; and local transportation. The increase in 1980 is due to inclusion of the Air Charter Service to transport research pilots from Ames to the U.S. Naval Air Station, Crows Landing, and to test the Micro-Wave Landing System.

### FACILITIES SERVICES

Ames Research Center (ARC) is located on 421 acres of ground in a complex of facilities made up of laboratory and office type buildings as well as research wind tunnels.

This complex encompasses 2,310,527 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.

#### Basis of Fund Requirements

III. <u>FACILITIES SERVICES</u> .....	<u>5.093</u>	<u>5.309</u>	<u>6.675</u>	<u>7.439</u>
A. <u>Maintenance and Related Services</u>				
1. Facilities.....	190	143	127	129
2. Equipment .....	<u>85</u>	<u>65</u>	<u>62</u>	<u>63</u>
Subtotal.....	275	208	189	192
B. <u>Custodial Services</u> .....	<u>1,327</u>	<u>1,350</u>	<u>1,561</u>	<u>1,640</u>
C. <u>Utilities Services</u> ..	<u>3,491</u>	<u>3,751</u>	<u>4,925</u>	<u>5,607</u>
Total, Facilities Services. ....	<u>5.093</u>	<u>5,309</u>	<u>6.675</u>	<u>7.439</u>

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands	<u>Current</u> <u>Estimate</u> of Dollars)	
A. <u>Maintenance and Related Services</u> .....	275	<u>208</u>	<u>189</u>	192
1. Facilities .....	190	143	127	129
2. Equipment .....	85	65	62	63

The level of maintenance in 1978 reflects one-time roof repairs to three facilities. The increase reflected in the 1980 budget estimate allows a modest growth in unit costs at the same level of services.

B. <u>Custodial Services</u> .. .....	<u>1,327</u>	<u>1,350</u>	<u>1,561</u>	<u>1,640</u>
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The increase in the 1979 current estimate provides for a three workyear increase and additional supplies and materials for an additional 122,000 square feet of laboratory and warehouse facilities. The 1980 budget reflects only unit cost growth over the 1979 current estimate. Included are:

1. Janitorial services (35 workyears of effort) .....	684
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Janitorial and building cleaning services are associated with approximately 1.6 million square feet of various types of space located in 75 buildings. Services are also provided for 50 trailers being utilized to provide temporary office and shop space.

2. Fire protection services. ....	360
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Fire protection services are provided by the U.S. Naval Air Station, Moffett Field, CA. The 1980 estimate is based on the most recent actual cost experience.

3. Security services (27 workyears of effort) .....	495
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Included are security services for buildings and property, including aircraft and computer facilities. Included also is the provision of "round-the-clock" staffing of the emergency duty office which monitors fire, security, and safety alarms and coordinates fire, security, health, and safety areas in emergency situations.

4. Other services.... ..	101
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Pest control services, on an as needed basis, are funded in this activity. Also included are refuse collection, laundry and custodial supplies.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
C. <u>Utilities Services</u> .....	<u>3,491</u>	<u>3,751</u>	<u>4,925</u>	<u>5,607</u>

The major utility service is electricity with lesser requirements for natural gas, fuel, oil, water and sewage services.

1. Electricity (215,000 MW/Hrs.) .....	4,580
2. Natural gas (214,000 K Cu. Ft.) .....	797
3. Fuel oil (235,000 gals.) .....	113
4. Water and sewage. ....	117

Electricity is provided by the U.S. Bureau of Reclamation (USBR) and the Pacific Gas and Electric Company (PGECO), natural gas is provided by PGECO, water by the U.S. Naval Air Station, Moffett Field, and sewage services by the City of Mountain View.

Approximately 80% of electric power costs 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 3.5-foot Hypersonic Tunnel, the 14-foot Transonic Wind Tunnel and in the operation of simulators and smaller wind tunnels, and other research facilities. Approximately 55% of natural gas is used in research facilities; the other part is used for heating and ventilation of institutional buildings. The funding level for 1980 will provide approximately 215 million KWH compared to 204 million KWH used in 1978 and the 242 million KWH planned for 1979.

The increase in the 1979 current estimate is a combination of recent industry requests and a seven-shift operation for increased programmatic requirements. Increases from the 1979 current estimate to the 1980 budget estimate allow only for rate increases by the U.S. Bureau of Reclamation and the Pacific Gas and Electric Company

#### TECHNICAL SERVICES

IV. <u>TECHNICAL SERVICES</u> .....	<u>621</u>	<u>607</u>	<u>686</u>	<u>909</u>
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#### Basis of Fund Requirements

A. <u>Automatic Data Processing</u>				
1. Operations .....	<u>296</u>	<u>301</u>	<u>363</u>	<u>478</u>
Subtotal... ..	<u>296</u>	<u>301</u>	<u>363</u>	<u>478</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands)	<u>Current Estimate</u> (Dollars)	
B. <u>Scientific and Technical Information</u>				
1. Education and Information.. .. .	<u>244</u>	261	<u>241</u>	<u>257</u>
Subtotal .. . . .	244	261	<u>241</u>	<u>257</u>
C. <u>Shop Support and Services</u> .. . . .	<u>81</u>	<u>45</u>	<u>82</u>	<u>174</u>
Total, Technical Services.. .. .	<u>621</u>	<u>607</u>	<u>686</u>	<u>909</u>

A. Automatic Data Processing

Obligations for administrative ADP operations and programming reflect ADP central facility operating costs which are incurred by administrative organizations. The ADP computer operations and programming are charged to institutional organizations through the Center's charge-back systems. The charges include the institutional organizations' porportionate share of support service contracts. The increase in the 1979 current estimate provides for 2 additional workyears to more accurately account for support required for administrative computing. The 1980 increase will provide for the full year effect of 1979 cost increases related to the central ADP facility .

1. Operation (14 workyears of effort) .. . . .	296	301	363	478
B. <u>Scientific and Technical Information</u> .. . . .	<u>244</u>	261	<u>241</u>	<u>257</u>

Included in this category is a support service contract at a level of 11 workyears to perform public information services (e.g., tour guide), media development (e.g., public exhibits, etc.) and educational programs. The increase in 1980 reflects the full year effect of previously negotiated contractor wage rates at the same level of effort provided in 1979.

1. Education and information... .. .	244	261	241	257
C. <u>Shop Support and Services</u> ..... .. .	<u>81</u>	<u>45</u>	<u>82</u>	174

This category includes administrative shop, photo and graphics services. The increase in the 1980 estimates are due to requirements of new exhibits (models and graphics) related to the Pioneer-Venus program.

MANAGEMENT AND OPERATIONS

	<u>1978</u> <u>Actual</u>	<u>1979</u> Budget      Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		<u>1980</u> <u>Budget</u> <u>Estimate</u>
V. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>2,701</u>	<u>2,689</u>	<u>2,598</u>	<u>2,664</u>
<u>Basis of Fund Requirements</u>				
A. Administrative Communications..	739	895	824	835
B. Printing and Reproduction.....	106	93	101	102
C. Transportation.....	47	189	37	38
D. Installation Common Services...	<u>1,809</u>	<u>1,512</u>	<u>1,636</u>	<u>1,689</u>
Total, Management and Operations .....	<u>2,701</u>	<u>2,689</u>	<u>2,598</u>	<u>2,664</u>
A. <u>Administrative Communications</u> ..	<u>739</u>	895	<u>824</u>	<u>835</u>

Communication services are provided by General Services Administration (GSA) for the Federal Communications Service (FTS) and the Pacific Telephone and Telegraph Company for local service. Other communications consist of teletype equipment and services provided by Western Union. The increase in 1980 is due to the full year effect of 1979 rate increases.

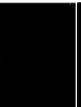
1. Local telephone services.. ..... 420

The major part of this covers 1,470 Centrex lines and 2,258 telephone instruments which serves about 3,400 individuals on-site at ARC, including on-site contractors and tenants from other Government agencies.

2. Long distance telephone service. .... 395

This item is primarily (98%) FTS services; the balance (2%) includes commercial long distance, message unit charges and leased line services charges.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
3. Non-telephone communications. ....				20
Includes Western Union telegraphic services and leased equipment.				
B. <u>Printing and Reproduction</u> .. ....	106	<u>93</u>	<u>101</u>	102
The estimates for administrative printing includes the Printing and Reproduction Facility operating costs incurred by administrative organizations and includes supplies, materials, equipment acquisition and outside procurements. The 1980 estimate is essentially level from 1979.				
C. <u>Transportation</u> .....	<u>47</u>	<u>189</u>	<u>37</u>	<u>38</u>
The estimates include freight costs, government bills of lading, air freights and other general shipments. The 1979 current estimate reflects a recategorization of certain travel costs of GSA rental vehicles into the Management and Operations travel function. The 1980 estimate is essentially level.				
D. <u>Installation Common Services</u> .....	<u>1,809</u>	<u>1,512</u>	<u>1,636</u>	<u>1,689</u>
These services include the Center Management and Staff function, the medical services operation, and the installation support services activities. The increase in 1980 results from the full year effect of 1979 rate increases.				
1. Center management and staff... ..				305
Includes the general management of the Center as an installation and includes such activities as the directorate offices, general and patent legal services, personnel, procurement, and financial management services. Significant cost items include the various Equal Employment Opportunity (EEO) programs for minorities and females, the Intergovernmental Personnel Act (IPA) programs, and studies and development of management systems .				
2. Medical services. ....				260
Medical services include the staffing of the Health Unit, laboratory service fees, clinic supplies, and maintenance of clinic equipment.				



	1978 <u>Actual</u>	1979		1980
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>

(Thousands of Dollars)

3. Installation support services (31 workyears of effort) ..... 1,124

Installation support services consist predominantly of the support service contract for supply management, mail, and pickup and delivery services. The balance of the functional costs consist of administrative equipment acquisition, office supplies and materials, maintenance and repair and lease of office equipment, and postage.

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

SUMMARY STAFFING		
	FY 79	FY 80
Excepted	25	25
GS 16	3	3
GS 15	119	119
GS 14	198	197
All Other GS	1043	1032
Wage Grade	277	277
Total Permanent	1666	1663

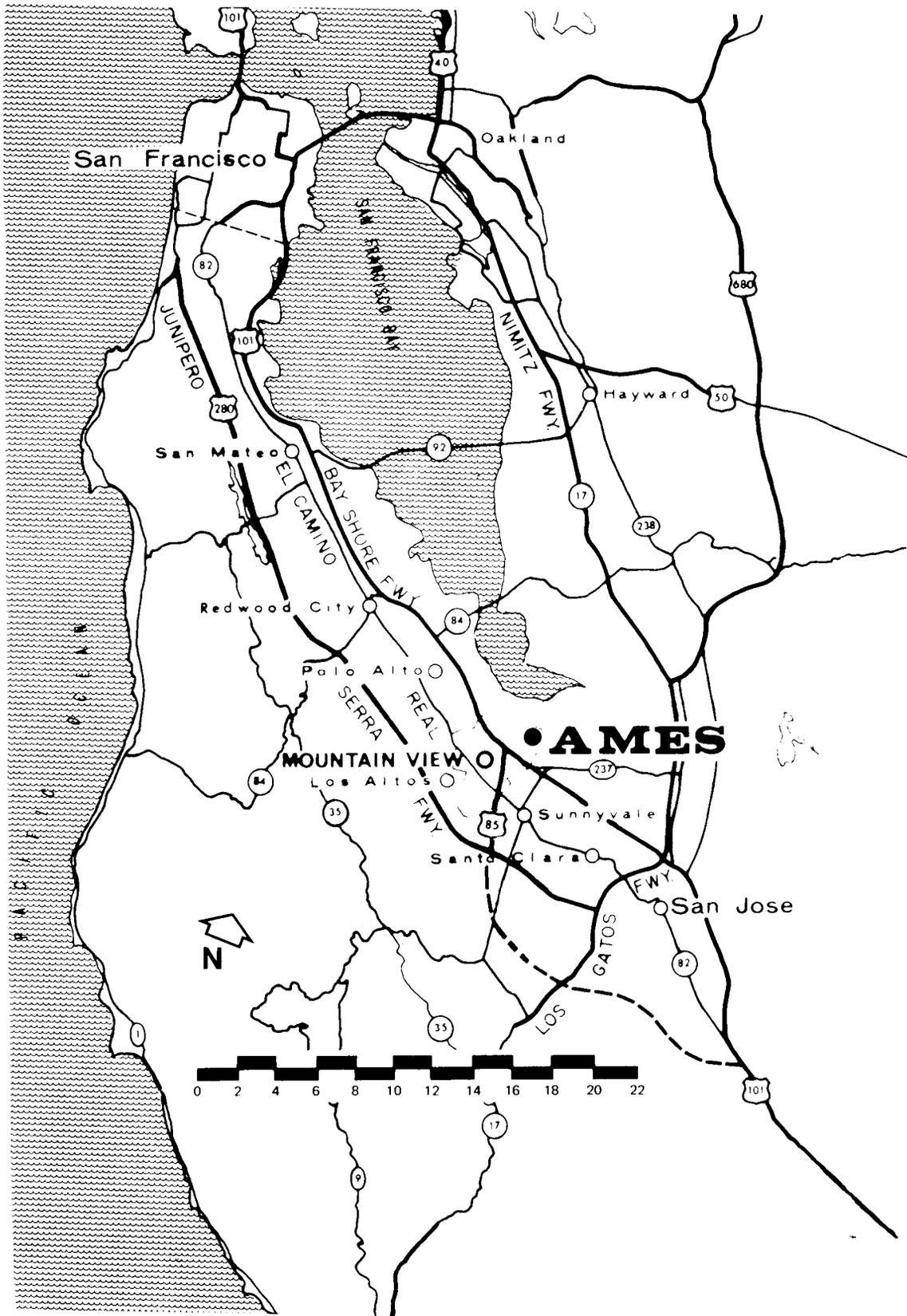
A reduction in FY 1979 of 39 and in FY 1980 of 13 has not yet been distributed to personnel ceilings in the internal organization structure.

DIRECTOR		
	79	80
EXCEPTED	2	2
GS 16	1	1
GS 15	2	2
GS 14	1	1
ALL OTHER GS	10	10
WAGE GRADE	-	-
TOTAL PERMANENT	16	16



DECEMBER 1978

# LOCATION MAP







RESEARCH AND PROGRAM MANAGEMENT  
FISCAL YEAR 1980 ESTIMATES  
HUGH L. DRYDEN FLIGHT RESEARCH CENTER

DESCRIPTION

The Hugh L. Dryden Flight Research Center (DFRC), Edwards, California, is 65 air miles northeast of Los Angeles. The Center 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 Base encompasses 300,722 acres. The Center 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 physical plant consists of an office-laboratory building with adjoining shops, a flight maintenance hangar, a flight loads research facility, and an integrated support facility. Special Shuttle support facilities include the Orbiter hangar and the Orbiter mating-demating facility. Auxiliary buildings include warehouses, an auxiliary power system building, an aircraft maintenance dock, and hangar. The aerodynamic test range is operated with sites at Edwards, California, and Ely, Nevada. The total capital investment of the Dryden Flight Research Center, including fixed assets in progress and contractor held facilities at various locations, as of September 30, 1978, was \$80,647,000.

CENTER ROLES AND MISSIONS

The primary mission of the Dryden Flight Research Center, established in 1947, is to conduct aeronautical flight research in the areas of aerodynamics, structures, control systems, propulsion systems, disciplinary integration effects, safety, operations, and human-vehicle interactions in support of both military and civil national needs. This includes planning, conducting, analyzing, and reporting of flight research for the purposes of verification of predicted characteristics and the identification of unanticipated problems in actual flight. The principal and supporting roles of the Center are:

PRINCIPAL

Aeronautical Flight Research - conducting aeronautical flight research in the areas of aerodynamics, structures, control systems, propulsion systems, disciplinary integration effects, safety, operations, and human-vehicle interactions, which involves the planning and preparation of flight test programs, the development

of flight test instrumentation, flight testing, and data analysis. DRC also provides host Center functions for NASA flight activities which are managed by other Centers but which require testing at the Edwards AFB complex. This function includes all institutional support and coordination as well as supervision of flight operations.

Remotely Piloted Vehicle Research - development of remotely piloted research aircraft, and management and operation of flight experiments.

SUPPORTING

Shuttle Orbiter - provide landing and recovery capability during Orbital Flight Tests (OFT) and contingency recovery capability after OFT,

Advanced Space Vehicle Configurations Technology - analysis and study of the effect of operational considerations on the design and test program of piloted research vehicles.

SUMMARY OF RESOURCES REQUIREMENTS

	<u>FUNDS</u>			
	1978	<u>1979</u>		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
		<u>Estimate</u>	<u>Estimate</u>	
I. Personnel and Related Costs....	13,777	13,798	14,396	14,270
II. Travel.....	306	388	369	415
III. Facilities Services...	2,457	3,628	2,448	2,661
IV. Technical Services...	226	348	409	458
V. Management and Operations.....	<u>1,481</u>	<u>1,319</u>	<u>1,935</u>	<u>1,987</u>
Total, fund requirements.....	<u>18,247</u>	<u>19,481</u>	<u>19,557</u>	<u>19,791</u>

Distribution of Permanent Positions by Program

	1978	1979		1980
	<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</u> .....	<u>13</u>	<u>37</u>	<u>34</u>	<u>19</u>
Space shuttle .....	13	37	34	19
<u>Space Science</u> .... ..	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
Life sciences .....	1	1	1	1
<u>Space and Terrestrial Applications</u> .....	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
Technology utilization .....	1	1	1	1
<u>Aeronautics and Space Technology</u> .....	<u>348</u>	324	<u>319</u>	<u>319</u>
Aeronautical research and technology .....	348	324	319	319
<u>Space Tracking and Data Systems</u> .....	<u>30</u>	<u>30</u>	<u>30</u>	<u>30</u>
Tracking and Data Acquisition .....	30	30	30	30
Subtotal, direct positions .....	393	393	385	370
<u>Center Management and Operations Support Positions</u> .....	<u>97</u>	<u>97</u>	<u>95</u>	<u>91</u>
Total, permanent positions .....	<u>490</u>	<u>490</u>	<u>480</u>	<u>461</u>

## PROGRAM DESCRIPTION

### SPACE SHUTTLE

19 Permanent Positions (Civil Service)

In 1980, 19 civil service personnel will be utilized at Dryden Flight Research Center (DFRC) to support the Shuttle Orbital Flight Test (OFT) activities. Current planning is for Edwards Air Force Base to be the primary landing site for the first four missions and the secondary landing site for missions five and six. After landing, the shuttle orbiter will be returned to Kennedy Space Center by shuttle carrier aircraft. Payloads will be removed prior to shuttle ferry. DFRC will provide operational support and institutional support for the Space Shuttle landing activities at Edwards. In addition, DFRC will serve as an interface to the Air Force Flight Test Center, provide aircraft to test the Microwave Scanning Beam Landing System, and provide Orbiter Convoy operations support. In 1979, DFRC will perform the Orbiter elevon seals test.

### LIFE SCIENCES

1 Permanent Position (Civil Service)

In 1980, one civil servant is required to develop and evaluate cost effective, reliable human/machine control systems for use in remote manipulation such as manual landing of Shuttle type vehicles. Flight studies of remotely piloted high-performance vehicles will be performed to determine information requirements and procedures necessary for descent, approach, flare, touchdown, and roll out without direct external vision. Television sensors and displays with inside-out references will be evaluated to define optimum human/machine design characteristics.

### TECHNOLOGY UTILIZATION

1 Permanent Position (Civil Service)

In 1980, one civil servant is required to continue studies of various means to improve the aerodynamic efficiency of ground vehicles. Various add-on devices, which potentially could be manufactured by small businesses, will be evaluated.

### AERONAUTICAL RESEARCH AND TECHNOLOGY

319 Permanent Positions (Civil Service)

In 1980, three hundred and nineteen civil service personnel are required to accomplish aeronautical flight research activities at the DFRC. The aeronautical program includes research and technology; systems technology; experimental programs involving structures, fluid and flight dynamics, avionics, aircraft operations and safety, aeronautical human-vehicle interaction, aerodynamic vehicles, advanced civil and military aircraft, and highly maneuverable aircraft; and experimental aircraft research in Short Takeoff and Landing (STOL), supersonic cruise, and tilt rotor vehicles.

In 1980, the objectives of the activities under the research and technology programs are to provide continuing research and development efforts in all disciplinary areas so that improved understanding can be applied to problems associated with aircraft in all flight regimes.

Under the systems technology program, in 1980, flight research of the digital fly-by-wire system, to provide technology for implementation in future aircraft, will be continued; full-scale flight test evaluations of various wake vortex alleviation devices will continue; the KC-135 aircraft will be used to test the winglet concept as a fuel savings means for current and future military and commercial transport aircraft; acoustic flight tests of an advanced high tip-speed propeller will be conducted in support of the advanced turboprop program; and flight research will continue to demonstrate the advantages of integrated airframe/propulsion control systems.

Within the experimental aircraft research programs, the Highly Maneuverable Aircraft Technology aircraft will be flight tested; the high speed flight testing support of a tilt rotor research aircraft is being coordinated to demonstrate the tilt rotor concept for civil and military applications; and flight test support will be provided for the evaluation of STOL research aircraft.

#### TRACKING AND DATA ACQUISITION

30 Permanent Positions (Civil Service)

In 1980, thirty civil service personnel are required to maintain and operate the NASA Aerodynamic Test Range (ATR), which provides direct operational support for a wide variety of aerodynamic and aerospace programs conducted by DFRC, other NASA Centers, military services, and supporting contractors. 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. Data links between the various Edwards facilities and the remote Ely Tracking Station provide continuous control and monitoring capabilities over the entire ATR.

#### CENTER MANAGEMENT AND OPERATIONS SUPPORT

91 Permanent Positions (Civil Service)

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

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

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, institutional support, financial management, and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Center-wide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation, supplies, etc.
- Medical care of employees
- Photographic and graphic support

PERSONNEL AND RELATED COSTS

	<u>1978</u>	<u>1979</u>		<u>1980</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>I. <u>PERSONNEL AND RELATED COSTS.</u> .....</b>	<b><u>13,777</u></b>	<b><u>13,798</u></b>	<b><u>14,396</u></b>	<b><u>14,270</u></b>

Basis of Fund Requirements

**A. Compensation and Benefits**

**1. Compensation**

a. Permanent positions .....	11,825	11,760	12,293	12,200
b. Nonpermanent. ....	426	352	403	382
c. Reimbursable detailees.. ....	32	101	99	106
d. Overtime and other compensation. ....	<u>148</u>	<u>247</u>	<u>204</u>	<u>184</u>
Subtotal, Compensation.....	12,431	12,460	12,999	12,872

	1978 <u>Actual</u>	<u>1979</u>		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
		(Thousands of Dollars)		
2. <u>Benefits</u> .....	<u>1,227</u>	<u>1,194</u>	<u>1,253</u>	<u>1,248</u>
Subtotal, Compensation and Benefits.....	<u>13,658</u>	<u>13,654</u>	<u>14,252</u>	<u>14,120</u>
 B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	30	58	58	58
2. Personnel training.....	<u>89</u>	<u>86</u>	<u>86</u>	<u>92</u>
Subtotal, Supporting Costs...	<u>119</u>	<u>144</u>	<u>144</u>	<u>150</u>
Total, Personnel and Related Costs....	<u>13,777</u>	<u>13,798</u>	<u>14,396</u>	<u>14,270</u>
 A. <u>Compensation and Benefits</u> .....				
1. <u>Compensation</u> .....	<u>12,431</u>	<u>12,460</u>	<u>12,999</u>	<u>12,872</u>
a. Permanent positions.....	11,825	11,760	12,293	12,200

The 1980 estimate supports a permanent personnel complement of 461 positions, a reduction of 29 positions from the 1979 level. The current estimate for 1979 is increased from the 1979 budget estimate as a result of the October 1978 pay increase partially offset by savings from the reduction of 10 permanent positions.

Basis of Cost for Permanent Positions

In 1980, the cost of permanent positions will be \$12,200,000, a reduction of \$93,000 from the 1979 level. The estimates are derived from the following calculations:

Cost of permanent positions in 1979.....	12,293
Cost of increases in 1980.....	+390

Within grade advances and career development		
Full year effect of 1979 actions.....	.....	+136
Partial year effect of 1980 actions.....,.....	.....	+144
Full year effect of October, 1978 pay increase.....		+ 12
Two extra paid days in 1980.....		+ 98
Cost decreases in 1980.....		-483
Turnover savings and abolished positions		
Full year effect of 1979 actions.....	.....	- 95
Partial year effect of 1980 actions.....	.....	-388
Cost of Permanent positions in 1980.....		<u>12,200</u>

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>

Other Compensation Costs

b. Nonpermanent Positions

1. cost.....	.....	426	352	403	382
2. Workyears .....	.....	46	43	47	44

The 1979 current estimate increases from the 1979 budget estimate due to the addition of a part-time employment program. The 1980 plan reflects a decrease as a result of absorption of the part-time program in the permanent position ceiling. This effort will support the following programs as shown:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training .....	27
Opportunity programs... ..	12
Summer employment .....	2
Other temporary employment .....	<u>3</u>
Total.. ..	<u>44</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
c. Reimbursable detailees.....	32	101	99	106

The services of a small group of military officers are used in the Center's programs where such assignments are of mutual benefit to NASA and the respective service. Under the existing agreements, the parent organization is reimbursed for salaries and related costs.

d. Overtime and other compensation.....	148	247	204	184
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Overtime is restricted to emergency repairs and abnormal temporary workload. A substantial portion is used to prepare for test flights. The 1979 current estimate decreases from the 1979 budget estimate due to the slippage of OFT flights into 1980 and a reestimate of shuttle support requirements.

2. <u>Benefits</u> .....	<u>1,227</u>	<u>1,194</u>	<u>1,253</u>	<u>1,248</u>
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The current estimate for 1979 is higher than the 1979 budget estimate due to the October 1978 pay raise which is partially offset by the savings from the reduction of 10 permanent positions. The 1980 estimate reflects the full year cost of the pay raise and higher health benefits which are partially offset by savings due to the manpower reductions.

Category of Cost

Civil Service Retirement Fund.....	854	828	886	869
Employee life insurance.....	50	53	42	42
Employee health insurance..	254	250	260	270
Workmen's compensation.....	31	31	31	33
FICA.....	14	7	7	7
Incentive Awards..	21	25	27	27
Severance pay.....	<u>3</u>	<u>---</u>	<u>---</u>	<u>---</u>
Total.....	<u>1,227</u>	<u>1,194</u>	<u>1,253</u>	<u>1,248</u>

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
B. <u>Supporting Costs</u> .....	<u>119</u>	<u>144</u>	<u>144</u>	<u>150</u>
1. Transfer of personnel.....	30	58	58	58

The costs associated with the transfer of personnel include movement of household goods, subsistence and temporary expenses, real estate costs and miscellaneous moving expenses related to change of duty station.

2. Personnel training.....	89	86	86	92
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Training funds provide for the maintenance and expansion of skills which are essential in carrying out the agency's many complex technical programs. The cost reflects tuition and related fees at a number of government and nongovernment institutions. The 1980 amount allows for announced increases in tuition costs.

TRAVEL

II. <u>TRAVEL</u> .....	<u>306</u>	<u>388</u>	<u>369</u>	<u>415</u>
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Basis of Fund Requirements

A. Program Travel.....	190	240	246	280
B. Scientific and Technical Meeting Travel.....	25	31	28	31
C. Management and Operations Travel.....	<u>91</u>	<u>117</u>	<u>95</u>	<u>104</u>
Total, Travel.....	<u>306</u>	<u>388</u>	<u>369</u>	<u>415</u>
A. <u>Program Travel</u> .....	<u>190</u>	<u>240</u>	<u>246</u>	<u>280</u>

Program travel is directly related to the accomplishment of the Center's mission, and accounts for 67 percent of the 1980 travel estimate. The increase in 1980 is a result of joint programs, between DFRC and other Centers, which require additional travel funds for necessary planning, coordination and management. These joint programs include Advance Turbo Prop, Laminar Flow Control, F-15 Profit and the Highly Maneuverable Aircraft Technology Augmentation.

	1978 <u>Actual</u>	<u>1979</u>		1980 <u>Budget</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Estimate</u>
B. <u>Scientific and Technical Meeting Travel</u> .....	<u>25</u>	<u>31</u>	<u>28</u>	<u>31</u>

Scientific and technical meeting 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 technical advances outside DFRC, as well as to present accomplishments and problems to their associates. Many of the meetings consist of working panels convened to solve specific governmental problems. It is estimated that travel requirements in 1980 will be at the 1979 level.

C. <u>Management and Operations Travel</u> .....	<u>91</u>	117	<u>95</u>	<u>104</u>
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Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; administrative training travel; and local transportation. Slight increase in 1980 results from increased costs related to air travel.

FACILITIES SERVICES

The Dryden Flight Research Center (DFRC) 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 446,347 gross square feet of building space including two major buildings. Also included are seven major technical facilities. This physical plant houses an average daily on-Center population of 1,200 to 1,500 personnel of all types. Many of the test facilities are utilized on schedules involving more than one shift,

III. <u>FACILITIES SERVICES</u> .....	<u>2,457</u>	<u>3,628</u>	<u>2,448</u>	<u>2,661</u>
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Basis of Fund Requirements

A. <u>Rental of Real Property</u> .....	<u>44</u>	<u>77</u>	<u>50</u>	<u>65</u>
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	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
B. <u>Maintenance and Related Services</u>				
1. Facilities.....	1,026	1,660	965	1,048
2. Equipment.....	<u>113</u>	<u>93</u>	<u>77</u>	<u>80</u>
Subtotal.....	<u>1,139</u>	<u>1,753</u>	<u>1,042</u>	<u>1,128</u>
C. <u>Custodial Services</u> .....	<u>1,027</u>	<u>1,406</u>	<u>962</u>	<u>1,015</u>
D. <u>Utility Services</u> .....	<u>247</u>	<u>392</u>	<u>394</u>	<u>453</u>
Total, Facilities Services....	<u>2,457</u>	<u>3,628</u>	<u>2,448</u>	<u>2,661</u>
A. <u>Rental of Real Property</u> .....	<u>44</u>	<u>77</u>	<u>50</u>	<u>65</u>

This item provides for the rental of trailers to provide office, shop, laboratory, and storage space in support of the Space Shuttle Orbital Flight Test (OFT) Program. The 1979 current estimate is reduced from the 1979 budget estimate due to a reduction in the number of OFT flights in 1979. The increase in 1980 is to support the current OFT flight schedule.

B. Maintenance and Related Services

1. <u>Facilities</u> .....	1,026	1,660	965	1,048
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This activity involves DRC and Air Force facilities used by Shuttle, and remotely-sited tracking and communication facilities. The decrease of the 1979 current estimate from the 1979 budget estimate is derived from the transfer of Supply Management to the Management and Operations function. The increase in 1980 is to support the current OFT flight schedule.

	1978	1979		1980
	<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. Maintenance and repair services (31 workyears of effort) .....				814
Maintenance and repair to include routine maintenance of applicable facilities				
b. Engineering services (four workyears of effort) .....				109
c. Supplies and materials. ....				44
d. Other services.. ....				81
2. <u>Equipment</u> .....	<u>113</u>	<u>93</u>	<u>77</u>	<u>80</u>

This activity involves three workyears of effort for the maintenance of facility-type equipment by our support service contractor.

C. <u>Custodial Services</u> . ....	<u>1,027</u>	<u>1,406</u>	962	<u>1,015</u>
-------------------------------------	--------------	--------------	-----	--------------

This activity involves a total of 43 workyears of effort to provide for security, janitorial, and refuse handling. The reduction in funding required in the 1979 current estimate is based on a reduced level of effort to support the OFT Program. The increase in 1980 is to support the current OFT flight schedule.

1. <u>Janitorial services (19 workyears of effort)</u> . ....				493
---	--	--	--	-----

This activity includes:

- a. Janitorial services
- b. Refuse and pest control

	1978	1979		1980
	<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>Security guard services (24 workyears of effort)</u> .....				522
This activity includes:				
a. Security of all on-site Government facilities and equipment				
b. Mail and messenger service				
c. Badging of all on-site personnel and visitors				
D. <u>Utilities</u> .....	247	<u>392</u>	<u>394</u>	<u>453</u>

Utility services are purchased through USAF 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. A summary of the proposed DFRC utilities budget for 1980 is as follows:

1. Electricity (14,000 mWh) .....	314
2. Natural gas (23,000 K cu. ft.) .....	96
3. Fuel oil (47,000 gals.) .....	27
4. Water and sewage... ..	14
5. Other... ..	<u>2</u>
 Total.... ..	 <u>453</u>

TECHNICAL SERVICES

IV. <u>TECHNICAL SERVICES</u> ..... ..	<u>226</u>	<u>348</u>	<u>409</u>	<u>458</u>
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Basis of Fund Requirements

A. Automatic Data Processing

1. Operations .....	<u>86</u>	<u>218</u>	<u>218</u>	261
Subtotal .....	86	<u>218</u>	<u>218</u>	<u>261</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
B. <u>Scientific and Technical Information</u>				
1. Library .....	1	14	14	15
2. Education and information.....	<u>34</u>	<u>49</u>	<u>60</u>	<u>66</u>
Subtotal. ....	<u>35</u>	<u>63</u>	<u>74</u>	<u>81</u>
C. <u>Shop Support and Services</u> ....	105	<u>67</u>	<u>117</u>	<u>116</u>
Total, Technical Services.....	<u>226</u>	<u>348</u>	<u>409</u>	<u>458</u>
A. <u>Automatic Data Processing</u> .....	<u>86</u>	<u>218</u>	<u>218</u>	261

Covers the support required for administrative keypunch and programming operations at the Center to satisfy payroll, personnel, accounting, and management information systems requirements of NASA and DFRC management. The 1979 and 1980 estimates include funds for the development of a management information system and maintenance of the existing systems.

B. <u>Scientific and Technical Information</u> .....	<u>35</u>	<u>63</u>	<u>74</u>	<u>81</u>
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Includes the purchase of books, supplies, and materials for, and operation of the Dryden Flight Research Center Library. It also provides for public information services.

1. Library .....	1	14	14	15
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Provides for the purchase of books, supplies, and materials for, and the operation of the Dryden Flight Research Center Library.

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
2. Education and Information. ....	34	49	60	66

Provides for the gathering and dissemination of information about the Center's programs to the mass communications media, the general public, and to the educational community at the elementary and secondary school levels. Assistance to the mass communications media includes the gathering and exposition of newsworthy material in support of media requests, and takes such forms as press kits, news releases, television and radio information tapes and clips, and feature material. The increase in 1980 reflects the full year effort of rate increases in 1979 with services at the current level.

C. <u>Shop Support and Services</u> ....	<u>105</u>	<u>67</u>	117	<u>116</u>
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Provides funding for three workyears of support service contractors for graphics, safety, and audio visual. The 1979 current estimate exceeds the budget estimate because the audio visual contract was transferred from the Installation Common Service function.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u> ....	<u>1,481</u>	<u>1,319</u>	<u>1,935</u>	<u>1,987</u>
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Basis of Fund Requirements

A. Administrative Communications....	308	346	380	379
B. Printing and Reproduction.....	25	25	35	36
C. Transportation.....	256	203	299	309
D. Installation Common Services. ....	<u>892</u>	<u>745</u>	<u>1,221</u>	<u>1,263</u>
Total, Management and Operations .....	<u>1,481</u>	<u>1,319</u>	<u>1,935</u>	<u>1,987</u>

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
A. <u>Administrative Communications.</u> .....	308	346	<u>380</u>	<u>379</u>

Includes estimates for Federal Telecommunications System (FTS), local telephone and exchange service, rental of TWX equipment, and three telephone operators provided under a support service contract.

1. Local telephone service. ....	<b>276</b>
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This funding covers the service for 575 main lines, 850 telephone instruments at the Center, and five main lines to Lancaster, California. Also included are the lease of switchboard equipment, commercial toll charges, and the support service contract for three telephone operators.

2. Long distance telephone service.....	100
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This category provides funding to support 26 FTS lines.

3. Non-telephone communications. ....	3
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This funding provides teletype (TWX) service.

B. <u>Printing and Reproduction.</u> .....	25	• 25	<u>35</u>	<u>36</u>
--	----	------	-----------	-----------

Includes the contractual publication of information and materials, and the related composition and binding operations. All common processes of duplication, including photostating, blue printing, and microfilming are included. The 1979 current estimate is increased due to higher cost of printing and reproduction materials and maintenance. Funding in 1980 remains at the same level as 1979.

C. <u>Transportation.</u> .....	<u>256</u>	<u>203</u>	<u>299</u>	<u>309</u>
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Provides funds for Government bills of lading issued to common carriers to move freight by rail, truck, water, and air; to fund shipments by United Parcel Services; and contract support for the Center's general purpose vehicles. The increase from the 1979 budget estimate to the 1979 current estimate is based on replacement of **two** passenger vehicles and two trucks,

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
D. <u>Installation Common Services</u> .....	<u>892</u>	<u>745</u>	<u>1,221</u>	<u>1,263</u>

This category provides for physical examinations for DFRC pilots, reimbursement of the Air Force Flight Test Center for shuttle support, supplies, materials, and equipment to support the general administrative effort; rental of equipment; and the supply management support service contract. The increase in 1979 provides for incorporation of the supply management service into this function (previously shown under Facilities).

- 1. Pilot physicals ..... 12

This category includes the costs for DFRC pilots physicals performed by the Lovelace Clinic in Albuquerque, New Mexico.

- 2. Air Force Flight Test Center (AFFTC) Support..... 110

This category includes reimbursement to the Air Force for services and miscellaneous supplies and materials provided in support of the Space Shuttle Orbital Flight Test (OFT) program.

- 3. Supplies and equipment ..... 384

This category funds office supplies, and office equipment, and miscellaneous common service supplies and equipment.

- 4. Rental of equipment ..... 50

Rented equipment is mostly office (e.g., photocopy type machines) that is more economical to rent than buy.

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
5. Supply management services (25 workyears) .....				669

Provides funding for supply system operation by support service contractor. The increase from the 1979 budget to the 1980 budget estimate is based on the transfer of the contract support for supply management from Facilities Related Services.

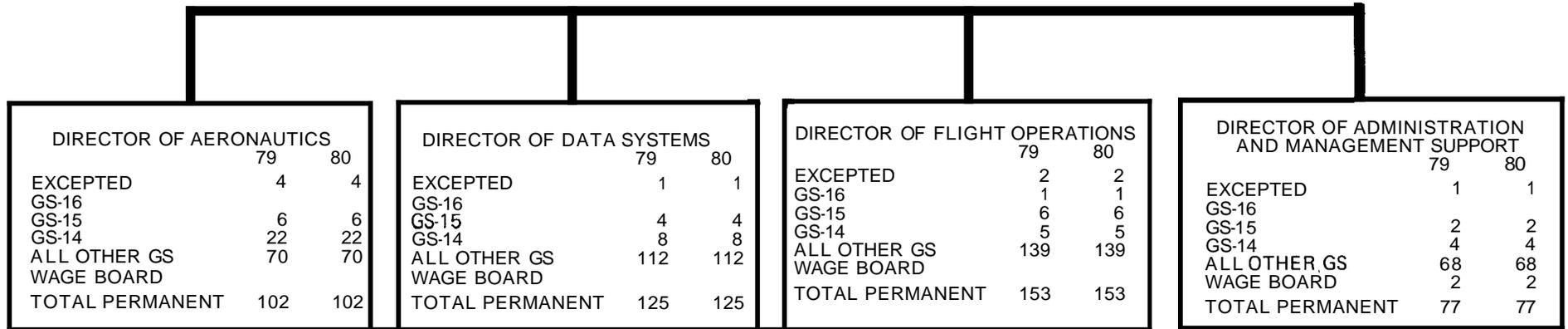
6. Postage .....				38
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**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
HUGH L. DRYDEN FLIGHT RESEARCH CENTER**

SUMMARY STAFFING		
	79	80
EXCEPTED	12	12
GS-16	2	2
GS-15	20	19
GS-14	39	38
ALL OTHER GS	405	388
WAGE BOARD	2	2
TOTAL PERMANENT	480	461

OFFICE OF THE DIRECTOR		
	79	80
EXCEPTED	4	4
GS-16	1	1
GS-15	2	2
GS-14	1	1
ALL OTHER GS	25	25
WAGE BOARD		
TOTAL PERMANENT	33	33

A REDUCTION IN FY 1979 OF 10 AND IN FY 1980 OF 19 HAS NOT YET BEEN DISTRIBUTED TO PERSONNEL CEILINGS IN THE INTERNAL ORGANIZATION STRUCTURE.



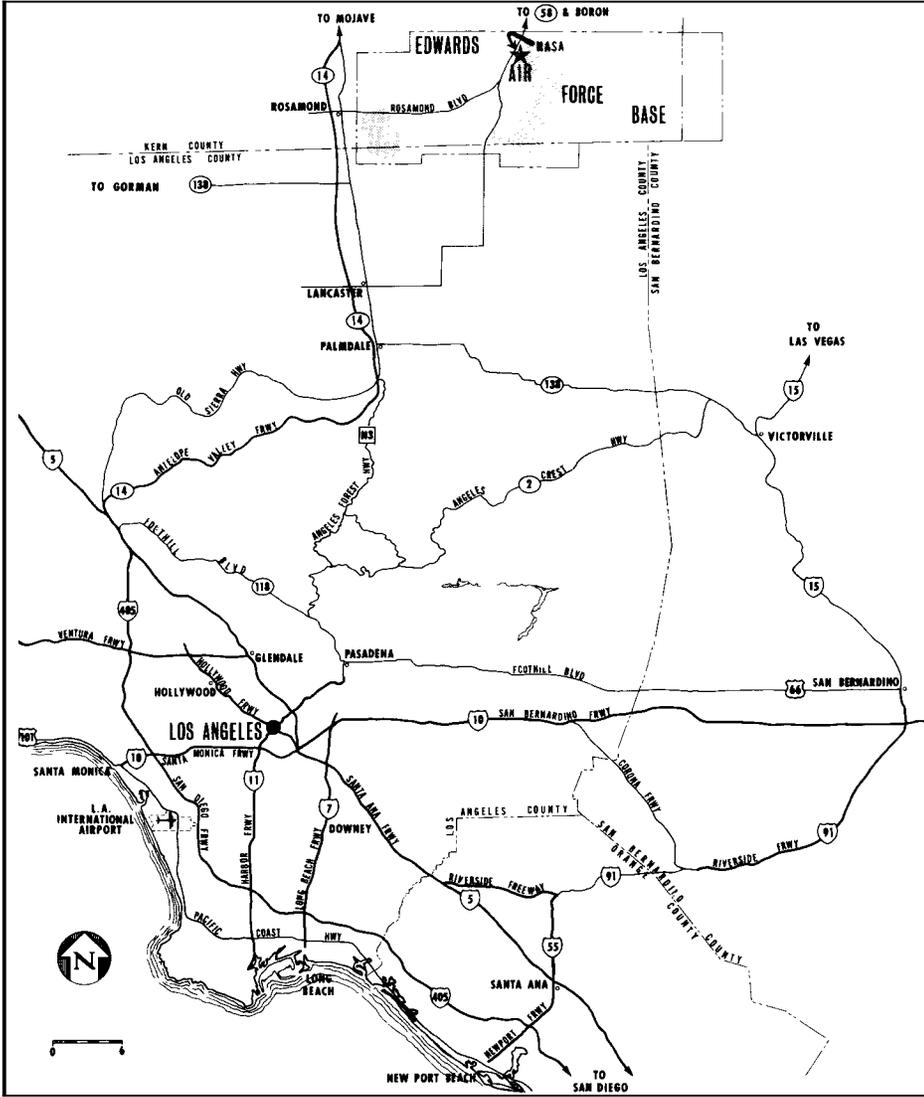
DIRECTOR OF AERONAUTICS		
	79	80
EXCEPTED	4	4
GS-16		
GS-15	6	6
GS-14	22	22
ALL OTHER GS	70	70
WAGE BOARD		
TOTAL PERMANENT	102	102

DIRECTOR OF DATA SYSTEMS		
	79	80
EXCEPTED	1	1
GS-16		
GS-15	4	4
GS-14	8	8
ALL OTHER GS	112	112
WAGE BOARD		
TOTAL PERMANENT	125	125

DIRECTOR OF FLIGHT OPERATIONS		
	79	80
EXCEPTED	2	2
GS-16	1	1
GS-15	6	6
GS-14	5	5
ALL OTHER GS	139	139
WAGE BOARD		
TOTAL PERMANENT	153	153

DIRECTOR OF ADMINISTRATION AND MANAGEMENT SUPPORT		
	79	80
EXCEPTED	1	1
GS-16		
GS-15	2	2
GS-14	4	4
ALL OTHER GS	68	68
WAGE BOARD	2	2
TOTAL PERMANENT	77	77

# DRYDEN FLIGHT RESEARCH CENTER FISCAL YEAR 1980 ESTIMATES AREA MAP



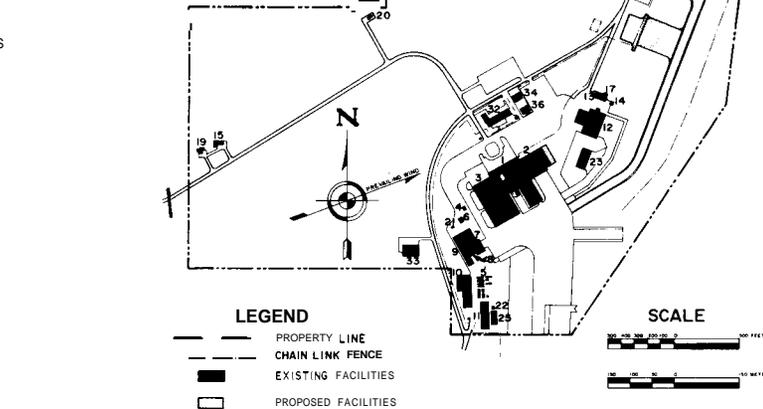
KEY PLAN

# DRYDEN FLIGHT RESEARCH CENTER FISCAL YEAR 1980 ESTIMATE LOCATION PLAN

## PROPOSED FACILITIES

- (A) DISCRETE PROJECTS  
I. LARGE AIRCRAFT MAINTENANCE DOCK
- (B) REHABILITATION AND MODIFICATION  
1. REHABILITATION OF BUILDING 4800  
2. MODIFICATION OF CENTRAL HYDRAULIC SYSTEM  
3. MODIFICATION OF THE FIREWATER SYSTEMS
- (C) LUMP-SUM REHABILITATION AND MODIFICATION  
i. ENCLOSURE OF STAIRWELLS, BLDG. 4800  
2. EROSION CONTROL, MISC. LOCATIONS  
3. (DELETED)  
4. SMALL PROJECTS  
a. FLIGHT OPERATIONS CREW ROOM RESTROOM MODIFICATIONS  
b. INSULATE BUILDINGS 4809.8 4810  
c. REHABILITATE LAWN SPRINKLER SYSTEM NORTH OF BUILDING 4800  
d. SOBER FIRE INSPECTION ITEMS, MISC. LOCATIONS  
e. PEDESTAL FOR THE HL-10 LIFTING BODY  
f. (DELETED)  
g. INSTALLATION OF A 6" DOMESTIC WATER LINE TO BUILDINGS 4809.8 4810  
h. MAINTENANCE & REPAIR OF THE SHUTTLE OVERLAND ROUTE. NOT SHOWN
- (D) MINOR CONSTRUCTION  
I. F-15 SIMULATION ENCLOSURE

REMOTE SITE LOCATION PLAN



## EXISTING FACILITIES

- 1 LABORATORY BUILDING (4800)
- 2 AIRCRAFT CONSTRUCTION AND MODIFICATION HANGAR (4801)
- 3 MAIN HANGAR (4802)
- 4 AIRCRAFT TIRE REPAIR SHOP (4803)
- 5 TRAILER PARK AND MODULAR BUILDINGS
- 6 BOILER HOUSE (4886)
- 7 SHOPS (A.G.E., MODEL, BATTERY, GARAGE) (4806)
- B STORAGE BUILDING (4807)
- 9 WAREHOUSE NQ 2 (4808)
- 10 WAREHOUSE NQ 3 (4809)
- 11 WAREHOUSE NQ 4 (4810)
- 12 FLIGHT LOADS RESEARCH BUILDING (4820)
- 13 PAINT SPRAY BUILDING (4821)
- 14 PAINT STORAGE BUILDING (4822)
- 15 COMMUNICATIONS BUILDING (4824)
- 16 MAINTENANCE DOCK (4826)
- 17 WOOD SHOP (4830)
- 18 WAREHOUSE NQ 5 (4831)
- 19 RADAR BUILDING (4870)
- 20 100 FT. TOWER, BORESITE TARGET ASSEMBLY AND EQUIP. BUILDING (4887)
- 21 CENTRAL STANDBY ELECTRICAL POWER FACILITY (4889)
- 22 STORAGE BUILDING (4804)
- 23 AIRCRAFT SERVICING DOCK (4823)
- 24 FPS-16 RADAR FACILITY (4982)
- 25 WAREHOUSE NP 6 (4827)
- 26 100 FT. TOWER, BORESITE TARGET ASSEMBLY AND EQUIP. BUILDING (4981)
- 27 SHUTTLE HANGAR (4833)
- 28 SHUTTLE SHOP (4834)
- 29 SHOP TRAILER COMPLEX (4854)
- 30 SHUTTLE MATING STRUCTURE (4860)
- 31 PROPELLANT FUEL AND OXIDIZER STORAGE AREA (4855)
- 32 INTEGRATED SUPPORT FACILITY (4825)
- 33 WAREHOUSE NP 7 (4832)
- 34 PAC TRAILERS
- 35 PUMP STATION NQ 1 (4853)
- 36 TRAINING TRAILERS
- 37 GFSC STDN SPACE SHUTTLE ALT FACILITY (4918)
- 38 RCA EARTH STATION (4917)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION DRYDEN FLIGHT RESEARCH CENTER EDWARDS, CALIFORNIA		DESIGNED BY: P. CONNALLY 1/27/79 CHECKED BY: D. J. D. / 1/27/79 DRAWN BY: [blank] SCALE: 1" = 100'
FY 1980 ESTIMATE LOCATION PLAN	PROJECT SCALE NOTED	SHEET NO. D MSK-D-005-7 SHEET 1 OF 1

**HUGH L. DRYDEN FLIGHT RESEARCH CENTER  
FISCAL YEAR 1980 ESTIMATES**



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1979 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 810 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 23 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, 1978, was \$509,069,000.

CENTER ROLES AND MISSIONS

Langley Research Center (LaRC) continues to play a major 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 of a technology base for facilitating advances.

Avionics Technology - developing a technology base related to improving avionics.

Military Support - providing technical support to military aviation in areas consistent with other LaRC aeronautics roles and LaRC 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 and Advanced Technology Laboratory. Defining and developing experiments in areas consistent with other LaRC space roles.

Environmental Quality Monitoring Technology - developing improved techniques for environmental monitoring. Includes research, experiment development/management, data analysis, and investigator management and specialized ground/aircraft investigations. Also includes development of Shuttle payloads related to environmental monitoring.

#### 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 earth 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 and meteorological sounding rockets.

SUMMARY OF RESOURCES REQUIREMENTS

	<u>FUNDS</u>		<u>1979</u>		<u>1980</u> Budget Estimate
	<u>1978</u> Actual	Budget <u>Estimate</u> (Thousands of Dollars)	Current <u>Estimate</u>	Budget <u>Estimate</u>	
I. Personnel and Related Costs.....	84,607	85,568	89,337	89,940	
11. Travel.....	1,854	2,156	2,008	2,154	
111. Facilities Services.....	8,148	9,321	9,268	10,192	
IV. Technical Services.....	2,386	1,825	1,721	2,032	
V. Management and Operations. ....	<u>5,024</u>	<u>5,709</u>	<u>5,662</u>	<u>5,940</u>	
Total, fund requirements.....	<u>102,019</u>	<u>104,579</u>	<u>107,996</u>	<u>110,258</u>	

Distribution of Permanent Positions by Program

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
<u>Direct Positions</u>				
<u>Space Transportation Systems</u> .....	<u>51</u>	52	<u>47</u>	<u>44</u>
Space Shuttle.....	9	7	7	4
Expendable launch vehicles.....	42	45	40	40
<u>Space Science</u> .....	<u>20</u>	<u>9</u>	<u>16</u>	---
Physics and astronomy.....	16	9	16	---
Planetary exploration.....	4	---	---	---
<u>Space and Terrestrial Applications</u> .....	<u>216</u>	<u>239</u>	<u>207</u>	223
Space applications .....	204	226	195	211
Technology utilization.....	12	13	12	12
<u>Aeronautics and Space Technolom</u> .....	<u>2,034</u>	<u>2,019</u>	<u>2,004</u>	<u>1,983</u>
Aeronautical research and technology.....	1,459	1,444	1,470	1,470
Space research and technology.....	<u>575</u>	<u>575</u>	<u>534</u>	<u>513</u>
Subtotal, direct positions .....	2,321	2,319	2,274	2,250
<u>Center Management and Operations Support Positions</u> .....	<u>750</u>	<u>750</u>	<u>741</u>	<u>740</u>
Total, permanent positions .....	<u>3,071</u>	<u>3,069</u>	<u>3,015</u>	<u>2,990</u>

## PROGRAM DESCRIPTION

### SPACE SHUTTLE

4 Permanent Positions (Civil Service)

In 1980, civil service personnel will be working on test and evaluation of propellant dynamics.

### EXPENDABLE LAUNCH VEHICLES

40 Permanent Positions (Civil Service)

The expendable launch vehicle program at Langley provides centralized procurement of the Scout Launch Vehicle. In 1980 civil service personnel will support a program which includes the procurement of launch vehicle hardware, launch services, engineering, and maintenance.

The 1980 launches under this program will be conducted from sites located at the Western Test Range in California, and the San Marco platform off the coast of Kenya, Africa.

### SPACE APPLICATIONS

211 Permanent Positions (Civil Service)

The space applications program at Langley is characterized by a research program that is a national resource for understanding environmental problems and for developing related monitoring systems. The Center's technical expertise is widely recognized in the areas of remote sensing of the terrestrial atmospheric trace species and analytical atmospheric modeling. In the area of Upper Atmospheric Research, Langley civil service personnel will continue its study of 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. Effort will be given to defining an Atmospheric Lidar System for the Spacelab/Shuttle which will perform atmospheric measurements of trace constituent, clouds, aerosols and temperature in the troposphere and stratosphere, and for measuring trace species, winds and temperature in the mesosphere and troposphere.

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, and lidar.

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-G, SAGE, and the Halogen Occultation Experiment (HALOE). The HALOE instrument will measure stratospheric species involved in ozone destruction by chlorine chemistry.

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 Satellite System, a prime element in NASA's support of the National Climate Program. Preliminary radiation budget studies, based on Nimbus data, have explored the relationship of radiation budget to such climatological parameters as cloudiness, snow and ice cover, and sea surface temperature.

A unique Langley marine research capability of coupled lab spectral signature, field test, data processing algorithm and display and predictive model research has been demonstrated. The Langley program will provide the technology base for design of future integrated remote sensing systems for increasing our understanding of water pollution problems.

#### TECHNOLOGY UTILIZATION

12 Permanent Positions (Civil Service)

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 non-aerospace segments of the economy.

In 1980, 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 non-aerospace segments of the economy having problems amendable to technological solutions.
3. Understand more fully the technology transfer process and its impact and systematically manage and optimize the process.

#### AERONAUTICAL RESEARCH AND TECHNOLOGY

1,470 Permanent Positions (Civil Service)

The aeronautical research and 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 indepth look at future technology requirements. The diversity of activities in such disciplines as materials, structures, flight stability and control, avionics, and aerodynamics provides the expertise to pursue the broader problems such as those involved in the terminal configured vehicle and aircraft energy efficiency technology programs. The unique wind tunnel and computing facilities at Langley compliment the expertise of the technical staff to produce a broad cohesive program in aeronautical research.

The aerodynamics activity at Langley encompasses extensive theoretical, experimental, and applications 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 full-scale conditions.

Aspects of the problems which are studied include airfoil and wing design, flowfield analysis, configuration design processes, noise and analysis, propulsion system integration, fuel efficiency, flight dynamics, and economic feasibility. In 1980, precursor aerodynamic tests will be carried out in the 0.3-meter transonic cryogenic tunnel in preparation for utilization of the National Transonic Facility currently under construction. Tunnel testing techniques will be further enhanced by combining the technology developed for non-optical positioning sensing of models with the superconducting coil technology to provide for the design and construction of an advanced magnetic balance and suspension system. The STAR Computer will be used in the areas of far-field jet 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 behavior of new airfoils will be furthered by the continued definition of the aerodynamic characteristics of a range of supercritical airfoils. 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. An improved data base for the aircraft noise prediction computer program will be developed so that noise contours can be predicted within 1.5dB accuracy. Other activities in the acoustics and noise reduction research include research on atmospheric propagation, noise predictions, and community impact and annoyance produced by aircraft noise. In the area of aircraft energy efficiency technology, major activities include continuation of work required for the design and testing of a laminar flow control wing box, cover panel and ducting, and for the design of a laminar flow control compatible supercritical airfoil section for flight test evaluation; the establishment of design data for high aspect ratio supercritical wings; investigations of high-lift aerodynamics configurations for advanced transports; and the evaluation of performance benefits achievable by incorporating winglets and wing tip extensions to wide-body transports. This technology also has application to improved mission performance for advanced maneuvering air combat aircraft and missile systems and is being investigated in relation to supersonic and hypersonic configuration concepts. In the area of supersonic configurations, improved aerodynamic platforms will be experimentally determined by subsonic, transonic, and supersonic wind tunnel tests.

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, computer aided analysis and design technology, and development of analytical

or semiempirical fatigue and life prediction methodology. Use of active 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 computational device using microprocessor components will be defined in 1980 that is capable of reducing computational costs and/or times by a factor of ten over present devices.

A short term, intensive effort is being pursued to quantify the potential for accidental release of carbon fibers into the atmosphere as a result of the crash and subsequent burning of commercial transport aircraft having carbon fiber composite components and to perform a comprehensive risk analysis of the electrical hazards associated with such a carbon fiber release.

The avionics work at Langley includes technology development in aircraft guidance and navigation, aircraft control systems, crew station avionics, 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) are being conducted in this program area. The work includes requirements analyses, design studies, systems and component technology development, ground simulation and technology validation, and proof-of-concept validation through experimental flight programs. The Langley expertise in the avionics area is being applied to terminal configured vehicle systems and operations technology, broadly applicable technology for development of low-cost Global Positioning System (GPS) navigation hardware and software, advanced control laws for various aircraft classes, intersystems communications networks for enhanced interfacing and integration of functions within an aircraft, and advanced technology improved display media and pilot/system interfaces in aircraft cockpits. Emphasis in 1980 will be on investigations of the capacity, efficiency, and safety potential of cockpit-displayed 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, and the investigation of concepts and technology which will result in highly accurate aircraft navigation capability utilizing the GPS. Other avionics technology applications are also found in work on advanced digital flight control systems, fluidics instrumentation for general aviation aircraft, and the development of mathematical tools to investigate and enhance reliability prediction and assessment, control algorithm design, and pilot describing functions.

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. Material 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. Other research efforts are underway to develop new or improved materials to meet projected requirements and to define manufacturing, forming, and joining processes to further improve structural efficiency.

The goal of the activities in the area of structures is to provide validated analysis and design methodology, design concepts, and dynamics and control methodology required for efficient long-life space transportation and payload structures. High temperature metallic heat shield concepts and actively cooled structural and propulsion concepts for advanced Space Transportation Systems are being derived and evaluated using specialized laboratories and wind tunnels. A complete radiation heat transfer, large deflection, and non-linear materials property analysis capability will be available in 1981. Analysis, design, and loads determination methodology for deployable and erectable large space platforms, antennae and booms are being studied as part of a multi-Center, multidisciplinary program for advanced technology. Experimentally verified analysis and design capability for composite space structures which are 10 to 100 times larger than existing flight hardware will be developed by mid-1981. By mid-1982, an improved structural analysis methodology for substantially improved computational efficiency will be developed and verified. It will include the effects of plasticity, large deflections, large rotations, and other sources of nonlinear behavior, and will require application of evolving advanced numerical techniques, computer software and computer hardware.

An extensive program in electronic component technology development, data processing and sensor development is conducted at Langley. Sensor developments include laser back scatter and fluorescence techniques for water quality measurements, continuously tuneable infrared laser techniques, and high power/high pressure tuneable gas lasers for the measurement of low concentration atmospheric constituents. In 1980 Langley will demonstrate the reliability of tuneable laser diodes to meet the requirements of a solar occultation Laser Heterodyne

Spectrometer experiment to measure stratospheric constituents in the 9-12um region, and will design and 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), and multi-purpose, user-oriented, software development, verification and validation techniques.

The objectives of the Langley program in entry technology are to develop the aerothermodynamic technology required for the design and operation of advanced vehicle systems for space and global transportation, and to provide space shuttle support. The objectives are being met through the application of analytical techniques and unique Langley facilities in the areas of Earth orbit transportation, aerodynamics, heat transfer, real gas effects, planetary entry, radiative heating and hypervelocity gas dynamics. Theoretical and experimental efforts in the areas of ablation product radiation and absorption, highly blown shock layer probe flight mechanics, and mass loss and shape change will be pursued to develop a sufficient data base to minimize planetary mission cost, maximize scientific return and ensure a high probability of mission success.

The Langley programs in Space Technology Shuttle Payloads involve a variety of tasks focused on extending basic research and technology development into the space environment when economically feasible, and/or when the objectives can be achieved only in space.

#### CENTER MANAGEMENT AND OPERATIONS SUPPORT

740 Permanent Positions (Civil Service)

Center Management and Operations Support is defined as that support or services being provided to all Langley Research Center organizations which cannot be directly identified to a benefiting 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 - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, program control, contracting and procurement, personnel management, property management, financial management, resource control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Centerwide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation, supplies, etc.
- Medical care of employees
- Photographic and graphic support

PERSONNEL AND RELATED COSTS

	<u>1978</u>	<u>1979</u>		<u>1980</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>84,607</u>	<u>85,568</u>	<u>89,337</u>	<u>89,940</u>
<u>Basis of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions .....	75,202	75,573	78,864	79,276
b. Nonpermanent.....	987	1,126	1,264	1,211
c. Reimbursable detailees.....	4	34	---	---
d. Overtime and other compensation.....	<u>342</u>	<u>510</u>	<u>536</u>	<u>544</u>
Subtotal, Compensation.....	76,535	77,243	80,664	81,031
2. <u>Benefits</u> .....	<u>7,572</u>	<u>7,693</u>	<u>8,041</u>	<u>8,214</u>
Subtotal, Compensation and Benefits.....	<u>84,107</u>	<u>84,936</u>	<u>88,705</u>	<u>89,245</u>

	<u>1978</u>	<u>1979</u>		<u>1980</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)		
<u>B. Supporting Costs</u>				
1. Transfer of personnel.....	39	95	95	105
2. Personnel training.....	<u>461</u>	537	<u>537</u>	590
Subtotal, Supporting Costs.....	<u>500</u>	632	<u>632</u>	<u>695</u>
Total, Personnel and Related Costs.....	<u>84,607</u>	<u>85,568</u>	<u>89,337</u>	<u>89,940</u>
<u>A. Compensation and Benefits.....</u>				
1. <u>Compensation</u> .....	<u>76,535</u>	<u>77,243</u>	<u>80,664</u>	<u>81,031</u>
a. Permanent positions.....	75,202	75,573	78,864	79,276

The funds shown above will support 2,990 permanent positions in 1980, a reduction of 25 positions from the 1979 level. The increase in cost from the 1979 budget estimate to the 1979 current estimate is due primarily to the October 1978 pay raise partially offset by savings from the reduction of 54 permanent positions.

Basis of Cost for Permanent Positions

In 1980 the cost of permanent positions will be \$79,276,000, an increase of \$412,000 over 1979. This increase results from the following:

Cost of permanent positions in 1979.....	78,864
Cost increase in 1980.....	+2,147
Within grade advances and career development	
Full year effect of 1979 actions.....	+643
Partial year effect of 1980 actions.....	+739
Full year effect of October 1978 pay increase.....	+110
Decrease in reimbursements.....	+44
Two additional paid days in 1980.....	+611

Cost decreases in 1980.....	-1,735
Turnover savings and abolished positions:	
Full year effect of 1979 actions.....	-777
Partial year effect of 1980 actions.....	-958
	<hr/>
Cost of permanent positions in FY 1980.....	<u>79.276</u>

	1978 <u>Actual</u>	<u>1979</u>		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
		(Thousands of Dollars)		
b. Nonpermanent positions				
1. Cost.....	987	1,126	1,264	1,211
2. Workyears.....	117	135	143	137

The 1979 current estimate increases from the 1979 budget estimate due to the addition of a part-time employment program. The 1980 estimate reflects a slight decrease from 1979 as a result of the absorption of the part-time program into the permanent position ceiling. This 1980 estimate will support the following programs as shown:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training programs.....	77
Summer programs.....	11
Youth opportunity programs.....	38
Other temporaries.....	<u>11</u>
<b>Total.....</b>	<b><u>137</u></b>

	<u>1978</u> Actual	<u>1979</u>		<u>1980</u>
		<u>Budget</u> Estimate (Thousands of Dollars)	<u>Current</u> Estimate	<u>Budget</u> Estimate
c. Reimbursable detailees.....	4	34	---	---

The current estimate in 1979 and 1980 reflects the phasing out of the appointment of a reimbursable detailee who participated in experimental flight programs.

d. Overtime and other compensation.. .. .	342	510	536	544
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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 rates. The increase from the 1979 budget estimate to the current estimate is due to the 1979 pay increase, partially offset by the savings from the reduction in permanent positions. The 1980 estimate is essentially level from 1979.

2. <u>Benefits</u> .....	<u>7,572</u>	<u>7,693</u>	<u>8,041</u>	<u>8,214</u>
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Following are the amounts of contribution by category:

Category of Costs

Civil Service Retirement Fund.....	5,285	5,305	5,563	5,680
Employee life insurance.....	328	340	345	349
Employee health insurance.....	1,564	1,678	1,729	1,803
Workmen's compensation... ..	275	289	289	300
FICA.. ..	19	28	30	29
Incentive awards.....	48	53	53	53
Severance pay.....	53	---	32	---
<u>Total</u> .....	<u>7,572</u>	<u>7,693</u>	<u>8,041</u>	<u>8,214</u>

The increase from the 1979 budget estimate to the current estimate is due to the October 1978 pay increase partially offset by the savings from the reduction of 54 permanent positions. The increase in 1980 over the 1979 current estimate is related to the increases in personnel compensation and is partially offset by savings due to the manpower reductions.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
B. <u>Supporting Costs</u> .....	<u>500</u>	<u>632</u>	<u>632</u>	<u>695</u>
1. Transfer of personnel .....	39	95	95	105

Transfer of personnel costs 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 1980 estimate reflects the same level of activity as 1979 adjusted for rising real estate costs.

2. Personnel training .....	461	537	537	590
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The increase in the 1980 budget estimate from the 1979 current estimate reflects the full year effect of rate increases in the Langley pilot training contract.

<u>TRAVEL</u>				
11. <u>TRAVEL</u> .....	<u>1,854</u>	<u>2,156</u>	<u>2,008</u>	<u>2,154</u>
<u>Basis of Fund Reuirements</u>				
A. Program Travel .....	1,315	1,435	1,375	1,478
B. Scientific and Technical Meeting Travel .....	247	250	250	265
C. Management and Operation Travel .....	<u>292</u>	<u>471</u>	<u>383</u>	<u>411</u>
Total, Travel .....	<u>1,854</u>	<u>2,156</u>	<u>2,008</u>	<u>2,154</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Program Travel</u> .....	<u>1,315</u>	<u>1,435</u>	<u>1,375</u>	<u>1,478</u>

Program travel is directly related to the accomplishment of the Center's mission and accounts for 69 percent of the travel budget for 1980. Travel for program purposes reflects the continuing effort in space research, aircraft technology, flight simulation, fluid mechanics, airborne science and applications, and space applications. The decrease between the 1979 budget estimate and current estimate is a result of an overall travel reduction. The increase from 1979 to 1980 reflects the level of program activity at the Center.

B. <u>Scientific and Technical Meeting Travel</u> .....	<u>247</u>	<u>250</u>	<u>250</u>	<u>265</u>
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Scientific and technical meeting 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 increase from 1979 to 1980 reflects the need to provide those employees with technological expertise the opportunities necessary to keep abreast of the latest state of the art in their respective fields, and represents roughly the same level of travel as in 1979.

C. <u>Management and Operations Travel</u> .....	<u>292</u>	471	<u>383</u>	<u>411</u>
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Management and operations travel is used for the direction and coordination of general management matters. It includes travel in such areas as personnel, financial management, and procurement activities; travel of the Center's top management to NASA Headquarters and other NASA Centers; and local transportation. The decrease between the 1979 budget estimate and the 1979 current estimate reflects a reduction based on 1978 experience and a reduction taken in general administrative travel. The 1980 estimate reflects a continuation of the 1979 level of travel.

FACILITIES SERVICES

Langley Research Center (LaRC) is located on 787 acres of grounds in a complex made up of laboratory and office type buildings as well as research wind tunnels.

This complex encompasses 2,087,601 gross square feet of building space including 11 major buildings. Also included are some 18 major technical facilities. This physical plant houses an average daily on-Center population of 4,200 to 4,500 personnel. Many of the test facilities are utilized on more than one shift/or during off peak hours.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
111. <u>FACILITIES SERVICES</u> .....	<u>8,148</u>	<u>9,321</u>	<u>9,268</u>	<u>10,192</u>
<u>Basis of Fund Requirements</u>				
A. <u>Maintenance and Related Services</u>				
1. <u>Facilities</u> .....	598	339	585	624
B. <u>Custodial Services</u> .....	1,538	1,958	1,894	1,980
C. <u>Utility Services</u> .....	6,012	7,024	6,789	7,588
Total, <u>Facilities Services</u> .....	<u>8,148</u>	<u>9,321</u>	<u>9,268</u>	<u>10,192</u>
A. <u>Maintenance and Related Services</u>				
1. <u>Facilities</u> .....	598	339	585	624

This activity reflects a decision by Center management to provide an adequate level of administrative facility maintenance and repair in order to maintain ageing facilities and equipment. This activity also provides for 12 workyears of effort to accomplish grounds maintenance. The increase in the 1980 request provides for negotiated contractor wage rate increases for maintenance at the level provided in 1979.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
B. <u>Custodial Services</u> .....	<u>1,538</u>	<u>1,958</u>	<u>1,894</u>	<u>1,980</u>

This activity involves 107 workyears of effort at LaRC to provide for janitorial and security services. The 1980 estimate provides for the full year effect of previously negotiated wage rate increases in 1979 for janitorial and security guard services at the current level.

C. <u>Utilities Services</u> .....	<u>6,012</u>	<u>7,024</u>	<u>6,789</u>	<u>7,588</u>
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Included in this item is the purchase of electric service from VEPCO, fuel oil from a local supplier, and water and sewage charges. Also included are funds to procure steam services from the USAF-Langley under an interagency support agreement.

A breakdown of the utilities costs is as follows:

1. Electricity (150,000 kWh) .....	6,000
2. Fuel oil (2,985,000 gals.) .....	1,278
3. Steam (USAF) .....	215
4. Water and <del>sew</del> .....	95

The 1979 current estimate reflects a reduction of five million kilowatt hours of electricity due to revised programmatic requirements. The 1980 estimate reflects the full year effect of rate increases at the same level provided in 1979.

#### TECHNICAL SERVICES

IV. <u>TECHNICAL SERVICES</u> .....	<u>2,386</u>	<u>1,825</u>	<u>1,721</u>	<u>2,032</u>
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#### Basis of Fund Requirements

##### A. Automatic Data Processing

1. Equipment .....	56	101	106	311
2. Operations .....	<u>2,062</u>	<u>1,311</u>	<u>1,275</u>	<u>1,368</u>
Subtotal.....	<u>2,118</u>	<u>1,412</u>	<u>1,381</u>	<u>1,679</u>

	<u>1978</u>	<u>1979</u>		<u>1980</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)		
<u>B. Scientific and Technical Information</u>				
1. Library .....	80	85	90	101
2. Education and information.....	<u>188</u>	<u>328</u>	<u>250</u>	<u>252</u>
Subtotal.....	<u>268</u>	<u>413</u>	<u>340</u>	<u>353</u>
Total, Technical Services.....	<u>2,386</u>	<u>1,825</u>	<u>1,721</u>	<u>2,032</u>
A. <u>Automatic Data Processing</u> .....	<u>2,118</u>	<u>1,412</u>	<u>1,381</u>	<u>1,679</u>

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; small miscellaneous contracts; and a 33 workyear level of effort support service contract for programming and operations.

1. Equipment.....	56	101	106	311
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This activity includes the lease and purchase of equipment associated with Langley's business computer complex. The 1980 increase reflects an equipment update for the central processor unit.

2. Operations.....	2,062	1,311	1,275	1,368
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This estimate includes ADP equipment maintenance, supplies, and the support service contract for programming and operations. The increase in 1980 reflects the full year effect of rate increases in 1979 for programming and operations services.

B. <u>Scientific and Technical Information</u> .....	<u>268</u>	<u>413</u>	<u>340</u>	<u>353</u>
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This estimate includes the purchase of books, materials, and supplies, and for support service contract assistance in the operation of the technical library. Also included are public information services and operation of the Visitor Information Center.

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
1. Library.....	80	85	90	101

Eight workyears of support contract effort are for the operation of the Center's technical library. The 1980 estimate reflects an increase for the full year effect for previously negotiated contractor wage rates at the same level of effort provided in 1979.

2. Education and information.....	188	328	250	252
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Funding for all the Center's public affairs activities is included in this estimate. Included are 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 1980 estimate is essentially level from 1979.

MANAGEMENT AND OPERATIONS

V. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>5,024</u>	<u>5,709</u>	<u>5,662</u>	<u>5,940</u>
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Basis of Fund Requirements

A. Administrative Communications.....	1,069	2,147	1,164	1,182
B. Printing and Reproduction. ....	182	159	169	177
C. Transportation.....	1,120	1,337	1,271	1,360
D. Installation Common Services.....	<u>2,653</u>	<u>2,066</u>	<u>3,058</u>	<u>3,221</u>
Total, Management and Operations.....	<u>5,024</u>	<u>5,709</u>	<u>5,662</u>	<u>5,940</u>

	1978	1979		1980
	<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>Administrative Communications</u> .....	1,069	2,147	1,164	1,182

This estimate includes funds for local telephone and exchange costs; Federal Telecommunications System (FTS) service; and datafax and telegraph service. The decrease in the 1979 current estimate is primarily a result of moving the estimate for postage to the installation common services function. The 1980 estimate provides for the full year effect of rate increases for communication services.

1. Local telephone service..... 793

This estimate provides for local telephone and exchange costs. The 1980 estimate provides for the full year effect of rate increases.

2. Long distance telephone services..... 380

These funds provide for long distance telephone service for the FTS. The 1980 estimate provides for the full year effect of rate increases for this service.

3. Nontelephone communications.....~.. 9

Included in this activity are costs for other miscellaneous communications such as teletype and datafax services. The 1980 estimate provides for the full year effect of rate increases for these services.

B. <u>Printing and Reproduction</u> .....	182	159	169	177
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This estimate provides for special printing and reproduction, supplies, and a four workyear support service contract effort for reproduction services. The 1980 estimate provides for the full year effect of a previously negotiated wage increase in support service contract costs.

	<u>1978</u>	<u>1979</u>		<u>1980</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>Transportation</u> .....	<u>1,120</u>	<u>1,337</u>	<u>1,271</u>	<u>1,360</u>

This activity includes the operation, maintenance, and purchase of motor vehicles; shipping transportation and freight charges; a 26 workyear support service contract effort for pickup and delivery of freight, furniture, and other bulk objects; and a seven workyear support service contract for operation and maintenance of the NASA-1 aircraft. This effort also includes all of the NASA-1 aircraft fuel, equipment, and expendable supplies. The 1980 estimate provides for the full year effect of a previously negotiated wage increase in support contractor costs and the full year effect of rate increases for other services.

D. <u>Installation Common Services</u> .....	<u>2,653</u>	<u>2,066</u>	<u>3,058</u>	<u>3,221</u>
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These funds will provide for 76 workyears of support service contract effort 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 increase in the 1979 current estimate is a result of moving the estimate for postage to this function from the administrative communications function. The 1980 estimate provides for the full year effect of previously negotiated rate increases in support service contracts at the same level of effort provided in 1979.

1. Center management and staff.....	384
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This function includes 20 workyears of support service contract effort and general supplies and equipment purchases for all administrative support organizations at the Center. The 1980 estimate reflects the full year effect of previously negotiated wage rate increases in support contract costs at the same level of effort provided in 1979.

2. Medical <del>services</del> .....	461
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This function includes 11 workyears of effort in the Center's occupational and environmental health services that provide dispensary services, emergency ambulance service, medical examinations, health physics and industrial hygiene services. The 1980 estimate provides for the full year effect of a previously negotiated increase in the cost of support contractor medical services at the same level of effort provided in 1979.

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
3. Installation support <del>services</del> .....				2,376

This function includes 45 workyears of support service contract effort for mail delivery and stock issuance and warehousing operations. Also included are the purchase, maintenance, and rental of office copy machines, typewriters and other office equipment, and postage costs. The 1980 estimate provides for the full year effect of a previously negotiated increase in cost of support contractors and continued level of effort in other services.

# LANGLEY RESEARCH CENTER

DECEMBER 1, 1978

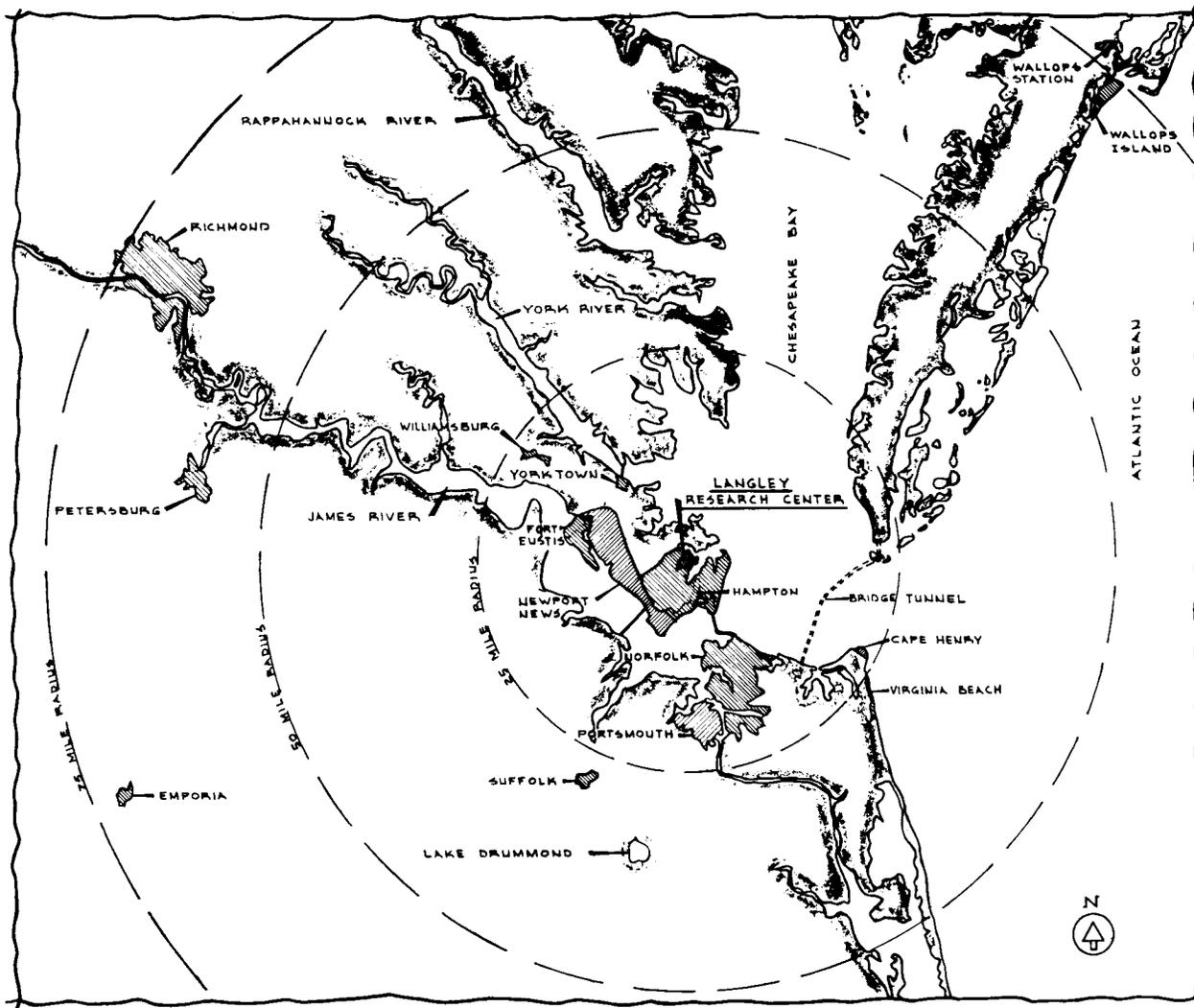
APM 9-24

SUMMARY STAFFING	
	79 80
Excepted	25 25
GS 15	8 5
GS 14	124 118
GS 13	304 303
Other GS	444 445
Wage Grade	45 45
Total Personnel	305 296

A reduction in FY 1979 of 80 and in FY 1980 of 25 has not yet been distributed to personnel in the internal organization structure.

OFFICE OF DIRECTOR	
	79 80
Excepted	7 7
GS 15	1 1
GS 14	2 2
Other GS	24 24
Total	34 34

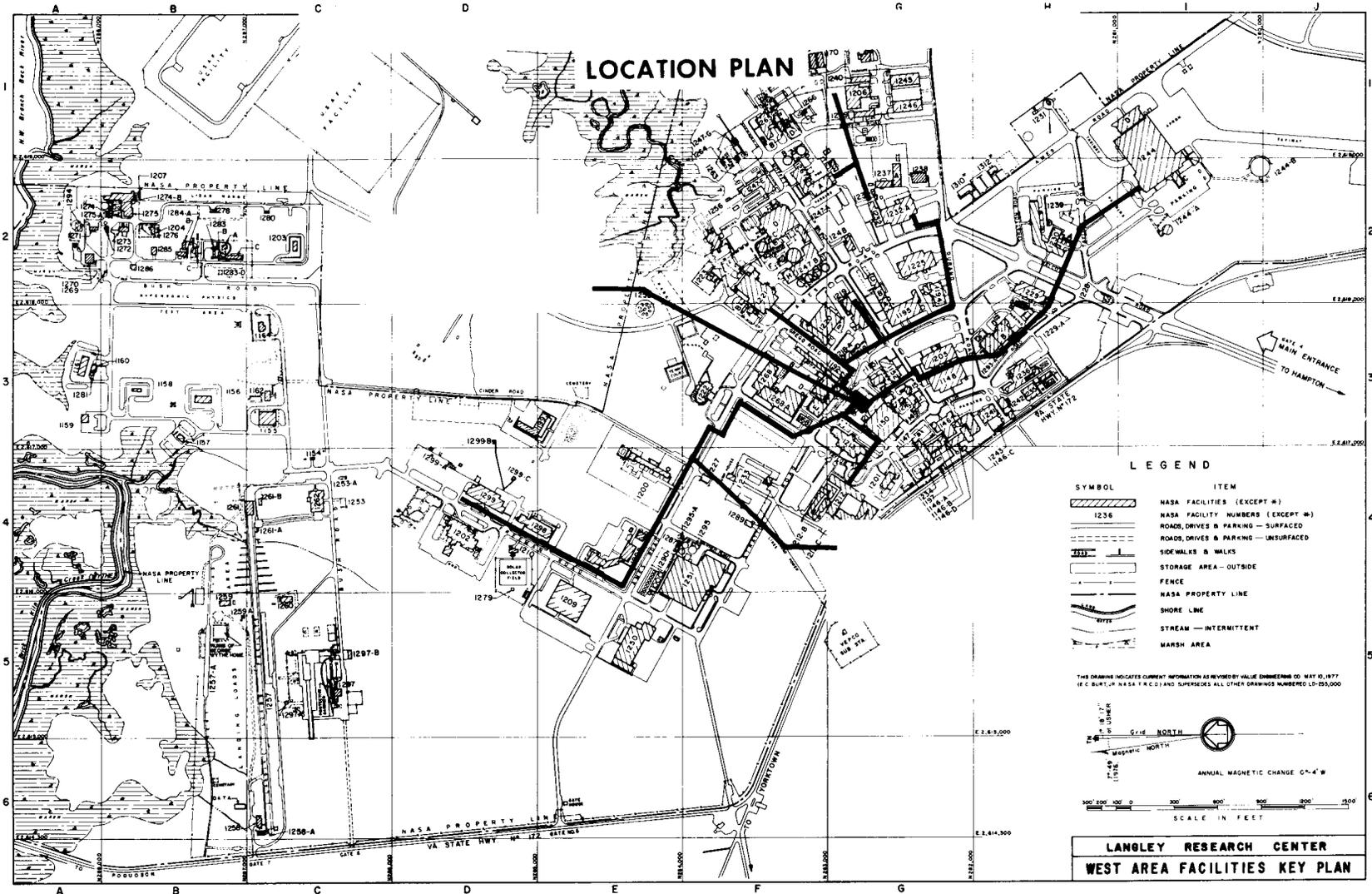




LANGLEY RESEARCH CENTER AND VICINITY

1" = 8 MILES

# LANGLEY RESEARCH CENTER FISCAL YEAR 1980 ESTIMATES







RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1980 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 100 buildings, including wind tunnels, test chambers, laboratories and other research facilities.

The Plum Brook Station established in 1956, is located south of Sandusky, Ohio, about fifty miles west of Cleveland, on land formerly occupied by the Plum Brook Ordnance works. There are 8,005 acres owned and an additional 47 acres in easements. There are 77 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, 1978, was \$429,724,000.

CENTER ROLES AND MISSIONS

The Lewis Research Center 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 high performance civil and military aircraft propulsion systems within environmental, safety, and energy restraints. Development of a technology base to advance the state of the art in aeronautical propulsion systems and components, including internal engine noise reduction, high temperature materials and structures, improved engine efficiency, pollution control, internal computational fluid mechanics and providing technical support to military aviation.

Launch Vehicle Procurement - management and operation of the Centaur launch vehicle system for scientific and applications missions for other federal government and commercial users.

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

Space Energy Processes and Systems Technology - development and maintenance of technology base, including associated structures and materials work.

Energy Technology - conducting energy-related research and development, primarily on a reimbursable basis, with broad emphasis on solar, gas turbine, ground propulsion, and other appropriate terrestrial energy systems.

SUPPORTING

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

Environmental Observations - development of remote sensing technology and systems for applications to water quality in the Great Lakes and to the characterization, mapping, and movement of lake ice and ocean ice.

SUMMARY OF RESOURCES REQUIREMENTS

	<u>FUNDS</u>		<u>1979</u>		<u>1980</u>
	<u>1978</u> <u>Actual</u>	<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>	
		(Thousands of Dollars)			
I. Personnel and Related Costs.....	71,998	80,253	78,334	80,524	
II. Travel.....	1,002	1,187	1,126	1,208	
III. Facilities Services.....	8,912	9,705	10,026	10,894	
IV. Technical Services....	732	565	418	429	
V. Management and Operations..	<u>2,272</u>	<u>2,070</u>	<u>2,609</u>	<u>2,745</u>	
Total, fund requirements .....	<u>84,916</u>	<u>93,780</u>	<u>92,513</u>	<u>95,800</u>	

Distribution of Permanent Positions by Program

	1978	1979		1980
	<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</u> .....	<u>144</u>	<u>129</u>	<u>129</u>	<u>105</u>
Space Shuttle.....	8	---	---	---
Expendable launch vehicles.....	136	129	129	105
<u>Space Science</u> .....	<u>43</u>	---	<u>24</u>	<u>4</u>
Physics and astronomy.....	25	---	6	---
Planetary exploration .....	14	---	14	---
Life sciences.....	4	---	4	4
<u>Space and Terrestrial Applications</u> .....	<u>121</u>	<u>133</u>	<u>121</u>	<u>125</u>
Space applications.....	115	127	115	119
Technology utilization.....	6	6	6	6
<u>Aeronautics and Space Technology</u> .....	<u>2,028</u>	<u>2,091</u>	<u>2,009</u>	<u>2,031</u>
Aeronautics research and technology.....	1,308	1,427	1,325	1,347
Space research and technology.....	370	314	334	334
Energy technology.....	<u>350</u>	<u>350</u>	<u>350</u>	<u>350</u>
Subtotal, direct positions.....	2,336	2,353	2,283	2,265
<u>Center Management and Operations Support Positions</u> .....	<u>585</u>	<u>585</u>	<u>575</u>	<u>570</u>
Total, permanent positions.....	<u>2,921</u>	<u>2,938</u>	<u>2,858</u>	<u>2,835</u>

## PROGRAM DESCRIPTION

### EXPENDABLE LAUNCH VEHICLES

105 Permanent Positions (Civil Service)

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, engineering and management support as well as maintenance and operation of ground support equipment.

In 1980, civil service personnel working on the Centaur Launch Vehicle program will continue to support the launching of both government and commercial payloads. Currently, four Atlas-Centaur launches are scheduled in support of the Navy FLTSATCOM and INTELSAT V programs for COMSAT.

### LIFE SCIENCES

4 Permanent Positions (Civil Service)

The Lewis Research Center has applied its expertise in materials, high-speed rotating machinery, fluid systems, controls, and miniature devices to medical applications for treating diseases of the human eye. With the support of the National Eye Institute (HEW), the Lewis Research Center has developed two significant devices: first, a surgical instrument which can quickly and safely remove any type of human eye cataract and, second, an intraocular pressure reduction and regulation system for use prior to intraocular surgery. Patent applications have been filed for both these instruments. They are now being tested and verified for commercialization by two U.S. eye institutes.

### SPACE APPLICATIONS

119 Permanent Positions (Civil Service)

Space Applications at Lewis Research Center consists of space communications and environmental observations. In 1980, Lewis civil service personnel will continue to support these programs as follows:

Communications - Lewis is studying the capabilities and costs of various advanced satellite communications systems concepts directed at providing additional frequency bands and improved communication service. The studies are being focused on the needs of the public and private sectors both nationally and internationally. Lewis is working on experimental systems with possible application to both the ground and space segments of any future advanced communications systems. Presently orbiting the earth is the joint U.S./Canadian communications Technology Satellite, which utilizes a high power transmitter developed by Lewis. Lewis has begun studies and a technology development program to expand the communication bands usable for communications in order to meet the increasing needs for additional frequencies. This program is directed at the 20 to 30 gigacycles band.

Environmental Observations - Lewis is presently assisting communities in the thermal scan of cities to determine the heat loss of structures and buildings for the purpose of encouraging reduced consumption of our Nation's energy resources. The thermal scanning techniques are also being applied to the real time determination of ocean surface temperatures by remote (airplane or satellite borne) sensors.

Program milestones include verification of remote sensing data for organic and inorganic matter in the Great Lakes, completing the evaluation of coastal zone color scanner algorithms, and complete tests to determine the ability to detect and classify icebergs and ships in the North Atlantic.

#### TECHNOLOGY UTILIZATION

6 Permanent Positions (Civil Service)

In 1980, Lewis civil service personnel in the Technology Utilization Program will be involved in transfer of new knowledge and innovative technology resulting from NASA R&D programs for application in industry, the public sector, and medicine. The primary objectives are to (1) increase the return on the national investment in aerospace R&D, (2) shorten the time from discovery to application, (3) aid the movement of new knowledge to potential users, and (4) contribute to the development of improved means of transferring the new knowledge to other places of potential applications. Examples of areas of present programs are: applications of nickel-zinc batteries (miner's caps, wheelchairs), surface texturing by ion beams (teeth implantation), automated insolation reporter (solar thermal input used by industry), material science (obliterated serial number restoration), and communications (central medical emergency dispatch).

#### AERONAUTICS RESEARCH AND TECHNOLOGY

1,347 Permanent Positions (Civil Service)

Lewis' major responsibility within aeronautics is aeronautical propulsion. The general goals of Lewis are to provide the advanced technology base for developing high-performance 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 1980 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 in turbo-machinery, heat transfer characteristics within turbine blading, friction and wear phenomena, low and high temperature composite materials, fatigue failure mechanisms, emission characteristics in reciprocating and turbine engines, alternate fuels characterization, noise generation mechanisms, and integrated control concepts.

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

In engine systems technology, Lewis is studying problems encountered in complete engines and propulsion systems including: engine performance at altitude, inlet flow distortion effects, dynamic component interactions, thrust augmentation, advanced control systems, techniques for reduced fuel consumption, engine emission and noise reduction, propulsion system-airframe interactions, and aviation safety technology associated with propulsion systems.

Within the aeronautics program at Lewis, work is being performed on a number of major project areas including: materials for advanced turbine engines, energy efficient engine, variable cycle engine, stratospheric cruise emission reduction, engine component improvement, quiet short-haul research aircraft, supersonic cruise research, advanced turboprops, and advanced helicopter transmissions.

#### SPACE RESEARCH AND TECHNOLOGY

#### 334 Permanent Positions (Civil Service)

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 1980 will be used in the activities described below.

The Lewis space propulsion programs include chemical and electric propulsion technology and component and systems development. The chemical propulsion program emphasizes advanced engine systems and components required for future space systems beyond the capability of the Space Shuttle. Improved components and methods of life prediction are being developed and demonstrated, advanced fuel-oxidant combinations are being tested, and complete engine systems tests are being conducted. Technology developments include advanced cooling techniques, fabrication techniques and materials for rocket chambers and nozzles, and advanced high pressure fuel/oxidant feed systems.

Electric propulsion supports both primary propulsion and auxiliary propulsion applications. The primary propulsion technology program consists of further thruster performance verification tests, 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 to verify the performance of a one-millipound thruster, develop and test thruster power systems, and perform complete system verification tests. A technology-readiness experiment is being developed for launch into orbit.

Space power generation studies include solar photovoltaic and electrochemical energy conversion. The photovoltaic program is directed towards 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. Lewis is also conducting a program to advance the state of the art of microwave power amplifiers for potential future applications in communications and power transmission.

The interactions of the space plasma environment with high-voltage power systems and components are being studied and technology is being developed to control these interactions and prevent power system failures.

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. Investigation of fundamental material properties affecting metal matrix composites, high temperature combustion corrosion, and electrochemical processes are also included.

#### ENERGY TECHNOLOGY

#### 350 Permanent Positions (Civil Service)

Civil service personnel will be involved in ongoing energy research and development projects related to meeting program milestones of 1980 and subsequent years.

Lewis provides a supporting research and technology base in terrestrial energy conversion and advanced ground propulsion under sponsorship of the Department of Energy. Presently under development are large wind turbo-generators (200 to 2,500 kilowatts) to help meet public power requirements and photovoltaic power systems where their application appears practical. Other programs at Lewis supporting stationary power generation include improved coal-fired utility gas turbine and magnetohydrodynamic system studies. Energy storage systems for stationary power applications are also under development.

Ground propulsion systems development at Lewis includes advanced heat engines and electric vehicles. The major thrust of the heat engine project is to advance the technology level of the auto gas turbine and Stirling engine propulsion systems such that their application to automotive propulsion would be practical and cost effective. The electric vehicle project provides near-term technology improvements to existing electric vehicle components and systems.

Program milestones for 1980 include completion of design and initiation of hardware fabrication for advanced electric and hybrid vehicle propulsion systems; the testing of ceramic components in auto gas turbine engines for automotive application; and completion, installation and initial operation of a two and one-half megawatt wind turbine.

CENTER MANAGEMENT AND OPERATIONS SUPPORT

570 Permanent Positions (Civil Service)

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

Director and Staff - The Center Director, Deputy Director and immediate staff, e.g., Technology Utilization, Equal Opportunity, Public Affairs, Reliability and Quality Assurance, Shuttle Assessment Office and Chief Scientist.

Management Support - Includes a wide range of activity categorized as management support for programs and functional organizations for the entire Center. Specific functions include resource and budget management, legal and patent counsel, program control, contracting and procurement, personnel management, property management, financial management, environmental health, resource control and management information systems and analysis.

Operations Support - This is a broad spectrum of activity that is required to maintain and operate facilities, buildings, and equipment; and to provide the normal housekeeping services and logistics support for the personnel, who manage and conduct the affairs of the Center. Specific activities are:

- Maintenance and operation of all buildings and facilities
- Data processing and computer support
- Reliability and quality assurance
- Centerwide security and protection
- Fire protection
- Custodial services
- Logistics support including transportation, supplies, etc.
- Medical care of employees
- Photographic and graphic support

PERSONNEL AND RELATED COSTS

	1978	1979		1980
	<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>71,998</u>	<u>80,253</u>	<u>78,334</u>	<u>80,524</u>
<u>Basis of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions.....	63,640	70,880	69,172	71,057
b. Nonpermanent positions.....	800	700	855	909
c. Overtime and other compensation.....	<u>890</u>	<u>1,046</u>	<u>1,008</u>	<u>1,062</u>
Subtotal, Compensation.....	65,330	72,626	71,035	73,028
2. <u>Benefits</u> .....	<u>6,373</u>	<u>7,201</u>	<u>6,933</u>	<u>7,078</u>
Subtotal, Compensation and Benefits.....	<u>71,703</u>	<u>79,827</u>	<u>77,968</u>	<u>80,106</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel.....	35	66	56	58
2. Personnel training.....	<u>260</u>	<u>360</u>	<u>310</u>	<u>360</u>
Subtotal, Supporting Costs.....	<u>295</u>	<u>426</u>	<u>366</u>	<u>418</u>
Total, Personnel and Related Costs.....	<u>71,998</u>	<u>80,253</u>	<u>78,334</u>	<u>80,524</u>
A. <u>Compensation and Benefits</u> .....	<u>71,703</u>	<u>79,827</u>	<u>77,968</u>	<u>80,106</u>
1. <u>Compensation</u> .....	<u>65,330</u>	<u>72,626</u>	<u>71,035</u>	<u>73,028</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
a. Permanent positions .....	63,640	70,880	69,172	71,057

The funds shown will support 2,858 permanent positions in 1979 and 2,835 permanent positions in 1980. The current estimate for 1979 reflects a decrease from the budget estimate. This change is the net effect of an increase in reimbursable activity, a reduction in personnel, and the increased cost due to the October 1978 pay raise. The increase in 1980 is due to the full year effect of the 1978 pay raise plus two additional days which is partially offset by the reduction in permanent civil service workforce.

Basis of Cost for Permanent Positions

In 1980 the cost of permanent positions will be \$72,057,000 an increase of \$1,885,000 over 1979. This increase results from the following:

Cost of permanent positions in 1979.....		69,172
Cost increase in 1980.....		+3,338
Within grade advances and career development		
Full year effect of 1979 actions.....	+780	
Partial year effect of 1980 actions.....	+696	
Full year effect of 1979 pay increases.....	+1,233	
Two extra days in 1980.....	+629	
Cost decreases in 1980.....		-1,453
Turnover savings		
Full year effect of 1979.....	-460	
Partial year effect of 1980 actions.....	-869	
Change in reimbursables.....	-124	
Cost of permanent positions in 1980.....		<u>71,057</u>

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
		<u>Estimate</u>	<u>Estimate</u>	
b. Nonpermanent positions				
1. cost., .....	800	700	855	909
2. Workyears... ..	91	98	103	98

The increase in 1979 from the budget estimate to the current estimate reflects 1978 experience, the effect of the October 1978 pay raise and the experimental part-time employment program. The decrease in work-years is due to the absorption of the part-time program into the permanent position ceiling. The 1980 plan supports a relatively constant temporary program. This effort will support the following programs as shown below:

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative training program.....	<u>40</u>
Summer programs.. ..	10
Youth opportunity programs.....	23
Other temporaries .....	<u>25</u>
Total .....	<u>98</u>

c. Overtime and other compensation. ....	890	1,046	1,008	1,062
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The 1980 increase in overtime and night differential is related to the full year cost of 1978 pay increases. Overtime hours remain constant.

2. <u>Benefits</u> .....	<u>6,373</u>	<u>7,201</u>	<u>6,933</u>	<u>7,078</u>
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Following are the amounts of contribution by category:

<u>Category of Costs</u>	1978	1979		1980
	<u>Actual</u>	<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	<u>Budget Estimate</u>
Civil Service Retirement Fund. ....	4,381	4,986	4,842	4,974
Employee life insurance. ....	250	305	246	251
Employee health insurance... ..	1,400	1,586	1,463	1,489
Workman's compensation .....	226	240	240	248
FICA..... ..	25	20	30	30
Incentive awards..... ..	68	60	75	80
Other benefits.. ..	4	4	5	6
Severance pay. ....	<u>19</u>	<u>---</u>	<u>32</u>	<u>---</u>
Total. ....	<u>6,373</u>	<u>7,201</u>	<u>6,933</u>	<u>7,078</u>

The increase in 1980 is due to the increase in permanent compensation.

B. <u>Supporting Costs.</u> .....	<u>295</u>	<u>426</u>	<u>366</u>	<u>418</u>
1. Transfer of personnel. ....	35	66	56	58

The increase in transfer of personnel in 1979 and 1980 over 1978 is due to increased recruiting to meet the requirements of maintaining a constant complement.

2. Personnel training .....	260	360	310	360
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About 38% of the training cost is for technically oriented training. Another 33% is provided specifically for the scientific and engineering staff. The remaining 29% supports other programs, including administrative and clerical. Training in 1978 was restricted due to budget limitations. The reduction in 1979 from the budget estimate to the current estimate is a result of the 1978 cutback. The 1979 and 1980 levels include funds for announced increases in tuition, primarily in the minority training programs.

TRAVEL

	<u>1978</u> <u>Actual</u>	<u>1979</u> <u>Budget Estimate</u> <u>Current Estimate</u> (Thousands of Dollars)		<u>1980</u> <u>Budget Estimate</u>
II. <u>TRAVEL</u> .....	<u>1.002</u>	<u>1.187</u>	<u>1,126</u>	<u>1,208</u>
<u>Basis of Fund Requirements</u>				
A. Program Travel. ....	814	992	931	1,004
B. Scientific and Technical Meeting Travel.....	114	119	125	130
C. Management and Operations Travel.. ..	<u>74</u>	<u>76</u>	<u>70</u>	<u>74</u>
Total, Travel .....	<u>1.002</u>	<u>1.187</u>	<u>1,126</u>	<u>1,208</u>
A. <u>Program Travel</u> .... ..	<u>814</u>	<u>992</u>	<u>931</u>	<u>1,004</u>

Program travel is directly related to the accomplishment of the Center's mission, and accounts for approximately 83% of the travel costs. It provides funds necessary to manage major contractual programs in Aeronautical Research and Technology, space propulsion, materials research and development, and Energy Technology. Program travel is essential to the management and procurement of launch vehicles. The increase in 1980 is due to the increased travel in support of the Aeronautical Research and Technology program.

B. <u>Scientific and Technical Meeting Travel</u> .. ..	<u>114</u>	<u>119</u>	<u>125</u>	<u>130</u>
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Scientific and technical meeting 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 LeRC, 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.

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
C. <u>Management and Operations Travel</u> .....	<u>74</u>	<u>76</u>	<u>70</u>	<u>74</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.

FACILITIES SERVICES

Lewis Research Center (LeRC) occupies 366 acres of grounds and a complex of facilities made up of test and office-type buildings and aircraft engine research facilities.

This complex encompasses 2,211,493 gross square feet of building space including 12 major buildings. Also included are eight major technical facilities. This physical plant houses an average daily on-Center population of 3,000 to 3,300 personnel. Many of the test facilities are utilized on more than one shift and/or during off-peak hours.

The estimates also include certain resources associated with plant needs at its component installation, the Plum Brook Operations Division.

III. <u>FACILITIES SERVICES</u> .....	<u>8,912</u>	<u>9,705</u>	<u>10,026</u>	<u>10,894</u>
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Basis of Fund Requirements

A. Maintenance and Related Services

1. Facilities.... ..	1,703	745	901	930
2. Equipment .....	<u>93</u>	<u>35</u>	<u>75</u>	<u>76</u>
Subtotal.... ..	<u>1,796</u>	780	<u>976</u>	<u>1,006</u>

B. <u>Custodial Services</u> .....	.....	<u>1,802</u>	<u>1,980</u>	<u>1,929</u>	<u>2,075</u>
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	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
		<u>Estimate</u>	<u>Estimate</u>	
<u>Utilities Services.. .. .</u>	5,314	6,945	7,121	7,813
Total, Facility Services .. . . . . .	<u>8,912</u>	<u>9,705</u>	<u>10,026</u>	<u>10,894</u>
A. <u>Maintenance and Related Services.....</u> . . . . .	1,796	780	976	1,006
1. Facilities. . . . .	1,703	745	901	930

This activity involves the LeRC facilities as well as those of Plum Brook Station. It provides for 14 workyears of effort to provide for maintenance, repair, and alterations of buildings and grounds. 1978 maintenance was exceptionally high due to necessary repairs caused by severe winter damage. Some of these repairs included fixing sidewalks and curbs, roads, roofs, and tuck pointing. The increase in 1979 from the budget estimate to the current estimate is due to the deferral of some maintenance work into 1979. The services provided are level from 1979 to 1980.

2. Equipment .. . . . . .	93	35	75	76
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1978 reflects a special one-time purchase of shop equipment. Both 1979 and 1980 represent a return to the 1977 level.

B. <u>Custodial Services.....</u> . . . . .	<u>1,802</u>	<u>1,980</u>	<u>1,929</u>	<u>2,075</u>
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This activity involves 122 workyears of effort at LeRC to provide for security, janitorial, and fire protection services. The increase in the 1980 estimate is primarily due to negotiated increases in contractor wage rates. The major services are distributed as follows:

1. Security (43 workyears) .. . . . . .	739
2. Janitorial (63 workyears) .. . . . . .	907
3. Other services (16 workyears) .. . . . . .	429

This activity includes rubbish disposal, fly ash removal, and industrial cleaning of walls, lights and windows on an as-needed basis, laundry services, and supplies and materials. Custodial services for the Plum Brook Station are included here.

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
C. <u>Utilities Services</u> .....	5,314	6,945	7,121	7,813

The 1980 estimate covers the projected consumption at the Lewis Research Center and the Plum Brook Test Station. Electrical power is provided by the local utility company with locally procured fuel oil being used as a central plant fuel at both sites. Natural gas is the primary heating fuel used at Lewis with fuel oil and coal as back-up depending on the market situation. Fifteen workyears of contractor effort provide for the operation of the central heating plant. Since the 1979 budget estimate utility consumption figures have been revised. The increase in 1979 from the budget estimate to the current estimate is due to increased utility costs, primarily electricity, coal and natural gas. There is a planned reduction in utility consumption of 12 percent from the 1979 budget estimate. In 1980 there is a further decrease in consumption; however, the saving is exceeded by increased rates. The distribution of the utilities budget is as follows:

1. Electricity (160,000 MW/Hrs.) .....	5,840
2. Natural Gas (280,600 K cu. ft.) .....	769
3. Fuel Oil (214,000 gals.) .....	96
4. Coal (7,000 tons).....	501
5. Steam Plant Support Contractor (15 workyears) .....	427
6. Water and Sewage.....	180

TECHNICAL SERVICES

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	
IV. <u>TECHNICAL SERVICES</u> .....	<u>732</u>	<u>565</u>	<u>418</u>	<u>429</u>
<u>Basis of Fund Requirements</u>				
A. <u>Automatic Data Processing</u>				
1. Equipment .....	14	22	29	13
2. Operations .....	<u>182</u>	<u>217</u>	<u>189</u>	<u>213</u>
Subtotal.. .....	<u>196</u>	<u>239</u>	<u>218</u>	<u>226</u>
B. <u>Scientific and Technical Information</u>				
1. Library .....	44	30	43	43
2. Education and Information. ....	492	231	157	<u>160</u>
Subtotal. ....	<u>536</u>	261	<u>200</u>	<u>203</u>
C. <u>Shop Support and Other Services</u> .....	<u>---</u>	<u>65</u>	<u>---</u>	<u>---</u>
Total, Technical Services .....	<u>732</u>	<u>565</u>	<u>418</u>	<u>429</u>
A. <u>Automatic Data Processing</u> .....	<u>196</u>	<u>239</u>	<u>218</u>	<u>226</u>

The funding provides for administrative data processing including equipment maintenance, programming and operation.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
1. Equipment .....	14	22	29	13
Equipment rental and maintenance are included in this activity.				
2. Operations .....	182	217	189	213
Seven support contractor workyears make up the services of the on-site keypunch support contract. The decrease in 1979 from the budget estimate to the current estimate is due to 1978 experience. The 1980 increase is due to support contractor wage increases.				
B. <u>Scientific and Technical Information</u> .....	<u>536</u>	<u>261</u>	<u>200</u>	<u>203</u>
Included in this activity are the purchase of books, supplies, and materials required for the operation of the Lewis Research Center library. Also provided are the public information services and the operation of the Visitor Information Center.				
1. Library .....	44	30	43	43
The increase in 1979 from the budget estimate to the current estimate is due to 1978 experience; purchases are expected to remain constant through 1980.				
2. Education and Information.....	492	231	157	160
The 1978 amount includes one-time costs of completing several exhibits in the Visitor Information Center. The normal level effort of services is provided in 1979 and 1980.				
C. <u>Shop Support and Services</u> .....	<u>---</u>	<u>65</u>	<u>---</u>	<u>---</u>
In the 1979 budget estimate, supplies and materials included in this function have been recategorized to the Management and Operations function.				

MANAGEMENT AND OPERATIONS

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		Estimate	Estimate	Estimate
		(Thousands of Dollars)		
V. <u>MANAGEMENT AND OPERATIONS...</u> .....	<u>2.272</u>	<u>2,070</u>	<u>2.609</u>	<u>2.745</u>
		<u>Basis of Fund Requirements</u>		
A. Administrative Communications.....	601	810	740	751
B. Printing and Reproduction.....	31	28	5	5
C. Transportation.....	322	578	589	601
D. Installation Common Services.....	<u>1,318</u>	<u>654</u>	<u>1,275</u>	<u>1,388</u>
Total, Management and Operations	<u>2.272</u>	<u>2.070</u>	<u>2.609</u>	<u>2.745</u>
A. <u>Administrative Communications</u> .....	<u>601</u>	<u>810</u>	<u>740</u>	<u>751</u>

This estimate provides for leased lines and equipment for local and long distance telephone service, Federal Telecommunications Service (FIS), trunklines for Federal communications, and non-telephone communications including telex, advanced records system, datafax and teleconference equipment. The decrease in 1979 from the budget estimate to the current estimate is due to the recategorization of postage to the Installation Support Services function. This is partially offset by rate increases from the Ohio Bell Company. The increase in 1980 is related to estimated rate increases in service.

1. Local telephone service..... 356

This activity includes the leased lines and equipment necessary to serve the Center. This includes approximately 1,785 instruments, 800 stations and 40 incoming and outgoing lines.

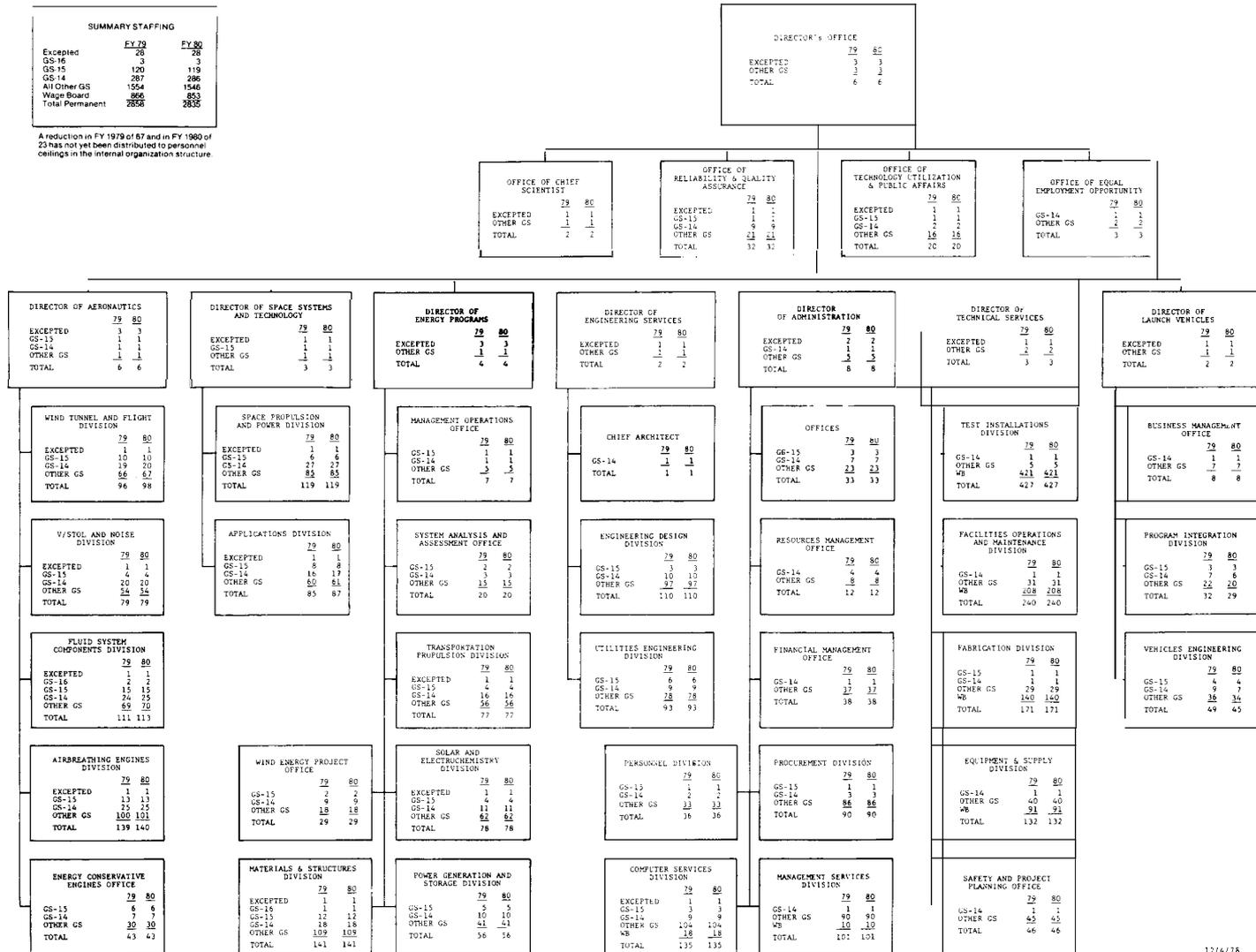
	<u>1978</u>	<u>1979</u>		<u>1980</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		(Thousands of Dollars)		<u>Estimate</u>
		<u>Estimate</u>	<u>Estimate</u>	
2. Long distance telephone service.....				380
Commercial long distance costs, FTS costs, and overseas calls are included in category.				
3. Non-telephone communications.....				15
This estimate includes funds for one telex instrument, one GSA teletype, advanced record systems unit, one "rapidfax", one "datafax", four teleconference units, and oceanic cable service.				
B. <u>Printing and Reproduction</u> .....	<u>31</u>	<u>28</u>	<u>5</u>	<u>5</u>
This activity includes general printing services and printing of the Lewis News. The decrease in 1979 is due to the Lewis News no longer being printed inhouse.				
C. <u>Transportation</u> .....	<u>322</u>	<u>578</u>	<u>589</u>	<u>601</u>
This function includes services for moving and hauling, packing and crating, special maintenance of motor vehicles, procurement, aircraft operation and maintenance. Two support contractor workyears are utilized for heavy equipment maintenance at Plum Brook.				
D. <u>Installation Common Services</u> .....	<u>1,318</u>	<u>654</u>	<u>1,275</u>	<u>1,388</u>
This funding provides for 42 workyears of support contractor effort to support Center management and staff activities, medical services, and various installation support services. The increase in 1979 from the budget estimate and the current estimate is due to three main factors: the recategorization of postage in this function; a new medical program that was begun in 1978 at LeRC which involves an increase of eight support contractor workyears; and, an increase of two support contractor workyears in the medical program at the Plum Brook Station, In 1980, the level of services being provided is unchanged.				
1. Center management and staff. ....				82
This funding provides for a support service contract for center management and administrative records keeping.				

	<u>1978</u>	<u>1979</u>		<u>1980</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. Medical services.....				438
<p>This category includes the cost of our health unit support service contract and medical supplies and routine medical examinations provided through our in-house occupational medicine program.</p>				
3. Installation support services.....				868
<p>This function includes the support service contracts for mail and package distribution services, and the stock issuance and warehousing operations. Also included are the purchase and maintenance of office machines and equipment, and postage.</p>				

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

SUMMARY STAFFING		
	FY 79	FY 80
Excepted	28	28
GS-16	3	3
GS-15	120	119
GS-14	287	286
All Other GS	1554	1546
Wage Board	866	853
Total Permanent	2858	2835

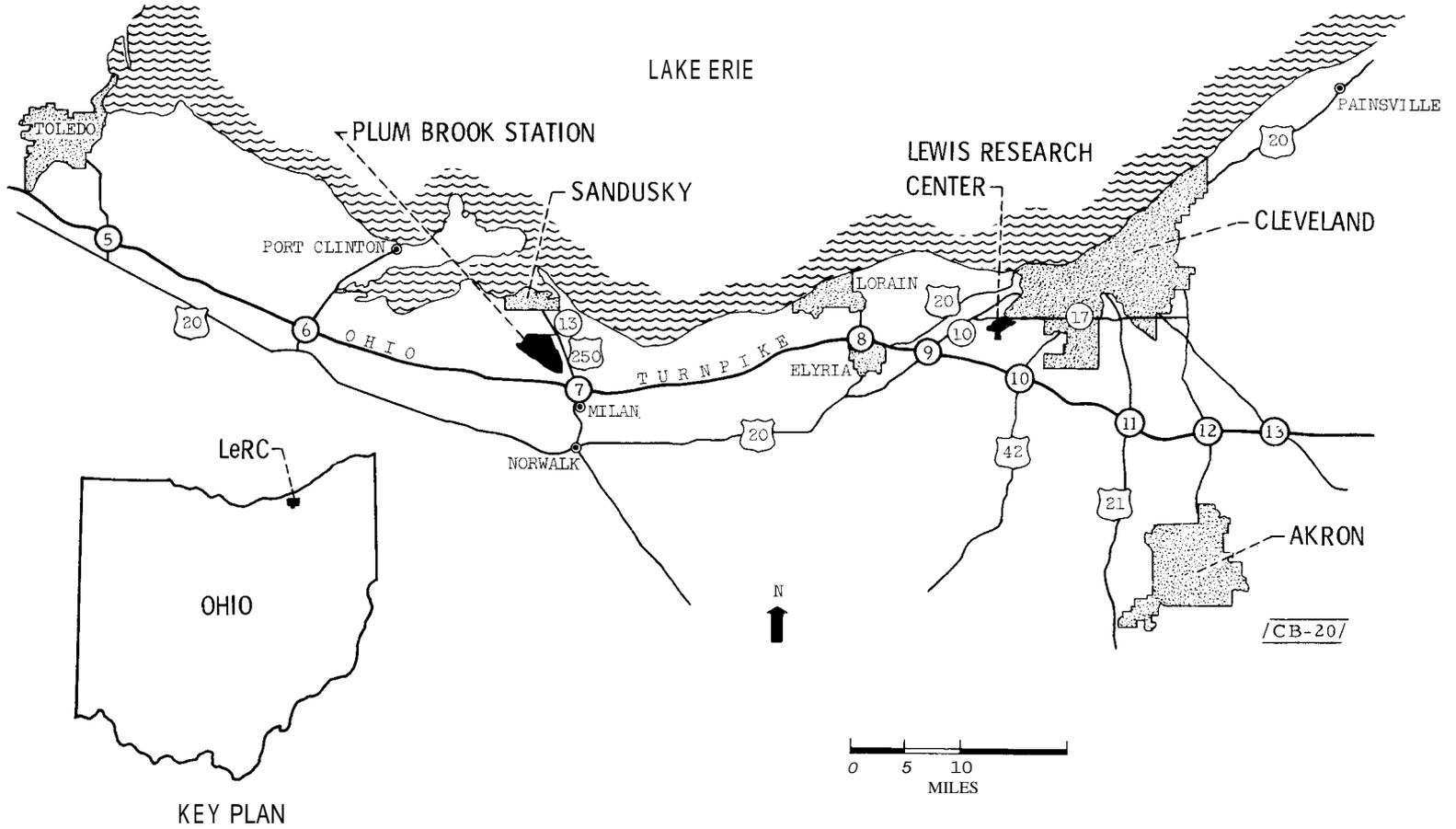
A reduction in FY 1979 of 57 and in FY 1980 of 23 has not yet been distributed to personnel ceilings in the internal organization structure.



12/4/78

LEWIS RESEARCH CENTER  
FISCAL YEAP 1980 ESTIMATES

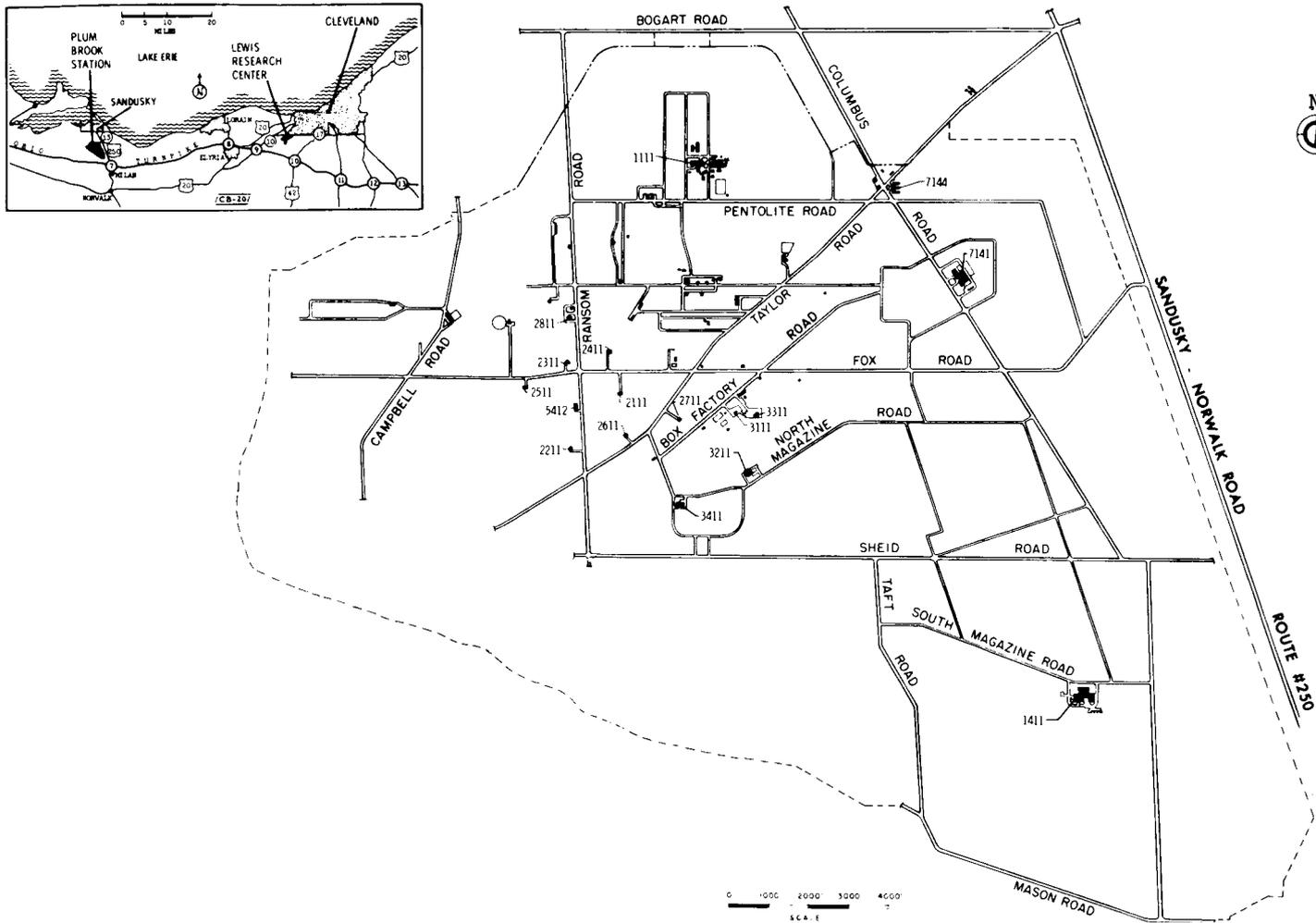
AREA MAP





LEWIS RESEARCH CENTER  
PLUM BROOK STATION  
FISCAL YEAR 1980 ESTIMATES

LOCATION PLAN

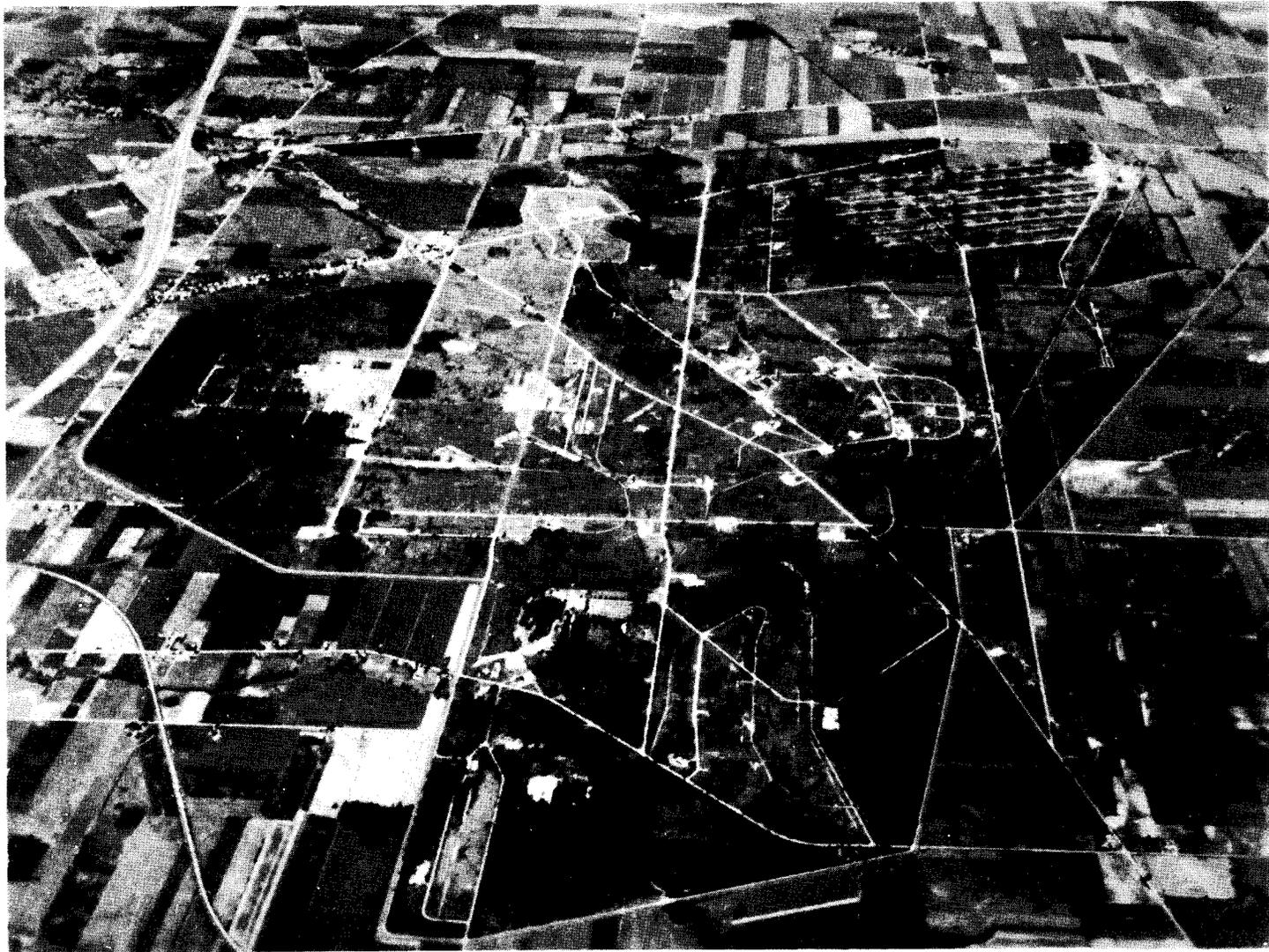


LEWIS RESEARCH CENTER  
FISCAL YEAR 1980 ESTIMATES  
CLEVELAND FACILITIES

RPM 10-26



LEWIS RESEARCH CENTER  
FISCAL YEAR 1980 ESTIMATES  
PLUM BROOK FACILITIES



## RESEARCH AND PROGRAM MANAGEMENT

### FISCAL YEAR 1980 ESTIMATES

#### NASA HEADQUARTERS

##### DESCRIPTION

NASA Headquarters is located at 400 Maryland Avenue, SW, Washington, DC, and also occupies other buildings in the District of Columbia, Maryland and Virginia. Except for some office space leased in the District of Columbia and a storage area in Virginia, 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 direction for the programs authorized by the Congress and to implement the national objectives stated in the National Aeronautics and Space Act of 1958, as amended. These objectives are to:

1. Extend our knowledge of the Earth, its environment, the solar system, and the universe;
2. Expand practical applications of space technology;
3. Develop, operate, and improve manned and unmanned space vehicles;
4. Improve the civil and military usefulness of aeronautical vehicles, while minimizing their environmental effects and energy consumption.
5. Disseminate pertinent findings to potential users; and
6. 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 - Responsible for the research, development and operations of space flight programs including the Space Shuttle, which will enable the U.S. Government, foreign, and commercial users to place a wide variety of payloads into Earth orbit in the 1980's. The Space Transportation System consists of the Shuttle, the first reusable Earth-to-orbit vehicle, and the Spacelab, an experiments payload carrier being developed by the European Space Agency. The Space Transportation Systems Office also has program responsibility for expendable launch vehicles and for conducting advanced studies.

Office of Space Science - Responsible for scientific research and development effort to increase scientific knowledge and understanding of the universe and its component parts and the effects of the space environment on living systems.

Office of Space and Terrestrial Applications - Responsible for the conduct of 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, materials processing in space, and technology utilization.

Office of Aeronautics and Space Technology - Responsible for 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 energy program provides an interface with and 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, DC. The overall capability of the agency to operate effectively is dependent upon sufficient R&PM funds to hire and support a Headquarters workforce to give direction and coordination to ensure accomplishment of the agency mission. This portion of the budget is prepared to reflect requirements to accomplish the following objectives:

- o To provide a balanced Agency Headquarters workforce capable of planning and providing executive direction to the programs authorized by the Congress and implementing the national objectives stated in the National Aeronautics and Space Act of 1958, as amended.
- o To 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.

- o To provide adequate facilities to house the workforce in Washington, DC.
- o To 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 pay, travel and necessary support services are included in this portion of the budget submission. Each office is assigned a function consistent with carrying out the 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 and management or support of the Headquarters. Included are such offices as the Chief Scientist, Chief Engineer, Comptroller, General Counsel, External Relations, Management Operations, Aerospace Safety Advisory Panel, Equal Opportunity, Procurement and the Inspector General. The Headquarters currently has eleven (11) centers throughout the U.S. which perform agency operational missions under direction of the Headquarters staff.

The Headquarters supporting workforce is organized to perform agency and Headquarters roles, although some elements perform only Headquarters support functions. For example, the Office of Headquarters Administration provides for support to the personnel and physical plant in Washington while the Office of Personnel Programs provides both Headquarters and Agency direction and support with respect to personnel requirements.

Facilities consist of the General Services Administration (GSA) leased space at FB-6, FB-10B and Reporters Building in Washington, DC, and a storage area in Virginia, and the scientific and technical information facility in nearby Maryland.

Technical support required by Headquarters is performed primarily by support service contractors. Currently, contractors support Headquarters automatic data processing and the scientific and technical information program. Administrative and logistical support is provided by the in-house workforce assisted by miscellaneous contract services. Such support includes communications, printing, supplies, materials, equipment, transportation, occupational medicine and health, and miscellaneous administrative support services.

SMMARY OF RESOURCES REQUIREMENTS

FUNDS

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
I Personnel and Related Costs .	52,528	54,317	55,708	55,893
II Travel.....	2,385	2,545	2,494	2,697
III Facilities Services.....	4,988	5,610	5,576	5,002
IV. Technical Services.....	15,195	15,082	15,289	15,989
V Management and Operations .	0	0	0	<u>7,256</u>
Total, fund requirements.....	<u>81,125</u>	<u>84,532</u>	<u>86,046</u>	<u>87,497</u>

Distribution of Permanent Positions by Program

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u>	<u>Current Estimate</u>	
<u>Direct Positions</u>				
<u>Space Transportation Systems</u>	<u>196</u>	<u>203</u>	<u>196</u>	<u>196</u>
Space Shuttle.....	77	75	77	70
Space flight operations.....	105	117	105	112
Expendable launch vehicles.....	14	11	14	14

	1978 Actual	1979		1980
		Budget Estimate	Current Estimate	Budget Estimate
<u>Space Science.....</u>	<u>104</u>	104	<u>104</u>	<u>101</u>
Physics and astronomy. ....	51	39	51	48
Planetary exploration.....	30	46	30	30
Life sciences.....	23	19	23	23
<u>Space and Terrestrial Applications.....</u>	<u>112</u>	<u>111</u>	111	<u>114</u>
Space applications.....	92	92	92	95
Technology utilization.. ..	20	19	19	19
<u>Aeronautics and Space Technology.....</u>	<u>159</u>	<u>155</u>	<u>159</u>	<u>159</u>
Aeronautical research and technology.....	81	77	81	81
Space research and technology.. ..	58	58	58	58
Energy technology.....	20	20	20	20
<u>Space Tracking and Data Systems.....</u>	<u>46</u>	<u>42</u>	<u>46</u>	46
Tracking and data acquisition.....	<u>46</u>	<u>42</u>	<u>46</u>	<u>46</u>
Subtotal, 'direct positions .....	617	615	616	616
<u>Management and Operations Support Positions.....</u>	<u>914</u>	<u>920</u>	<u>888</u>	<u>877</u>
Total, permanent positions .....	<u>1,531</u>	<u>1,535</u>	<u>1,504</u>	<u>1,493</u>

PERSONNEL AND RELATED COSTS

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	
I. <u>PERSONNEL AND RELATED COSTS</u> .....	<u>52.528</u>	<u>54,317</u>	<u>55,768</u>	<u>55,893</u>
<u>Basis of Fund Requirements</u>				
A. <u>Compensation and Benefits</u>				
1. <u>Compensation</u>				
a. Permanent positions .....	45,916	46,930	48,135	48,236
b. Nonpermanent .....	906	1,175	1,205	1,203
c. Reimbursable detailees .....	249	279	310	314
d. Overtime and other compensation .....	<u>255</u>	<u>277</u>	<u>342</u>	<u>343</u>
Subtotal. Compensation .....	47,326	48,661	49,992	50,096
2. <u>Benefits</u> .....	<u>4,422</u>	<u>4,553</u>	<u>4,658</u>	<u>4,691</u>
Subtotal. Compensation and Benefits .....	<u>51,748</u>	<u>53,214</u>	<u>54,650</u>	<u>54,787</u>
B. <u>Supporting Costs</u>				
1. Transfer of personnel .....	163	220	220	234
2. Office of Personnel Management Services .....	78	138	138	140
3. Personnel training .....	<u>539</u>	<u>745</u>	<u>760</u>	<u>732</u>
Subtotal. Supporting Costs .....	<u>780</u>	<u>1,103</u>	<u>1,118</u>	<u>1,106</u>
Total. Personnel and Related Costs .....	<u>52,528</u>	<u>54,317</u>	<u>55,768</u>	<u>55,893</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Compensation and Benefits</u> .....	<u>51,748</u>	<u>53,214</u>	<u>54,650</u>	<u>54,787</u>
1. <u>Compensation</u> .....	<u>47,326</u>	<u>48,661</u>	<u>49,992</u>	<u>50,096</u>
a. Permanent positions .....	45,916	46,930	48,135	48,236

The cost for permanent positions is the largest part of Personnel and Related Costs. The funds shown above will support 1,504 permanent positions in 1979, and 1,493 permanent positions in 1980.

Basis of Cost for Permanent Positions

The estimate for permanent compensation (starting from prior year cost) is based upon the position structure at the start of the year, as modified by the addition of new positions and abolishment of existing positions, within grade advances, career development, and the October 1978 pay raise. After these modifications, the year-end position structure is established and the cost effect for the year is calculated based on the estimated period that these modifications are in effect as follows:

Cost of permanent positions in 1979 .....	48,135
Cost of increases in 1980 .....	+1,220
Within grade advances and career development:	
Full year effect of 1979 actions .....	+391
Partial year effect of 1980 actions .....	+414
Full year effect of October 1978 pay raise .....	+44
Two extra days .....	+371
Cost decreases in 1980 .....	-1,119
Turnover savings:	
Full year effect of 1979 actions .....	-677
Partial year effect of 1980 actions .....	-442
Cost of permanent positions in 1980 .....	<u>48,236</u>

	1978	<u>1979</u>		1980
	<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. Nonpermanent positions				
1. cost.....	906	1,175	1,205	1,203
2. Number of workyears.....	87	105	113	108

The increase in the 1979 current estimate over the budget estimate is due to the effect of the October 1978 pay raise, an increase in the disadvantaged youth programs and the implementation of an experimental part-time employment program. The change in 1980 reflects a continuation at the same level except for the absorption of the part-time program into the permanent position ceiling.

The 1980 plan includes 108 nonpermanent workyears, which will be used to support the following programs at the levels indicated below.

Distribution of Nonpermanent Workyears by Program

<u>Program</u>	<u>Workyears</u>
Cooperative program.....	12
Summer program.....	18
Youth opportunity program.....	41
Other temporary employment.....	37
<b>Total.....</b>	<b>..... <u>108</u></b>

c. Reimbursable detailees .....	249	279	310	314
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These funds provide for the services of military officers and civilians who are detailed from other Government agencies to NASA Headquarters where such assignments are of mutual benefit. The number detailed varies from seven to sixteen, all of whom are assigned to Headquarters program offices with the exception of three that are assigned to the Office of Facilities. The estimates for 1979 and 1980 will cover the cost of ten workyears. The 1979 current estimate and the 1980 estimate are increased from the 1979 budget estimate to reflect an increase of one workyear, as well as the cost of the October 1978 pay raise.

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u> <u>Budget</u> <u>Estimate</u>
		<u>Budget</u> <u>Estimate</u>	<u>Current</u> <u>Estimate</u>	
		(Thousands of Dollars)		
d. Overtime and other compensation.....	255	277	342	343

The increase in the 1979 current estimate over the budget estimate reflects increased activity associated with key program milestones, especially the Shuttle program, and events within various management and operating offices, and the October 1978 pay raise. 1980 is essentially level with 1979.

2. <u>Benefits</u> .....	<u>4,422</u>	<u>4,553</u>	<u>4,658</u>	<u>4,691</u>
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In addition to compensation, NASA makes an employer's contribution to personnel benefits as authorized and required by law. The increase in the 1979 current estimate and 1980 budget estimate from the 1979 budget estimate reflects the cost of the October 1978 pay raise partially offset by the savings due to the manpower reductions. The following table indicates the costs of personnel benefits by the various cost categories:

Category of Cost

Civil Service Retirement Fund.....	3,217	3,291	3,378	3,365
Employee life insurance.....	197	215	212	217
Employee health insurance.....	718	726	730	733
Workmen's compensation.....	125	129	90	128
FICA.....	47	69	68	68
Incentive awards.....	97	90	145	145
Severance pay.....	<u>21</u>	<u>33</u>	<u>35</u>	<u>35</u>
Total.....	<u>4,422</u>	<u>4,553</u>	<u>4,658</u>	<u>4,691</u>
B. <u>Supporting Costs</u> .....	<u>780</u>	<u>1,103</u>	<u>1,118</u>	<u>1,106</u>

Supporting personnel costs provide for the expenses of moving employees to their initial duty station or reassignment; for security investigations and other recruitment costs; and for maintaining and expanding the skills of our employees. These costs are summarized as follows:

	<u>1978</u> <u>Actual</u>	<u>1979</u>		<u>1980</u>
		<u>Budget</u> <u>Estimate</u> (Thousands of Dollars)	<u>Current</u> <u>Estimate</u>	<u>Budget</u> <u>Estimate</u>
1. Transfer of personnel .....	163	220	220	234

Legislation enacted in 1966 provided that the Government would pay for certain relocation costs which are budgeted in this category, such as the expenses of selling and buying a home and the cost of family relocations. The estimated costs for 1979 and 1980 are based on the number and historical average cost of relocations.

2. Office of Personnel Management services.....	78	138	138	140
---	----	-----	-----	-----

Headquarters reimburses the Office of Personnel Management and others for investigation of new hires and Equal Employment Opportunity complaints for the entire agency. The cost of investigation is a function of two variables, the number of investigations to be conducted, and the unit charge made by the Office of Personnel Management or other agencies. There is also a payment to the Commission for Federal wage system surveys and any requested investigation of formal discrimination complaints.

3. Personnel training.....	539	745	760	732
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The maintenance and expansion of the skills is essential in carrying out the agency's many complex technical programs. Such training is provided within the framework of the Government Employees Training Act of 1958. 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. Such training is used to maintain and expand employees skills. The 1980 estimate is \$28,000 less than the 1979 current estimate due to a decrease in agencywide training and attendance at the Federal Executive Institute.

TRAVEL

	1978	1979		1980
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
11. <u>TRAVEL</u> .....	<u>2,385</u>	<u>2,545</u>	<u>2,494</u>	<u>2,697</u>

Basis of Fund Requirements

A. Program Travel.....	906	1,095	1,095	1,201
B. Scientific and Technical Meeting Travel.....	266	235	235	305
C. Management and Operations Travel.....	<u>1,213</u>	<u>1,215</u>	<u>1,164</u>	<u>1,191</u>
Total, Travel...	<u>2,385</u>	<u>2,545</u>	<u>2,494</u>	<u>2,597</u>
A. <u>Program Travel</u> .....	<u>906</u>	<u>1,095</u>	<u>1,095</u>	<u>1,201</u>

Program travel funds are used in support of NASA's research and development programs, such as the Space Shuttle, Aeronautics, Space and Terrestrial Applications, and other direct Research and Development (R&D) projects. This category represents approximately 45% of the Headquarters travel requirements for 1980. The increase in travel is due principally to the increased number of trips planned for 1980.

B. <u>Scientific and Technical Meeting Travel</u> .....	<u>266</u>	<u>235</u>	<u>235</u>	<u>305</u>
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Scientific and technical meeting 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 in 1980 is an attempt to restore the Headquarters scientific and technical meeting travel to a level in line with the 1978 level after adjustment for increases in transportation costs.

	<u>1978</u>	<u>1979</u>		<u>1980</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 Travel</u> .....	1,213	1,215	1,164	1,191

Management and operations travel is for the direction and coordination of general management matters. It includes travel by senior officials to review Center requirements and operations, travel in such areas as personnel, financial management, and procurement to assure agency policies and procedures are being implemented properly throughout the agency; local transportation; and Congressional travel.

#### FACILITIES SERVICES

NASA Headquarters involves a complex of buildings in the District of Columbia and nearby Maryland and Virginia. These are either Government-owned or leased buildings for which NASA must provide reimbursement to GSA in accordance with P.L. 92-313.

This complex encompasses some 556,790 gross square feet of building space including six buildings. This complex of primarily office space supports an average daily Headquarters population of 2,000 to 2,100 personnel. The personnel are engaged in a one-shift operation exercising management over the centers that constitute the National Aeronautics and Space Administration.

III. <u>FACILITIES SERVICES</u> .....	<u>4,988</u>	<u>5,610</u>	<u>5,576</u>	<u>5,662</u>
<u>Basis of Fund Requirements</u>				
A. <u>Rental of Real Property</u> .....	<u>4,454</u>	<u>4,777</u>	<u>4,768</u>	<u>4,866</u>
B. <u>Maintenance and Related Services</u>				
1. <u>Facilities</u> .....	411	669	644	629
2. <u>Equipment</u> .....	---	10	---	---
Subtotal....	<u>411</u>	<u>679</u>	<u>644</u>	<u>629</u>
C. <u>Custodial Services</u> .....	<u>123</u>	<u>154</u>	<u>164</u>	<u>167</u>
Total, Facilities Services...	<u>4,988</u>	<u>5,610</u>	<u>5,576</u>	<u>5,662</u>

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	
A. <u>Rental of Real Property</u> .....	<u>4,454</u>	<u>4,777</u>	<u>4,768</u>	<u>4,866</u>

This provides space for personnel as well as storage and warehouse space for equipment, supplies and materials. The requirements are approximately the same as those rented in 1979, however, the 1980 total cost increase reflects increased rental rates as projected by GSA.

B. <u>Maintenance and Related Services</u> .....	<u>411</u>	<u>679</u>	<u>644</u>	<u>629</u>
1. <u>Facilities</u> .....	<u>411</u>	<u>669</u>	<u>644</u>	<u>629</u>

This estimate includes funds for maintenance and alterations such as partition changes, telephone changes and general buildings maintenance. The 1979 budget estimate included \$25,000 for medical equipment maintenance that has been realigned to the Management and Operations function in the 1979 current and 1980 budget estimates.

2. <u>Equipment</u> .....	<u>---</u>	<u>10</u>	<u>---</u>	<u>---</u>
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This category in the 1979 budget estimate included funds for the maintenance and repair of security alarm systems. The budget has since been realigned and this item is now contained in Custodial Services below.

C. <u>Custodial Services</u> .....	<u>123</u>	<u>154</u>	<u>164</u>	<u>167</u>
1. <u>Security guard service</u> .....	<u>119</u>	<u>154</u>	<u>154</u>	<u>157</u>
These funds cover security guard service in the Headquarters buildings.				
2. <u>Security Alarm Systems</u> .....	<u>4</u>	<u>---</u>	<u>10</u>	<u>10</u>

This estimate includes reimbursement to GSA for the installation and maintenance of the security alarm systems and equipment in the NASA Headquarters buildings.

TECHNICAL SERVICES

	<u>1978</u>	<u>1979</u>		<u>1980</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)		
IV. <u>TECHNICAL SERVICES</u> .....	<u>15,195</u>	<u>15.082</u>	<u>15,289</u>	<u>15,989</u>

Basis of Fund Requirements

A. Automatic Data Processing

1. Equipment .....	1,608	1,800	1,279	1,298
2. Operations .....	<u>3,042</u>	<u>3,962</u>	<u>3,597</u>	<u>3,752</u>
Subtotal.....	<u>4,650</u>	<u>5,762</u>	<u>4,876</u>	<u>5,050</u>

B. Scientific and Technical Information

1. Library .....	86	115	181	184
2. Educational and information.....	<u>10,005</u>	<u>9,017</u>	<u>9,779</u>	<u>10,295</u>
Subtotal.....	<u>10,091</u>	<u>9,132</u>	<u>9,960</u>	<u>10,479</u>

C. Shop Support and Services.....

	<u>454</u>	<u>188</u>	<u>453</u>	<u>460</u>
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Total, Technical Services.....

	<u>15,195</u>	<u>15.082</u>	<u>15.289</u>	<u>15.989</u>
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A. Automatic Data Processing.....

	<u>4,650</u>	<u>5,762</u>	<u>4,876</u>	<u>5,050</u>
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The funding provides for the lease, purchase, maintenance, programming and operations services of ADP equipment.

1. Equipment.....	1,608	1,800	1,279	1,298
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The funding provides for the maintenance and lease of ADP equipment.

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u> (Thousands of Dollars)	

The reduction from the 1979 budget estimate to the 1979 current estimate is due to a decrease in rental of accessories and maintenance and repair of ADP equipment in the amount of \$250,000. The remaining \$271,000 is due to a realignment of requirements from the ADP function to scientific and technical information.

2. Operations.....	3,042	3,962	3,597	3,752
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This funding provides for the programming and operation services for payroll, accounting, procurement, personnel, and contracts reports. The decrease in operations in the 1979 current estimate from the budget estimate is due to a reduction in the time sharing service partially offset by an increase in support contractor manpower at higher wage rates than originally budgeted. The increase in the 1980 estimate is due primarily to requirements for mass storage, replacement copiers and microfiche developer.

B. <u>Scientific and Technical Information</u> .....	<u>10,091</u>	<u>9,132</u>	<u>9,960</u>	<u>10,479</u>
1. <u>Libraries</u> .....	86	115	181	184

The technical libraries provide reference acquisition, cataloging, translating and dissemination services to all NASA employees. The increase in the 1979 current estimate from the 1979 budget estimate is due to realigning the costs for the operation of the NASA Headquarters library to the education and information function.

2. <u>Education and Information</u> .....	10,005	9,017	9,779	10,295
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Two major activities are contained in this subfunction. The first is education and information programs and the second is the NASA Headquarters scientific and technical information activity. The increase in the 1979 current estimate over the 1979 budget estimate is due to the realignment of some of the requirements of the NASA Scientific and Technical Information Facility (STIF) from the ADP function. The increase in 1980 is due to support contractor wage increases.

	<u>1978</u> Actual	<u>1979</u>		<u>1980</u>
		Budget	Current	Budget
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
		(Thousands of Dollars)		
a. Education and information programs.....				2,557

The educational and informational 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. The largest single program is the Aerospace Education Science program, a touring space science education lecture demonstration unit. 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 U.S. Space Program.

b. Scientific and technical information.....				7,738
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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 Information Facility, which is estimated to cost \$3.8 million in 1980. The cost of all other information services is estimated at approximately \$3.9 million in 1980. 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.

c. <u>Shop Support and Services</u> .....	<u>454</u>	<u>188</u>	<u>453</u>	460
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These funds provide for the continuation of studies on reliability cost evaluations and NASA-wide Safety, Reliability and Quality Assurance Standards. Also included here are Graphic and Photo Processing

Services. The change from the 1979 budget estimate to the 1979 current estimate is a result of moving Graphic and Photo Processing Services from the Installation Common Services function to Shop Support and Services. There is no change in the level of effort of this program for 1980.

MANAGEMENT AND OPERATIONS

	<u>1978</u>	<u>1979</u>		<u>1980</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)		
V. <u>MANAGEMENT AND OPERATIONS</u> .....	<u>6,029</u>	<u>6,978</u>	<u>6,919</u>	<u>7,256</u>
		<u>Basis of Fund Requirements</u>		
A. Administrative Communications.....	1,214	2,284	1,497	1,520
B. Printing and Reproduction.....	1,043	722	1,108	1,124
C. Transportation .....	374	182	299	304
D. Installation Common Services.....	<u>3,398</u>	<u>3,790</u>	<u>4,015</u>	<u>4,308</u>
Total, Management and Operations.....	<u>6,029</u>	<u>6,978</u>	<u>6,919</u>	<u>7,256</u>
A. <u>Administrative Communications</u> .....	1,214	2,284	1,497	1,520

Provides for the costs of leased lines, long distance tolls, telephone exchange services, and other communications. The decrease in the 1979 current estimate from the 1979 budget is due primarily to the postage costs which are now reported under the Installation Common Services function.

1. Local telephone ~~service~~..... 556

Includes cost of operation of telephone exchange services.

	<u>1978</u> <u>Actual</u>	<u>1979</u> Budget      Current <u>Estimate</u> <u>Estimate</u> (Thousands of Dollars)		<u>1980</u> <u>Budget</u> <u>Estimate</u>
2. Long distance telephone <del>service</del> .....				794
Covers cost of leased lines and long distance tolls.				
3. Nontelephone communications (Includes TXW) <del>services</del> .....				170
<b>B. <u>Printing and Reproduction</u>.....</b>	<u>1,043</u>	<u>722</u>	<u>1,108</u>	<u>1,124</u>

Administrative printing includes contractual printing and related composition and binding operations. This includes services performed by other agencies, chiefly the Government Printing Office (GPO), and by commercial printing firms. All common processes of duplicating including photostating, blueprinting, microfilming and other reproductions, are included. The increase in the 1979 current estimate over the budget estimate is due primarily to reimbursing the GPO for the Agency's share of printing cost for the Federal Register and the Code of Federal Regulations.

<b>C. <u>Transportation</u>.....</b>	<u>374</u>	<u>182</u>	<u>299</u>	<u>304</u>
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Includes 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 but funded through NASA Headquarters. The increase in the 1979 current estimate from the budget estimate is due to two major items: purchase of motor vehicles for the Jet Propulsion Laboratory; and increased costs for the operation and maintenance of the Beachcraft Queenaire administrative aircraft.

<b>D. <u>Installation Common Services</u>.....</b>	<u>3,398</u>	<u>3,790</u>	<u>4,015</u>	<u>4,308</u>
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This function includes 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; international support services; contractor incentive awards; Equal Employment Opportunity community relations and fellowships; Administrator's

1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
	<u>Budget Estimate</u> (Thousands of Dollars)	<u>Current Estimate</u>	

representation allowance; NASA management training facility study; overseas administration support and documentation; and administrative supplies, materials and equipment. The increase in the 1979 current estimate over the budget estimate is due to the postage being categorized into the installation common services function from the communications function. This is partially offset by graphics and photo processing services being moved into the shop support and services function under Technical Services and the photocopy equipment operation moving to the printing and reproduction service. The level of services being provided is constant in 1979 and 1980.

1. Installation support services..... 2,076

Included in this category, specifically, are such services as Administrator's representation allowance, contract histories, minor Government services, labor and traveling services, overseas support, contractor incentive awards, Headquarters Equal Employment Opportunity community relations and fellowships, patent fees and services: and Aerospace Fellowships.

2. Medical services..... 381

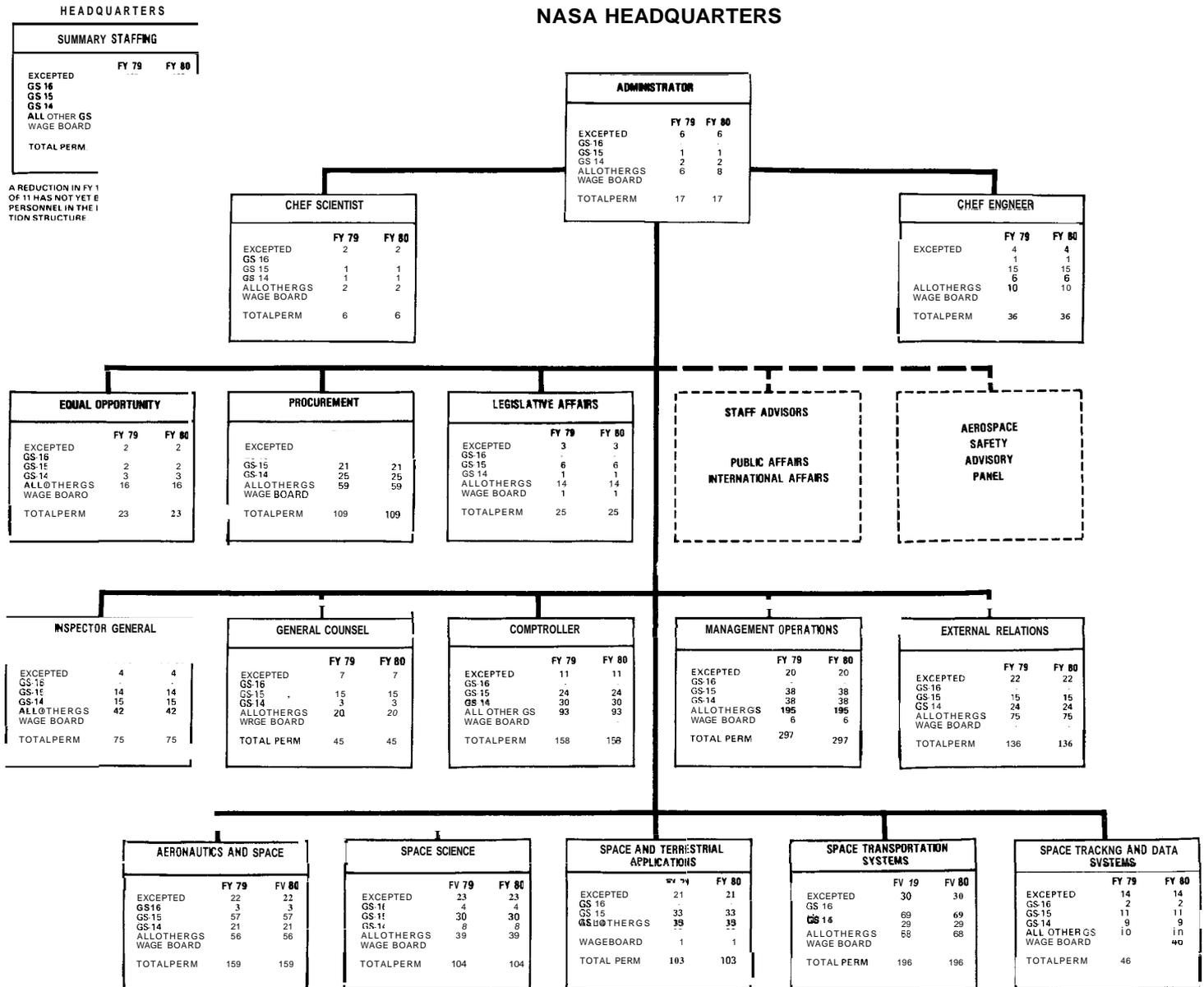
This funding provides for the services and required supplies of the medical health unit and includes the cost of the staff examinations support service contract.

3. Supplies, materials and equipment..... 1,851

This funding provides for the purchase and rental of office equipment and the supplies and materials required for the operation of NASA Headquarters.

# ORGANIZATION AND STAFFING

## NASA HEADQUARTERS



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1980 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, The Laboratory occupies 176.8 acres of land of which 155.0 acres are owned by NASA and 30.9 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 June 30, 1978, was \$414,154,000.

The Jet Propulsion Laboratory is a Government-owned facility, managed, staffed, and operated by the California Institute of Technology under a contract with NASA. The entire cost of operating the Laboratory 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 costs are funded from the Research and Program Management appropriation and are included in the NASA Headquarters budget presentation. 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 programs concerned with scientific exploration of the planets and interplanetary space using automated spacecraft. The Laboratory is also assigned the conduct of selected automated earth-orbital missions. 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 scientific justification and following with spacecraft design, development, testing, and flight operations.

2. The development and operation of the Deep Space Network which provides tracking and data acquisition services for all NASA projects involving flights of automated spacecraft beyond near-earth orbits.
3. Continuing programs of scientific investigation and supporting research and technology.

In more specific terms, Laboratory activities in support of NASA can be categorized as follows:

Planetary Exploration - Since the very beginning of the Nation's space activities, the Jet Propulsion Laboratory has devoted a major part of its effort to the Planetary Exploration Program. The Mariner series of spacecraft was designed and developed by JPL, and the Laboratory has had project management responsibility for all Mariner missions, including the functions of integration, assembly, and testing of the spacecraft. The 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. Similar to the Mariner spacecraft, the Viking Orbiters, launched with the Viking Landers in 1976, have performed successfully and are planned to operate to Spring 1979.

In the continuing series of planetary missions, the Jet Propulsion Laboratory has management responsibility for the Voyager Jupiter-Saturn mission. Two spacecraft have been launched, on August 20 and September 5, 1977, and are currently operating well in cruise mode on planned trajectories. The launches occurred as intended during a time period when the relative positions of Jupiter and Saturn were uniquely favorable for the utilization of gravity-assist techniques to shorten flight times to Saturn. Voyager encounters at Jupiter will occur in March and July of 1979, and at Saturn in November 1980 and August 1981. Scientific data will be gathered on the interplanetary medium, the planets themselves, several of their large satellites, and the rings of Saturn. The mission design includes an option to adjust the trajectory of one spacecraft as it nears Saturn and enable it to continue on to Uranus. The spacecraft for these missions make maximum use of previous Mariner and Viking Orbiter designs and technology, consistent with the requirements of long-range communications, solar independent power, and the required flight times.

The Jet Propulsion Laboratory also has project management responsibility for the Galileo mission, which was a new project start in 1978. This mission is designed to orbit the planet Jupiter and send an instrumented probe into the planet's atmosphere. The atmospheric probe will make direct measurements of physical and chemical properties and will be designed to survive to a considerable depth. The orbiter will have a lifetime in orbit of about 20 months during which it will observe Jupiter and several of its major satellites at close range. Galileo will be the first planetary mission to be launched aboard the Space Shuttle. The launch data is scheduled for January 1982. Jupiter encounter will occur in June 1985.

The International Solar Polar Mission (ISPM) is also managed at JPL. JPL has mission management responsibility as well as responsibility for the U.S. spacecraft and science. The European Space Agency (ESA) has the

responsibility for the European spacecraft and European science. The dual launch of the spacecraft will be in 1983 and the spacecraft flight will use the Jovian gravitational effect to propel the two spacecraft out of the solar equatorial plane in order to provide a new and unique science opportunity for solar observation.

Scientific Satellites - Consistent with its role as an alternate center for earth-orbital spacecraft development, the Laboratory has been selected to manage the Infrared Astronomy Satellite (IRAS) project. This project will involve international cooperation with the spacecraft bus being designed and built in the Netherlands. The NASA Ames Research Center will be responsible for the infrared telescope. Development activities are in progress, and launch is scheduled for the second quarter of 1981.

Supporting Research and Technology - The Jet Propulsion Laboratory maintains a strong program of supporting research and advanced technical development designed 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 electric propulsion, chemical propulsion, electronics, and basic research in such fields as fluid physics, polymer materials, and applied mathematics.

Science Program - 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.

Tracking and Data Acquisition - The Jet Propulsion Laboratory is responsible for the design, development, maintenance, and operation of NASA's worldwide Deep Space Network and a Mission Control and Computing Center. Tracking stations are located in California, Spain, and Australia. These facilities provide support not only to JPL-managed flight missions, but also to projects such as Pioneer and Helios managed by other NASA installations and involving flights beyond near-earth orbits.

Distribution of Permanent Positions by Program

	<u>1978</u>	<u>1979</u>		<u>1980</u>
	<u>Actual</u>	<u>Budget</u>	<u>Current</u>	<u>Budget</u>
		<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>
<u>Space Transportation Systems</u> .....	<u>7</u>	<u>6</u>	<u>---</u>	<u>---</u>
Space Shuttle.....	4	4	---	---
Space flight operations .....	3	2	---	---

	1978 Actual	1979		1980
		Budget Estimate	Current Estimate	Budget Estimate
<u>Space Science</u> .....	892	972	1,105	1,104
Physics and astronomy.....	116	76	120	99
Planetary exploration.....	757	874	966	986
Life sciences.....	19	22	19	19
<u>Space and Terrestrial Applications</u> .....	212	153	190	171
Space applications.....	199	148	173	157
Technology utilization.....	13	5	17	14
<u>Aeronautics and Space Technology</u> .....	294	302	272	261
Aeronautical research and technology.....	17	15	15	15
Space research and technology.....	248	257	237	230
Energy technology.....	29	30	20	16
<u>Space Tracking and Data Systems</u> .....	379	413	385	391
Tracking and data acquisition.....	379	413	385	391
Subtotal. direct positions.....	1,784	1,846	1,952	1,927
<u>Direct Support</u> .....	570	581	636	620
<u>Center Management and Operations Support</u> .....	1,043	1,045	1,156	1,151
Total. permanent positions.....	3,397	3,472	3,744	3,698

SUMMARY OF RESOURCES REQUIREMENTS

FUNDS

	1978	1979		1980
	<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.. .. .	96,586	101,148	114,042	113,934
II. Travel .....	3,787	4,187	3,824	3,800
III. Facilities Services... .. .	8,703	9,371	10,075	10,577
IV. Technical Services.... .. .	2,556	3,849	2,754	2,966
V. Management and Operations .....	<u>5,551</u>	<u>10,960</u>	<u>5,970</u>	<u>6,181</u>
Total, fund requirement.....	<u>117,183</u>	<u>129,515</u>	<u>136,665</u>	<u>137,458</u>

SIMULATED RESEARCH AND PROGRAM MANAGEMENT BUDGET

EXPLANATION OF CHANGES

Personnel and Related Costs - The increase from 1979 budget to the current estimate is attributable to (1) higher starting salaries resulting from merit increases in 1978, (2) a higher manpower estimate for 1979, and (3) the resulting increase in cost of benefits due to additional manyears and higher rate and base for calculating FICA. The decrease from 1979 to 1980 is due to the reduction of positions planned in 1980.

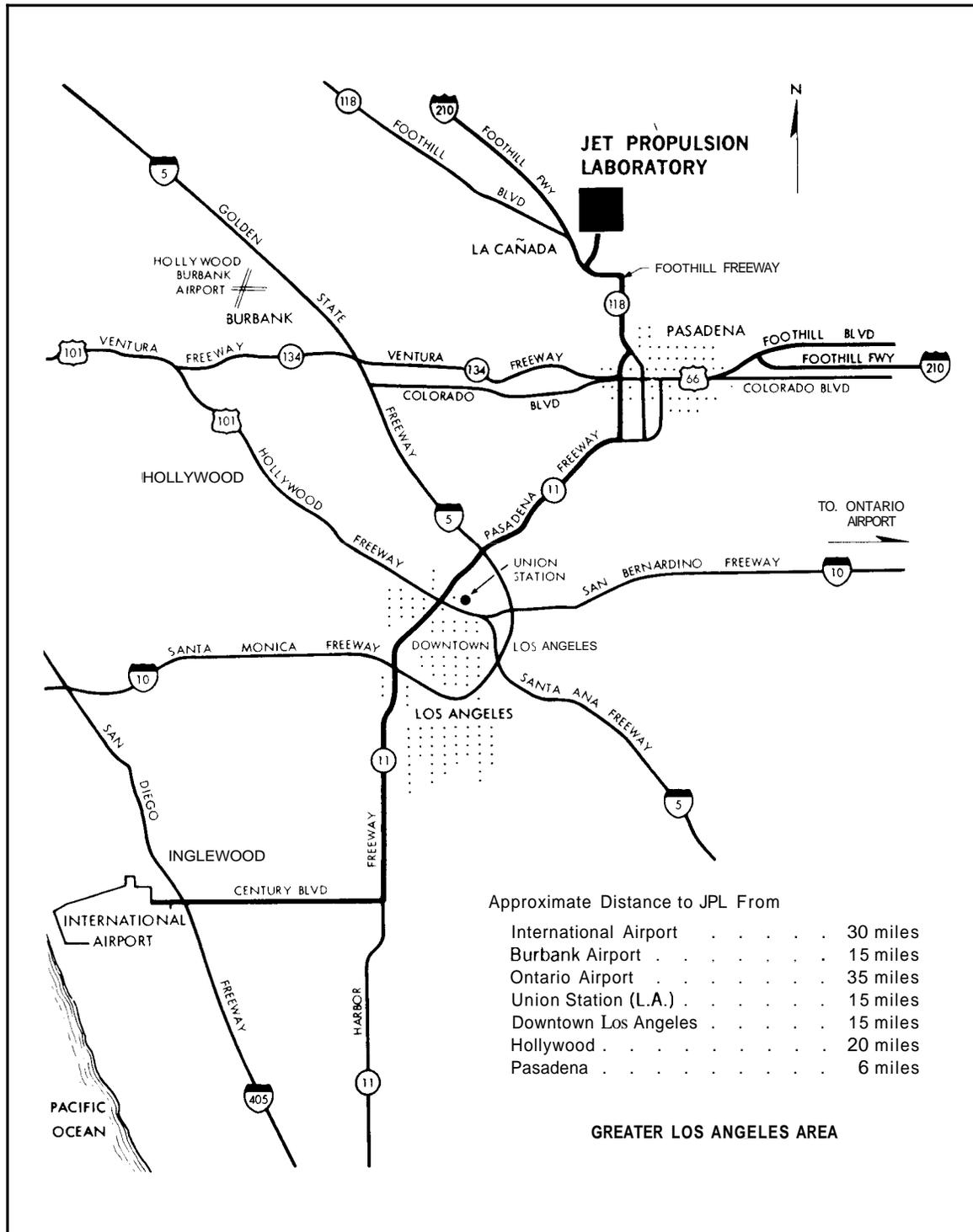
Travel - Travel is remaining at approximately the same level in 1980 as in 1979.

Facilities Services - The increase from 1979 budget to the current estimate results from updated estimates for maintenance alteration and repair (+\$373,000) and for operation of facilities, including utilities (+\$284,000). The increase from 1979 to 1980 is due to higher costs of maintenance and repair, as well as higher costs for electricity (+\$342,000) and gas (+\$51,000).

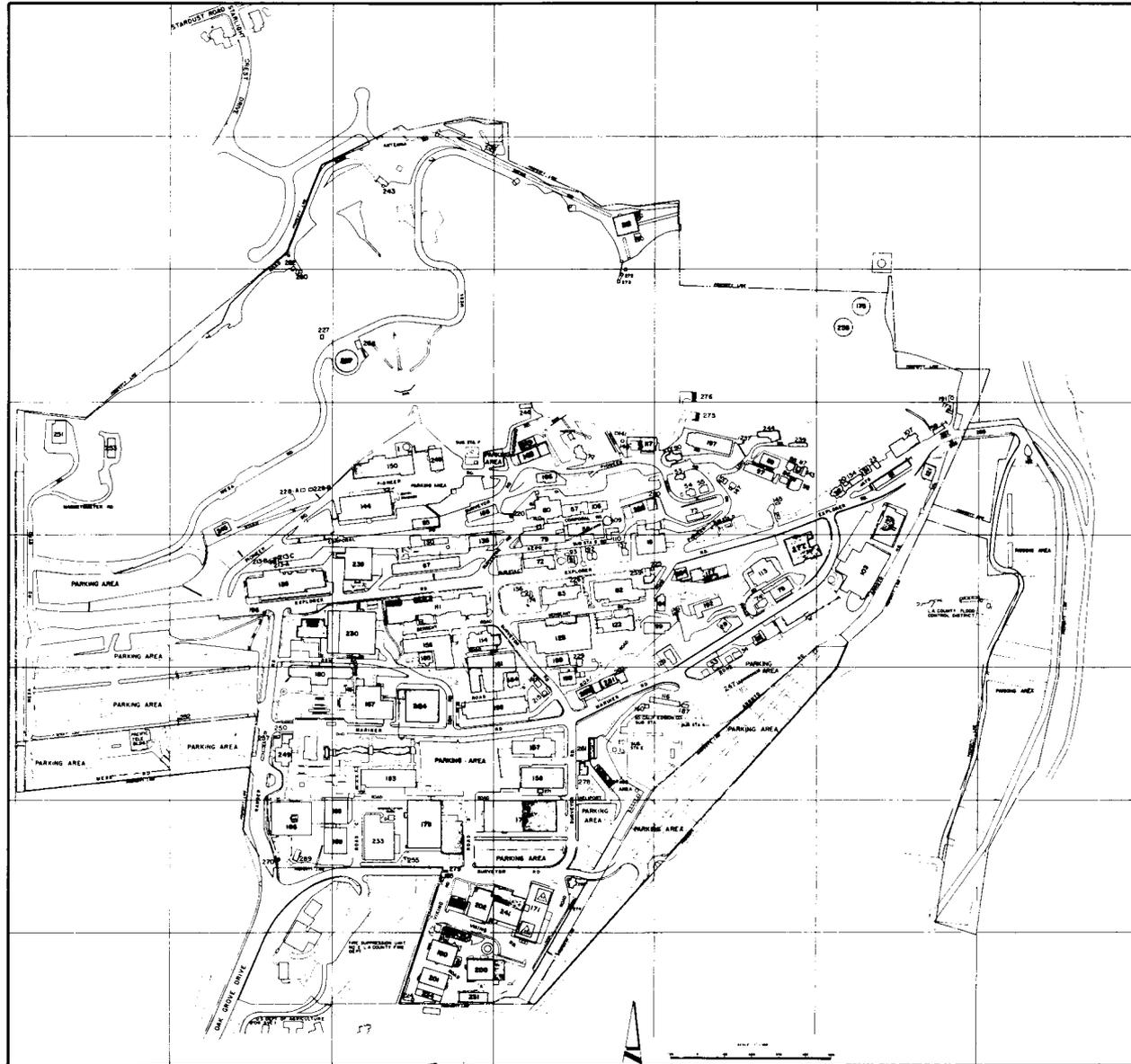
Technical Services - The increase from 1979 to 1980 is due to a higher demand for these services, principally technical documentation, library support and fabrication.

Management and Operations - The decrease from 1979 budget to current estimate results from removing the Caltech fee and overhead from the simulated R&PM account. The increase from 1979 to 1980 is due to increased rates for communication services and increased costs for laboratory-wide administrative support services.

# JET PROPULSION LABORATORY

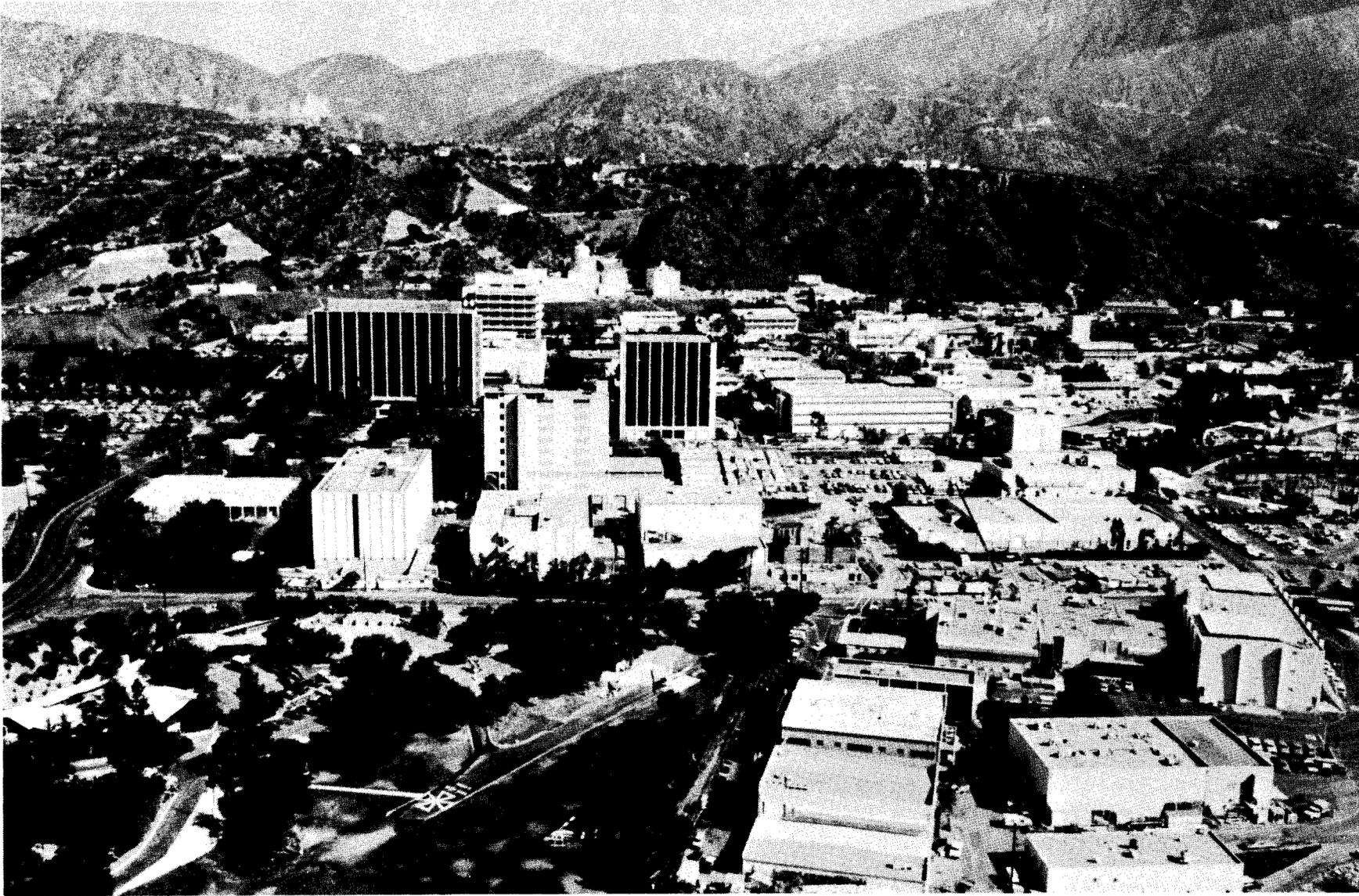


# JET PROPULSION LABORATORY FISCAL YEAR ESTIMATES LOCATION PLAN



**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	B-1
13	Offices, Lab & Shop	D-3	106	Test Cell (Air Fuel)	C-2	179	Spacecraft Assy Facility	B-3	250	Guard Shelter	A-1
18	Structural Test Lab	D-2	107	Test Cell	E-2	180	Central Engineering Bldg	B-3	251	Gyro Lab	A-1
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-1
23	Shop Test Cell No. 12 (Liq)	E-2	110	Fuel Stor Tank	C-2	183	Physical Science Lab	B-3	255	Sewage Lift Station	B-1
31	Test Cell (Liq)	E-2	111	General Offices Bldg	B-2	184	Electronic Stores	C-3	256	Model Range Control Bldg	B-1
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	C-2
34	Shop Test Cell No. 33 (Liq)	D-3	116	Propellant Storage Dock	D-3	187	Chemical Storage	D-3	259	Liquid Nitrogen Bottling Stor	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 Officer	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	Guard Shelter	B-3	267	Water Reservoir	B-2
54	Blending Lab (Solid)	D-2	126	Systems Div Office Bldg	B-2	196	Guard 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 Slot	C-3
59	Chemistry Lab	D-3	134	Shop Test Cell	E-2	200	Plant Engineering Services	B-4	272	East Illuminator Bldg	C-1
65	Materials Lab	D-3	135	Guard Shelter	A-2	201	Carpenter Shop	B-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 Stores	D-2	137	Cooling Tower	C-2	209	Illuminator Tower	D-1	275	Chemical Stor Prop Bldg	D-2
77	Engineering Offices	C-2	138	Engineering Offices	C-2	210	Blaine Track	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-2	213	Cooling Tower 'A', 'B' & 'C'	B-2	278	Helicopter Mount Hangar	C-3
77	Soil Science Lab	C-2	145	Magazine Propellant	D-2	218	Credit Union	B-3	279	Guard Island	B-3
78	Hydraulics Lab	D-3	147	Cooling Tower	D-2	220	C.R.S. Terminal Bldg	C-2	280	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-ft Space Simulator	B-2	225	Guard Shelter-Mew	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	Guard Shelter	B-1	285	Arroyo Bridge	E-2
83	Electronic Parts & Engineering	C-2	157	Engineering & Mechanics Bldg	C-3	228	Cooling Tower (A & 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 Guard 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	Paint Shop	B-4	'A' Gate	A-J	
87	Ovens (Solid)	D-2	161	Telecommunications Lab	C-3	233	Spacecraft Development Bldg	B-3	'B' Gate	A-J	
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	t-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-2	
93	Vaporizer (Wind Tunnel)	C-2	170	Fabrication Shop	C-3	243	Remote Antenna Range Contn	B-1			
97	Development Lab & 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-2			
99	Chemistry Lab (Solid)	D-3	174	Cooling Tower	C-2	246	Soils Test Lab	C-2			
			175	Water Reservoir	E-2	248	10-ft Space Simulator	C-2			



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1980 ESTIMATES

SUMMARY OF AERONAUTICAL RESEARCH AND TECHNOLOGY  
OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY

	1978 <u>Actual</u>	1979		1980 <u>Budget Estimate</u>
		<u>Budget Estimate</u> (Millions of Dollars)	<u>Current Estimate</u>	
Research and development.....	228.0	264.1	264.1	300.3
Construction of facilities.....	38.4	76.5	76.5	62.5
Research and program management.....	<u>170.7</u>	<u>181.2</u>	<u>189.2</u>	<u>194.1</u>
Total.....	<u>437.1</u>	<u>521.8</u>	<u>529.8</u>	<u>556.9</u>
Number of direct positions (end of year) associated with aeronautical research and technology.....	<u>3,887</u>	<u>3,925</u>	<u>3,896</u>	<u>3,921</u>

The objectives of the Aeronautical Research and Technology program are to provide the Nation with the necessary technology for safer, more economical, more efficient, and environmentally acceptable air transportation to maintain a strong U.S. competitive position in the international aviation marketplace; and to support the Department of Defense in maintaining the superiority of U.S. military aircraft.

The 1980 program supports these objectives by stressing the technology areas judged to be the most critical by special assessments, advisory groups, and by industry and other users of technology within and outside the Federal Government. The 1980 activities are designed to maintain a strong research and technology base position in the various technology disciplines. The strength of this generic research and technology base is essential to enhance the growth of new improved aeronautical products. Emphasis will be placed on improving aircraft energy efficiency and performance; reducing noise and pollution; and improving safety in terminal area operations.

In the area of conventional takeoff and landing aircraft, efforts on technology to reduce aircraft noise and emissions, to improve terminal area safety and aircraft operations, and to evaluate the suitability of broad specification jet fuels for use in current and future commercial jet engines will continue. Major emphasis will be on aircraft energy efficiency technology efforts, including the testing of individual components to validate the technology for use in high-bypass turbofan engines as part of the energy efficient engine program.

Rotorcraft activities will continue to address rotor aerodynamics, structures, avionics, flight dynamics, terminal operations, engines and drive systems and rotor system design. General aviation activities will emphasize the reduction of noise and emissions, crashworthiness and advanced low-cost avionics systems. In vertical takeoff and landing technology, broad based technology for future military and civil aircraft applications will be continued. Supersonic cruise research will place emphasis on the interactions between the airframe and propulsion system, long-life structural tests, and demonstration of advanced propulsion components. Also, efforts in the area of high performance aircraft will continue on configuration aerodynamics and flight testing of highly maneuverable aircraft technology concepts.

The construction of facilities request for 1980 includes the completion of the funding for the construction of the National Transonic Facility at the Langley Research Center and for the modification of the 40x80-Foot Subsonic Wind Tunnel at the Ames Research Center. It also provides for the first part of the modification to the Central Air System, the system that provides air to the test cells and large propulsion cells at the Lewis Research Center; modification of the 8-Foot Transonic Pressure Tunnel to do laminar flow research at Langley Research Center; modification of the Model Support System of the 8-Foot High Temperature Structures Tunnel at the Langley Research Center; and modification to the Static Test Facility at the Ames Research Center.

The research and program management funding provides for the civil service salaries, travel, electric power for wind tunnel operations, and other general installation costs necessary to conduct the aeronautics program.

RESEARCH AND DEVELOPMENT  
 ESTIMATED FY 1980 OBLIGATIONS FOR  
EQUIPMENT TO BE PLACED AT NASA INSTALLATIONS

<u>Program Budget Line Item</u>	1980 (Thousands of Dollars)
<u>Space Transportation Systems</u> .....	<u>72.305</u>
Space Shuttle .....	(36.879)
Space Flight Operations .....	(35.397)
Expendable Launch Vehicles .....	(29)
<u>Space Science</u> .....	<u>5.150</u>
Physics and Astronomy .....	(1.097)
Planetary Exploration .....	(22)
Life Sciences .....	(4.031)
<u>Space and Terrestrial Applications</u> .....	<u>13,152</u>
<u>Aeronautics and Space Technology</u> .....	<u>32.911</u>
Aeronautical Research and Technology .....	(23.043)
Space Research and Technology .....	(8.142)
Energy Technology .....	(1.726)
<u>Tracking and Data Acquisition</u> .....	<u>11.770</u>
GRAND TOTAL .....	<u><u>135.288</u></u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1980 BUDGET

PROGRAM BUDGET LINE .ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1980 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Shuttle	Johnson Space Center Bldg. 35, 72-76-01	Shuttle Procedures Simulator	Provides shuttle crew station procedures simulator	100	
Space Shuttle	Johnson Space Center Bldg. 5, 72-76-03	Shuttle Mission Simulator	Provides both a motion base and fixed simulator with out-the-window display	2400	FY 1976 Modifications to Crew Training Facilities Bldg. 5 C O F Project 7278
Space Shuttle	Johnson Space Center Bldg. 30, 72-77-01	Computers for Shuttle Data Processing Complex	Replacement of computers in real time computer complex	1456	FY 1977 Modifications to the Mission Con- trol Center Bldg.30
Space Shuttle	Johnson Space Center Bldg. 30, 72-77-03	Analog Event System	Accepts digital output data from other systems and converts to visual media for interpretation	150	
Space Shuttle	Johnson Space Center Bldg. 30, 72-78-03	Orbiter Data Reduction Complex	Computers to support post flight orbiter data reduction	900	FY 1978 Modifications to Administrative Bldg. 30
Space Shuttle	Johnson Space Center Bldg. 30, 72-80-01	On-board Television	Provides downlink Shuttle Video prior to release	150	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1980 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, ANI) EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1980 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-00	Dump Data Facility	Handles and processes all data recorded on-board shuttle vehicles	247	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-04	Flight Planning (System II)	Purchase of computer and peripherals for design and documentation of missions for the STS to a rate of 20 flights/year.	180	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-05	Flight Planning System III	Purchase of computers and peripherals for design and documentation of missions with the intent of increasing the design capability to 60 flights/year	3000	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-06	Hardcopy Unit	To provide hardcopy of Digital Data display from the SDPC	350	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-07	Payload Operating Control Center (POCC) Decommutator	To provide the capability to process command and control parameters from several independent Payload data streams simultaneously	157	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1980 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1980 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 30, 72-77-04	Network Interface Processor (NIP)	Provides interface between Mission Control Center and space tracking data network	500	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-77-05	Master Interface Timing System	Provides central timing system for Mission Control Center (MCC)	200	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-01	Wide Band Recorder	Records incoming data at Mission Control Center	500	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-02	Display Control System	Provides data and control interface between the dis- play control system and the shuttle data processing complex	546	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-78-05	Digital Voice Unit	Unit for converting digital voice from on- board shuttle to its normal analog output and also converting analog to digital uplinks	400	
Space Flight Operations	Johnson Space Center Bldg. 5, 72-78-07	Spacelab Simulator (SLS)	Simulator to train flight and ground crews for the operation and monitoring of spacelab subsystems	800	FY 1978 Modification to accommodate Space- lab Support Simulator Bldg. 5

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDEE IN FY 1980 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, ANI) EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PUKPOSE	FY 1980 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-08	Wide Band I/F Equipment	To provide capability to bring independent payload high rate data streams into JSC POCC	1342	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-79-09	Payload Data Interleaver System	Downlink System to accept and process Digital Data from Shuttle PDI.	491	
Space Flight Operatlons	Johnson Space Center Bldg. 30, 72-79-10	Text and Graphics System	System to provide for uplink of Text and Graphics infor- mation to the Shuttle	610	
Space Flight Operations	Johnson Space Center Bldg. 5, 72-79-11	Interim Upper Stage Simulater (IUSS)	The IUSS will be a set of equipment which will pro- vide the added capability to the Shuttle Mission Simulator to train the flight crews to monitor and control the Interim Upper Stage vehicle and its subsystems. It will essentially provide a visual scene of the IUS in the windows of the SMS and allow the simulation of vehicle dynamics within the SMS computer complex	185	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1980 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1980 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Flight Operations	Johnson Space Center Bldg. 16, 72-80-02	Aeronautics Test Support System Quick Look Station	Supports spacecraft aeronautics verification testing	338	
Space Flight Operations	Johnson Space Center Bldg. 30, 72-80-03	Data Quality Monitoring and Testtrig Equipment	Insures that data received is of sufficient integrity prior to processing by the Mission Control Center (MCC)	529	
Space Flight Operations	Kennedy Space Center 76-78-10	Launch Processing System (LPS) for Shuttle Flow II	Supports the second line of facilities for processing <b>two</b> shuttle orbiters.	6200	
Space Flight Operations	Kennedy Space Center 76-78-11	Cargo Intergration Test Equipment (CITE)	Performs Orbiter/ Cargo interface verification prior to cargo installation	5238	
Space Shuttle Operations	Marshall Space Flight Center Bldg. 4487, 62-80-01	Replacement of EAI 80 Digital Portion of EAI 8900 Hybrid Computer	Perform Simulations <b>of</b> Shuttle ascent <b>with</b> real winds; IUS and 25KW power module; and closure path; thrust impingement effects and grappling capability studies <b>for</b> Large Space Structures and Teleoperator Retrieval System	250	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1980 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1980 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Aeronautical Research and Technology	Ames Research Center Bldg. 239, 21-80-01	External Scene Generation System	Provides realistic situatuion to the aircrew in order to promote the fidelity of their performance in the "full system" human factors research	700	
Aeronautical Research and Technology	Ames Research Center Bldg. N-233, 21-80-02	CDC-7600 Computer Disk Expansion	Provide expanded disk memory capability	300	
Aeronautical Research and Technology	Ames Research Center Bldg. 243, 21-80-03	FSAA Servo Drive System	Provide solid state electronics for the Motion Drive Servo Control System for the Flight Simulator for Advanced Aircraft (FSM)	250	
Aeronautical Research and Technology	Ames Research Center Bldg. 243, 21-80-04	Analog Systems Replacements	Provide replacement analog computers for the simulation complex	475	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1980 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1980 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Aeronautical Research and Technology	Ames Research Center Bldg. 210, 21-80-05	Sigma 9 (Disk G)	Provide updated computer and related simulator interconnection equipment	450	
Aeronautical Research and Technology	Lewis Research Center 22-79-01	Scientific Computer	To provide increased computational speed, increased memory capacity, improved system reliability, and increased terminal support both for test facilities and interactive terminals	3200	Funding also supported by Space Research and Technology and other Programs. CO F Project 2271

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1980 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1980 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Physics and Astromomy	Goddard Space Flight Center Bldg. 11, 51-79-02	Minicomputer to support Engineering Analysis	Provide computer resources to support structural and thermal analyses	240	
Physics and Astronomy	Goddard Space Flight Center 51-80-06	Gray Scale Imaging Augmentation	Provide displays of data from spacecraft instruments; spectrogram data, which demands at least 16 levels of gray shading.	270	
Life Sciences	Johnson Space Center Bldg. 36, 72-80-04	Life Sciences Payloads Science Monitoring Area, Support Data Systems and Display Equipment	Provide real-time monitoring of life sciences shuttle/ spacelab experiments	310	FY 1980 Modifications to accomodate Life Sciences Equipment

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1980 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1980 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Space Applications	Johnson Space Center Bldg. 17, 72-80-05	Agriculture and Forestry Applications Analysis System	Computer augmentation for support of multi-crop, multi-country remote sensing programs	1500	FY 1980 Modifications for earth resources computer
Space Applications	Goddard Space Flight Center 51-79-03	Landsat-D Ground Support Equipment	Ground Support Equipment needed for Landsat-D, including Operations Control Center (OCC) Data Management System (DMS), Landsat-D Assessment System (LAS) and Transportable Ground Station (TGS)	11000	
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14 51-80-01	Telemetry and Command Processor (TAC). TAC will capture the data, line decode/encode, establish frame sync and format data compatible with existing Payload Operating Control Centers (POCC)	Required to match the existing POCC's with command transmissions and non frame- synchronized telemetry data. This approach of inserting TAC front-end to existing POCC's minimizes the impact to on-going support	300	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1980 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PUKPOSE	FY 1980 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14 51-RO-02	POCC Pilot Model (POCCNET). This acquisition is the start 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 efficiency requirements and to minimize develop- ment and recurring costs with each new mission. The POCCNET concept is envisioned as very cost effective in the TDRSS/ STS/Spacelab/MMS era	2330	
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14 51-80-03	Mission Operations Computing Facility (MOCF). Required to replace obsolete Flight Dynamics and Attitude computation system and provide more real time support capability as well as greater reliability and economy of operation	Provides mission operations support computer capability to GSFC POCC's as required	5000	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1980 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1980 OBLIGATIONS (\$ IN 'THOUS.)	RELATED FACILITY PROJECT
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 15 years. The data system will require new space area of 5,000 square feet	3300	None, existing space will be made available
Tracking and Data Acquisition	Goddard Space Flight Center, Bldg. 14 51-08-05	Near Real-Time Transmission Facility to receive unprocessed Landsat data from selected STDN stations and forward processed Landsat data to Dept. of Interior facility at Sioux Falls, South Dakota	Required to support near real-time transmission of Landsat data	340	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SUMMARY OF MAJOR EQUIPMENT ACQUISITION OBLIGATIONS INCLUDED IN FY 1980 BUDGET

PROGRAM BUDGET LINE ITEM	RECEIVING INSTALLATION, BUILDING LOCATION, AND EAD CONTROL NUMBER	EQUIPMENT DESCRIPTION	PROGRAMMATIC PURPOSE	FY 1980 OBLIGATIONS (\$ IN THOUS.)	RELATED FACILITY PROJECT
Tracking and Data Acquisition	Jet Propulsion Laboratory 55-80-01	Network Data Processor. High order language development system for application software design. Includes hosted compiler for use with Deep Space Network standard operational ModComp computers to enable more efficient development and maintenance software being implemented	Required initially for application software development needed for replacement of obsolete DSN station monitor and control computers. Existing 15 year old systems require replacement due to unavailability of manufacturers components or maintenance support and can only be continued in operation by cannibalization of other systems	250	
Tracking and Data Acquisition	Wallops Flight Center 53-80-01	Replacement of the Rawin Set AN/GMD-1B of the Rawin Observation System. The AN/GMD-1B consists of a seven foot parabolic AZ-EL antenna with antenna control, receiver and parametric amplifier electronics. This system was designed in the 1940's and will be replaced by unit presently under development	This system is used to track weather instrumented balloons and rocket payloads and is used extensively to track and acquire data from constituent measuring payloads	250	

