

*National Aeronautics
and Space Administration*

BUDGET ESTIMATES

BUREAU OF THE BUDGET SUBMISSION

FISCAL YEAR 1971

Volume II

**CONSTRUCTION OF FACILITIES
RESEARCH AND PROGRAM MANAGEMENT**

FY 1971 COF BUDGET ESTIMATES
BY AUTHORIZATION LINE ITEM
(Dollars in Thousands)

<u>Ames Research Center</u>		<u>\$1,330</u>
Polymer Research Laboratory	1,330	
<u>Electronics Research Center</u>		<u>6,500</u>
Avionics Systems Facility	6,500	
<u>Goddard Space Flight Center</u>		<u>2,050</u>
Earth Resources Technology Laboratory Addition to Building 23	2,050	
<u>Jet Propulsion Laboratory</u>		<u>1,410</u>
Modification to Solar Simulator (Mercury Intensity Capability)	420	
RTG Power Applications Research Laboratory	990	
<u>Kennedy Space Center</u>		<u>15,665</u>
Lunch Complex 39	225	
Addition and Modifications to Communications Distribution Switching Center	350	
Alterations to Launch Complex 17	2,160	
Titan Centaur Alterations to Launch Complex 41	9,890	
Sterilization Building Addition to Spacecraft and Assembly Complex	3,040	
<u>Langley Research Center</u>		<u>3,600</u>
Program Direction and Management Building	3,600	
<u>Manned Spacecraft Center</u>		<u>900</u>
Calibration Laboratory	900	

<u>Marshall Space Flight Center</u>		<u>525</u>
Multi-Spectral Photographic Sciences Laboratory	525	
<u>Nuclear Rocket Development Station</u>		<u>6,000</u>
Nuclear Rocket Propulsion Facilities ETS-1 and E/STS-2	6,000	
<u>Various Locations</u>		<u>45,050</u>
Space Shuttle Facilities	25,000	
Alterations to Launch Complex 2	3,300	
Power Plant Addition 210' Antenna Facility, Goldstone, California	750	
Relocation of ATS Transportable Facility to European Area	500	
Relocation Manned Space Flight Transportable Facility to Santiago, Chile	500	
Modifications and Rehabilitations - All Locations	15,000	
<u>Facility Planning and Design</u>		<u>7,200</u>
	TOTAL	<u>\$90,230</u>

FY 1971 COF BUDGET ESTIMATES
(Dollars in Thousands)

1.	<u>Earth Orbital Manned Space Flight</u>		<u>\$ 25,500</u>
	Various	Space Shuttle Facilities	25,000
	Various	Relocation Manned Space Flight Transportable Facility to Santiago, Chile	500
2.	<u>Lunar Exploration - None</u>		
3.	<u>Planetary Exploration</u>		<u>14,100</u>
	KSC	Titan Centaur Alterations to Launch Complex 41	9,890
	KSC	Sterilization Building Addition to Spacecraft and Assembly Complex	3,040
	JPL	Modification to Solar Simulator (Mercury Intensity Capability)	420
	Various	Power Plant Addition 210' Antenna Facility Goldstone, California	750
4.	<u>Astronomy - None</u>		
5.	<u>Space Physics</u>		<u>2,160</u>
	KSC	Alterations to Launch Complex 17	2,160
6.	<u>Life Sciences - None</u>		
7.	<u>Space Applications</u>		<u>5,850</u>
	WTR	Alterations to Launch Complex 2	3,300
	GSFC	Earth Resources Technology Laboratory Addition to Building 23	2,050
	Various	Relocation of ATS Transportable Facility to European Area	500
8.	<u>Space Technology</u>		<u>8,320</u>
	JPL	RTG Power Applications Research Laboratory	990
	NRDS	Nuclear Rocket Propulsion Facilities ETS-1 and E/STS-2	6,000
	ARC	Polymer Research Laboratory	1,330

9.	<u>Aeronautics</u>		<u>6,500</u>
	Avionics Systems Facility	6,500	
10.	<u>Supporting Activities</u>		<u>27,800</u>
	KSC	Launch Complex 39	225
	KSC	Addition and Modifications to Communications Distribution Switching Center	350
	MSC	Calibration Laboratory	900
	MSFC	Multi-Spectral Photographic Sciences Laboratory	525
	Various	Modifications and Rehabilitations All Locations	15,000
	FP&D	Facility Planning and Design	7,200
	LRC	Program Direction and Management Building	3,600
		TOTAL	<u><u>\$90,230</u></u>

FY 1971 COF BUDGET ESTIMATES
(Dollars in Thousands)

<u>Office of Manned Space Flight</u>		<u>\$ 27,000</u>
Various	Space Shuttle Facilities	25,000
KSC	Launch Complex 39	225
KSC	Addition and Modifications to Communi- cations Distribution Switching Center	350
MSC	Calibration Laboratory	900
MSFC	Multi-Spectral Photographic Sciences Laboratory	525
<u>Office of Space Science and Applications</u>		<u>20,860</u>
KSC	Alterations to Launch Complex 17	2,160
KSC	Titan Centaur Alterations to Launch Complex 41	9,890
KSC	Sterilization Building Addition to Space- craft and Assembly Complex	3,040
WTR	Alterations to Launch Complex 2	3,300
GSFC	Earth Resources Technology Laboratory Addition to Building 23	2,050
JPL	Modification to Solar Simulator (Mercury Intensity Capability)	420
<u>Office of Advanced Research and Technology</u>		<u>18,420</u>
ARC	Polymer Research Laboratory	1,330
ERC	Avionics Systems Facility	6,500
JPL	RTG Power Applications Research Laboratory	990
LRC	Program Direction and Management Building	3,600
NRDS	Nuclear Rocket Propulsion Facilities ETS-1 and E/STS-2.	6,000
<u>Office of Tracking and Data Acquisition</u>		<u>1,750</u>
Various	Power Plant Addition 210' Antenna Facility, Goldstone, California	750
Various	Relocation of ATS Transportable Facility to European Area	500
Various	Relocation Manned Space Flight Trans- portable Facility to Santiago, Chile	500

Associate Administrator for Organization and Management

22,200

Various
FP&D

Modifications and Rehabilitations
Facility Planning and Design

15,000
7,200

TOTAL

\$90,230

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Advanced Research and Technology 4. Est. Construction Cost: \$1,330,000

3. Cognizant Installation: Ames Research Center 5. Est. Design Cost: \$ 96,000

6. Project Title/Description: Polymer Research Laboratory

Provides for construction of a single story laboratory building with a total floor area of about 24,000 square feet, divided into eight research areas or laboratories. Each research area or laboratory will contain exhaust hoods, chemical benches, sinks and other associated equipment. About 2,300 square feet of offices will be provided adjacent to the laboratories. Included are radiation and electrical shielding, special ventilation, and filtration of inlet and exhaust from some special laboratories. Certain areas need close control of temperature and humidity.

7. Explanation/Justification: This facility is required to support chemical research in space and aeronautics, investigations with a direct application to other National problems, such as reductions in fire and crash hazards, and improvement in water and air pollution control. Suitable space is not available at the Center to house this activity and the work is currently being carried on in make-shift quarters in scattered locations at the Center. The Analytical Laboratory is located on the mezzanine floor of the Gas Dynamics Laboratory. This location is crowded and has inadequate protection for handling of hazardous and toxic chemicals. Furthermore, this laboratory cannot be expanded in its present location. The Chemical Synthesis Laboratory is located on part of the upper floor of the Electrical Services Building which is located in close proximity to the cafeteria. Processing the ingredient materials contained in new plastics involves handling and working with toxic and explosive mixtures. Because of the danger of toxic exhaust fume ingestion by the cafeteria air conditioning system, many operations have been curtailed. The other activities doing Polymer Research at Ames are carried out in similar unsuitable space.

In order to firmly establish the real need for a new facility a space utilization expert was retained to analyze total space utilization requirements in certain key facilities including the Polymer Research Laboratory and to determine the practicability of using existing center buildings. The consultant findings and conclusions regarding this analysis are as follows:

7. Explanation/Justification: (Continued)

1. Present facilities are not adequate for specialized work of the Chemical Research Projects Office.
 2. In none of the buildings inspected is there sufficient space to provide permanently for the needs of this research office.
 3. Adaptable space in existing buildings - 203 and 219, is insufficient for present or future needs. Building 219 is unsatisfactory for the lab.
 4. Relocation of the lab into converted facilities would not provide satisfactory permanent quarters.
 5. Cost of inevitable future relocations would cost more in long range than one-time cost of a new facility.
 6. Cost of new facility is approximately \$1.34M
- Cost to convert existing facilities:
- | | |
|-------------------------|------------------|
| For Polymer Lab | .890M |
| For Displaced Functions | .472M |
| | <u>\$ 1.362M</u> |

In summary, the basic requirement is to provide a chemistry laboratory building in which the primary considerations will be personnel safety, operational efficiency, and adaptability to changing research objectives.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Advanced Research and Technology 4. Est. Construction Cost: \$6,500,000

3. Cognizant Installation: Electronics Research Center 5. Est. Design Cost: \$244,000

6. Project Title/Description: Avionics Systems Facility

This facility will house the specialized research and computational equipment required for future avionics systems research, and working space for approximately 150 people. The building will enclose a gross area of approximately 56,000 square feet and will have three floors including a high bay area. This project will also provide an extension of all utility systems, including the utility tunnel and will provide parking for 135 vehicles.

7. Explanation/Justification: The proposed facility will provide better systems design of integrated avionics systems for commercial and general aviation, and will help alleviate current serious problems with avionic systems technology. Such problems as collision avoidance and all weather landing, require large scale simulation before adequate systems design can be established. Provision of a large-scale simulation facility at ERC will greatly increase the capability to contribute to the solution of these problems, and will serve to maintain and enhance the Center's expertise in the field of avionics.

9. Estimated future requirements for this or comparable type work None identified at this time.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Space Science and Applications 4. Est. Construction Cost: \$2,050,000

3. Cognizant Installation: Goddard Space Flight Center 5. Est. Design Cost: \$ 35,000

6. Project Title/Description: Earth Resources Technology Laboratory Addition to Building 23

Provides for a 45,000 square foot addition to the Data Interpretation Laboratory to house the Earth Resources Technology Satellite Mission Control Center. An integrated data processing facility, a photographic laboratory, and adjoining technical and scientific office space will make up the addition which will be constructed as a fourth floor to Building 23.

7. Explanation/Justification: The Earth Resources Technology Satellite (RTS) is an earth sensing system involving imagery of the earth obtained from space under a defined set of conditions (specific attitude, orbit, inclination, and sensor resolution). The data received from several tracking stations must be processed and disseminated to several users, such as the U. S. Departments of Interior, Agriculture, and Geological Survey. For the acquisition and use of this data, control center and data processing equipment and facilities must exist and be tied together into a complete system. New facilities are essential because of the extensive operational activities which cannot be accommodated by existing capabilities on a full or even a significant sharing basis. A large amount of data will require rapid response. This new facility will provide equipment which will permit tape recording of data in real time, or receipt of many tapes by mail, conversion of the video data to film, using computer processing for registration and rectification of film data taken in various spectral regions, and providing annotations of the film regarding orbit number, latitude and longitude.

The facility is required to support ERTS A and B missions. The construction schedule is October 1970 through October 1971 to support an ERTS A launch in March 1972.

8. Estimated future requirements for this or comparable type work will be dependent on future flight programs.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Space Science and Applications 4. Est. Construction Cost: \$420,000

3. Cognizant Installation: Jet Propulsion Laboratory 5. Est. Design Cost: \$ 25,000

6. Project Title/Description: Modification to Solar Simulator (Mercury Intensity Capability)

This project proposes the modification of an existing solar simulation system so as to produce a high quality, well collimated, 7 1/2-foot diameter beam of radiant energy at an intensity of 780 watts per square foot. This level was selected because Venus-Mercury 1973 mission proposes an encounter of the planet Mercury at a solar distance of 0.42 astronomical units. The proposed system will utilize the existing lamp reflector array. A new 11-foot diameter collimating mirror and a new mixer lens array will provide a beam of $\pm 5\%$ uniformity and $\pm 2\ 1/2^\circ$ collimation angle. All building utilities and services are adequate for the proposed modification.

7. Explanation/Justification: The high success ratio of planetary flight programs is the result of an exhaustive program of developmental testing and preflight qualification of flight spacecraft in simulated space environments here on Earth. An attempt to extrapolate from the present solar simulator capability of 270 watts/square foot (Venus intensity) to the 900 watts/square foot required to simulate Mercury intensity will increase the probability of catastrophic failure. This is an unnecessary risk which is unwarranted on a multimillion dollar mission when a modest amount for test facility modifications will permit a total mission simulation prior to launch. The improved simulation capability will be used with a prototype Venus-Mercury spacecraft for a thermo-control testing program which will start in October 1971. Approximately ten months will be required to procure and install the solar simulator units.

8. Estimated future requirements for this or comparable type work Modification may be required for future programs to maintain this "state-of-the-art" facility in an updated mode.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 7, 1969

1. No. _____

2. Cognizant Office: Advanced Research and Technology

4. Est. Construction Cost: \$990,000

3. Cognizant Installation: Jet Propulsion Laboratory

5. Est. Design Cost: \$ 70,000

6. Project Title/Description: RTG Power Applications Research Laboratory

This project provides a laboratory for radioisotope fueled thermoelectric generator (RTG) systems research. A total of 17,600 gross square feet will include high bay isolation rooms for radiation spectrum tests; test areas for RTG system testing; a small amount of office space and, a central laboratory stores area for handling and storage of isotope fuels to meet radiological requirements.

7. Explanation/Justification: The utilization of nuclear fueled solar-independent power systems is absolutely essential to many future space missions. A family of deep space missions such as the Ground Tour, outer planet explorers and "out-of-ecliptic" missions is under definition by NASA. These will all need a unique power supply independent of the sun. In order to properly evaluate and develop an isotope power supply with an 8 to 12 year life, and to insure no deleterious effects on the equipment and experiments, extensive ground testing and evaluation are essential.

To date, only extremely limited experience has been obtained by any organization in the handling and utilization of even the very smallest RTG units. It is significant to note that the SNAP-19 generator now aboard Nimbus III is not operating in accordance with predictions based on ground testing, which is due in part to the present limited understanding of isotope generator behaviour in realistic space environments. The NASA and JPL on-going research programs have reached the point where it is vital that the transition to actual isotope power sources be accomplished as the basis for substantial new progress, hardware evaluation and related efforts to keep the secondary power program in harmony with mission plans. This facility will enable research and a thorough evaluation to be performed, as well as the testing of corrective and developmental hardware.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Manned Space Flight 4. Est. Construction Cost: \$225,000

3. Cognizant Installation: Kennedy Space Center 5. Est. Design Cost: \$ 13,000

6. Project Title/Description: Launch Complex 39

This project provides for: (1) the construction of a 3,700 square foot Electrical Utilities Maintenance Building to replace trailers and substandard facilities now housing 29 engineering, supervisory, and support personnel responsible for operations and maintenance of the LC 39 electrical distribution system, (2) Conversion of a 2,800 square foot mezzanine area of the Launch Equipment Shop from storage to office area to house 43 personnel who support the launch support equipment modification and repair effort at Launch Complex 39.

7. Justification/Justification: Experience has shown that operating and maintenance costs for trailers are significantly higher than those for permanent office space. In addition, productivity of the personnel is greatly reduced because of the need to conduct business between scattered trailers serving the same function. The problem is compounded during inclement weather, since sanitary facilities are not available in trailers, making it necessary for employees to travel to the nearest permanent facility.

KSC will have 189 trailers that are eight years old or older by January 1971. Since the normal useful life of a trailer in this area is eight years, replacement will be necessary. Since launch support activities are continuing and important functions, the trailers must be replaced by permanent facilities for effective and more economical operation.

8. Estimated future requirements for this or comparable type work: None

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Manned Space Flight 4. Est. Construction Cost: \$350,000

3. Cognizant Installation: Kennedy Space Center 5. Est. Design Cost: \$ 21,000 *

6. Project Title/Description: Addition and Modifications to Communications Distribution and Switching Center

This project provides for the construction of:

- (1) A 5,500 square foot addition to the Communications Distribution and Switching Center to house 50 communications supervisory and support personnel presently housed in trailers.
- (2) Interconnecting passageways within the existing building to provide access from the existing office area to the restrooms.
- (3) A new combined chilled water air conditioning system to replace existing systems consisting of a single chilled water system and four direct expansion units.

7. Explanation/Justification:

- (1) The building addition is necessary to house fifty administrative, operational and support personnel now housed in seven trailers located east of the main building. These people are essential to the continuing permanent operation of all communications and instrumentation systems supporting Center launch programs-missions. By 1971, KSC will have 189 trailers, 8 years old or older. This is part of a plan to replace these deteriorating trailers for permanent operations.
- (2) Modifications to the Communications Dispatch and Switching Center are required in order to provide access between work areas without passing through equipment areas containing components of critical circuits. The existing situation is a hazard to circuit reliability as well as to personnel.
- (3) The CD&SC is now equipped with five separate air conditioning systems which are difficult and expensive to maintain. In addition, several are approaching the replacement stage so that operational effectiveness and economy dictate installation of a single completely integrated system.

8. Estimated future requirements for this or comparable type work None

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 7, 1969

1. No. _____

2. Cognizant Office: Space Science and Applications 4. Est. Construction Cost: \$2,160,000

3. Cognizant Installation: Kennedy Space Center (ETR) 5. Est. Design Cost: \$ 120,000

6. Project Title/Description: Alterations to Launch Complex 17

Provides for alterations and additions to the launch pad, umbilical mast configuration and the Launch Control Center necessary for prelaunch checkout and launch of the Delta launch vehicle series incorporating a new inertial guidance system. Facility additions include a theodolite vehicle alignment shelter, and a theodolite collimator shelter. Collateral equipment changes require adaptation of the electrical, propellant and pneumatic vehicle servicing systems, and the extension of the second stage propellant transfer system.

7. Explanation/Justification: The introduction of an inertial guidance system is one of many Delta system changes designed to improve overall launch vehicle reliability and operational safety. Introduction of this guidance system in mid-1971 to support the IMP-H launch, scheduled for the third quarter of 1971 will also permit phasing out of the present ground guidance and control center at KSC, thus reducing launch operations and maintenance costs by approximately \$1.6 million per year. Launch Complex modifications work will require a period of eight months; therefore, it will be necessary to start this work by November 1970 in order to meet the IMP-H launch date.

8. Estimated future requirements for this or comparable type work will be dependent on future launch vehicle configurations

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 7, 1969

1. No. _____

2. Cognizant Office: Space Science and Applications 4. Est. Construction Cost: \$9,890,000

3. Cognizant Installation: Kennedy Space Center (ETR) 5. Est. Design Cost: \$ 540,000

6. Project Title/Description: Titan Centaur Alterations to Launch Complex 41

Modifications to the Air Force Launch Complex 41 are required to accommodate the Titan-Centaur launch vehicle configuration selected to launch the proof flight and Pioneer missions in 1972 and two Viking spacecraft flights to Mars in July 1973. It provides for all alterations and additions to the launch complex including modifications to the service structure, the unbilical towers, launch control center and launch complex. Since the Centaur vehicle is new to Launch Complex 41, it will also be necessary to add LOX and LH₂ storage areas and systems, gaseous nitrogen and helium system modifications, theodolite facilities, and a new transporter unbilical mast with an additional set of portable AGE.

7. Explanation/Justification: Launch Complex 41 is one of two complexes at the Eastern Test Range capable of accommodating the checkout and launch of the Titan launch vehicle. The addition of the Centaur stage requires the addition of liquid oxygen and liquid hydrogen propellant services not currently available to Pad 41. The project provides for the modification necessary to support the checkout and assures the successful launching of the Titan-Centaur test flight in mid-1972 followed by Pioneer G and Viking Missions in 1973. The modifications will be initiated during FY 71 and scheduled to be completed in March 1972.

8. Estimated future requirements for this or comparable type work will be dependent upon future launch vehicle configuration:

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Space Science and Applications 4. Est. Construction Cost: \$3,040,000

3. Cognizant Installation: Kennedy Space Center 5. Est. Design Cost: \$ 180,000

6. Project Title/Description: Sterilization Building Addition to Spacecraft Assembly Complex

Provides for the construction of a 11,000 square foot building consisting of two low bay Viking Mars lander checkout areas, two lander sterilization ovens, a single lander/orbiter assembly area and adjoining integrated air lock. It also provides for a 30' x 30' airlock addition to the Propellant Laboratory.

7. Explanation/Justification: The NASA planetary quarantine policy requires that no act be performed that might irretrievably remove a planet as a base for scientific investigation. The probability level of 1×10^{-3} has been established by the committee on Space Research (COSPAR), as a requirement to insure that a planet will not become contaminated from space program activities during the period of exploration. As a result of this requirement, a terminal sterilization facility will be required to sterilize planetary landing vehicles to the degree required by their missions. The initial requirement will be for the Viking program which has been given an allocation of 3.14×10^{-5} for each of its two flight missions by the NASA Planetary Quarantine Office.

The sterilization facility must be operational by September 1972. In order to meet this date construction is scheduled to start by November 1970, with equipment installation to start by January 1972 and be complete by September 1972.

8. Estimated future requirements for this or comparable type work will be dependent upon future planetary programs and associated sterilization requirements.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Advanced Research and Technology 4. Est. Construction Cost: \$3,600,000

3. Cognizant Installation: Langley Research Center 5. Est. Design Cost: \$ 275,000

6. Project Title/Description: Program Direction and Management Building

This project provides for the construction of a six-story building of approximately 91,000 square feet gross area to provide housing for 555 personnel including key Center officials, project management groups, and administrative support.

7. Explanation/Justification: A Program Direction and Management Building is required to provide adequate facilities for Langley's top management personnel, which would include the Office of the Director and Associate Director, Assistant Director levels, and engineering and technical service officials and supporting key staff and line employees.

These organizations currently have some 555 staff members who are widely dispersed throughout the Center's East and West areas, many of whom are located in buildings that are 4 miles from their parent division or project manager's office. None of these staffs are housed in facilities which were initially intended for program and project direction and management personnel. Facilities being utilized include trailers or buildings which were designed as aeronautical research facilities and include former shops, laboratories, and numerous small office spaces scattered about the Center. These facilities are completely inadequate for serving the mission of the Center by whatever yardstick is used to measure efficiency, economy, and productivity. One building, as proposed, which is capable of providing adequate housing for approximately 555 key Center officials, is required.

9. Estimated future requirements for this or comparable type work None

7. Explanation/Justification: (Continued)

Construction of the Program Direction and Management Building will provide the only workable solution to the present inadequacies resulting from the dispersion of functional relationships and the utilization of laboratory and shop buildings for technical management functions for which they were not intended. This new building will provide the proper environment for the firm interrelationships of activities directed, will result in efficient work flow, and will ease communications. Laboratory and shop spaces now occupied by administrative and support personnel will be returned to its original use and the need for temporary trailer-type housing for small groups will be eliminated.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Manned Space Flight

4. Est. Construction Cost: \$900,000

3. Cognizant Installation: Manned Spacecraft Center

5. Est. Design Cost: \$ 54,000

6. Project Title/Description: Calibration Laboratory

Provides for the construction of a single story 22,000 square foot environmentally controlled facility to house measurement reference standards traceable to the National Bureau of Standards, and laboratory facilities for calibration of all measuring devices and instruments used at MSC. An analytical laboratory for analysis of gases and metals will also be provided.

7. Explanation/Justification: Existing calibration activities are being conducted in substandard, overcrowded and widely scattered locations without adequate environmental control conditions. The proposed calibration laboratory is urgently required at this time for the following reasons:

1. To provide adequate housing for such a significant function, to meet the greater degree of quality and reliability demanded by increasingly more sophisticated, complex and miniaturized space instruments and equipment.
2. To free-up needed high bay space in Building 15, which is urgently required for its original intended purpose of instrumentation and electronic systems development.
3. To accomplish the operation with increased effectivity and at decreased cost. Presently calibration activities have to stop for significant periods when adjacent "shake tables" or the overhead crane are in operation. This results in lost time on the part of highly trained engineers and technicians, and a marked loss of confidence and morale resulting from performing critical work in substandard facilities.

8. Estimated future requirements for this or comparable type work None

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Manned Space Flight

4. Est. Construction Cost: \$525,000

3. Cognizant Installation: Marshall Space Flight Center

5. Est. Design Cost: \$ 30,000

6. Project Title/Description: Multi-Spectral Photographic Sciences Laboratory

Construction of a 14,000 square foot single story environmentally-controlled laboratory of masonry construction. Environmental control will consist of temperature and humidity control equipment, **electrostatic dust control** and water filtering equipment. The facility will include laboratory areas for processing and printing black and white or color in either still or motion film. Facilities for development and integration of photographic instrumentation and test setups will also be provided. Security film holding and storage area, utilities, parking for 20 cars and access drives are also a part of this project.

7. Explanation/Justification: The existing mill-type structure, originally constructed during World War II for chemical processing has now reached the limit of physical and economic utility. The existing and badly deteriorated structure cannot continue to support the Center's R&D activities without complete replacement of plumbing, electrical, lighting and other utilities. However, the basic structure is of light steel construction with corrugated asbestos siding, so that without a complete rebuilding program, which is considered uneconomical, this structure cannot maintain the necessary acoustic, light, humidity, and temperature controls required by this function.

The overwhelming majority of all MSFC photographic work is in direct support of research and development programs. Therefore, if a replacement facility is not provided, the existing facility can impose serious constraints on these programs. Complex photo-optical systems and techniques are currently beyond the capabilities of the existing facility, so that the situation will be further aggravated by normal growth of sophistication and complexity of photographic systems.

9. Estimated future requirements for this or comparable type work None

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Advanced Research and Technology 4. Est. Construction Cost: \$ 6,000,000

3. Cognizant Installation: Nuclear Rocket Development Station 5. Est. Design Cost: \$ 2,500,000

6. Project Title/Description: Nuclear Rocket Propulsion Facilities ETS-1 and E/STS-2

This project will provide for modifications to the Test Stand (ETS-1) and the initial construction of the Engine/Stage Test Stand (E/STS-2) for the Nuclear Rocket Propulsion Development Program to perform early systems development tests for flight systems design verification.

The modifications to the ETS-1 will include additional steam generation, extensions to the utilities and modifications to the existing blockhouse to accommodate the development test of the nuclear engine.

Since extensive development and qualification testing is required to qualify a nuclear rocket propulsion module for flight, Engine/Stage Test Stand 2 will be designed to provide this capability. This increment of the construction for E/STS-2 will provide for the site work and the purchase of long lead items.

7. Explanation/Justification: The primary objective of the nuclear propulsion module development program is to confirm the validity of the flight systems design and to qualify the system for flight. To achieve these goals, a ground test module will be used as a test bed. Modifications to the existing Engine Test Stand (ETS-1) and construction of the Engine/Stage Test Facility (E/STS-2) at the Nuclear Rocket Development Station (NRDS) are required for the nuclear ground test program.

The existing test facility, ETS-1 will be modified and upgraded by 1972 in order to accommodate the development of the nuclear engine. E/STS-2 will be designed to accommodate the installation and testing of the propulsion module, NERVA engine, propellant tank, all associated propellant distribution piping, and all required engine and module control systems. With additional fluid capabilities to supplement those existing at ETS-1, test durations will be increased to about 50 minutes at full power thereby allowing closer simulation of anticipated mission profiles.

9. Estimated future requirements for this or comparable type work \$43.2 M CoF

7. Explanation/Justification: (Continued)

The initial increment of construction funds in the amount of \$6,000,000 for FY 1971 is required for (1) procurement of equipment including storage vessels, heat exchangers and associated pumps, piping, valves, instrumentation and controls to provide about 10 minutes additional full steam flow rate capacity for steam generation and delivery system of the common complex (ETS-1/E/STS-2); (2) rough grading and excavation including installation of underground utilities in preparation for test stand structure construction; and (3) test stand and control building structures. It is necessary to start test stand and associated construction work at this time in order to permit installation of process and instrumentation and controls systems to meet the required facility construction completion date of October 1973. Also in the FY 1971 Program \$2,500,000 will be requested for final design.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Manned Space Flight 4. Est. Construction Cost: \$25,000,000

3. Cognizant Installation: Various Locations 5. Est. Design Cost: \$ 2,000,000

6. Project Title/Description: Space Shuttle Facilities - Facilities will be provided at diverse locations to support engine and vehicle development. Modifications to engine development facilities will be required at the Mississippi Test Facility where Test Stands A-1 and A-2 will be modified to provide a maximum of four engine test positions as well as additional LH₂ storage and transfer facilities, at a cost of \$9.5 million. At the Edwards Test Facility Test Stands 1-A, 1-B, and 1-C will be modified to provide a maximum of four test positions, and LH₂ storage and transfer capability will be provided at a cost of \$8.5 million. Component Test Facilities at the MSFC - Huntsville and other locations will be necessary at a cost of \$2.0 million; and, the Arnold Engineering and Development Center Altitude Test Cell (J-4) will require additional exhaust capacity at a cost of \$1.0 million. In addition, long lead procurement in support of the vehicle testing program will be initiated at a cost of \$4.0 million.

7. Explanation/Justification: The Space Shuttle is scheduled to be operational during the 1976-77 time frame. A key element of the program is the development of a new LOX-LH₂ engine. Analysis of the testing program necessary to develop this engine indicates that a maximum of eight engine test positions and associated component test facilities must be made available. The first firing is scheduled for the latter part of 1971, and an evaluation of the character and complexity of the modifications leads to the need for FY 1971 construction start. During this same time frame long lead procurement of materials and components required for test stand modifications to support the shuttle vehicle testing program is also planned since the vehicle test facility must be available by early calendar year 1973.

8. Estimated future requirements for this or comparable type work: will be required for vehicle development and launch facilities. This cost has not been finalized as yet.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Space Science and Applications 4. Est. Construction Cost: \$3,300,000

3. Cognizant Installation: Kennedy Space Center (WTR) 5. Est. Design Cost: \$ 180,000

6. Project Title/Description: Alterations to Launch Complex 2

(a) Provides for the modification of the launch deck, gantry, and test support equipment and a new umbilical tower to accommodate multi-solid capability required to support the Delta polar orbit launch program on the West Pad of Space Launch Complex 2; (b) Replacement of defective wiring and unsuitable electrical fixtures on the service structure and umbilical tower; (c) Rearrangement and updating of blockhouse control and monitoring consoles; (d) Detrailerization and upgrading of miscellaneous pad launch support equipment such as the helium and nitrogen pneumatic systems, and the liquid nitrogen dewar tank.

7. Explanation/Justification: Space Launch Complex 2 comprises the entire west coast capability for polar launches for NASA and ESSA scientific and weather satellite missions. Presently programmed missions require new launch vehicle configurations with solid strap-on motors. This project provides for necessary modifications to SLC-2 to accommodate the solid strap-on capability. In addition, the service structure and umbilical tower electrical power systems will be upgraded to conform to NFPA Class I, Div. 2, Group D requirements. The upgrading of blockhouse and pad launch support equipment will improve operational effectiveness and flexibility. The modifications will be initiated during FY 1971 in order to meet a May 1972 launch date for Nimbus E. Inasmuch as the complex must remain active during the intervening period, precise scheduling will be necessary in order to perform all modifications without any interruption of on-going schedules.

8. Estimated future requirements for this or comparable type work will be dependent upon follow-on and future year flight programs requiring polar orbit launching.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Tracking and Data Acquisition

4. Est. Construction Cost: \$550,000

3. Cognizant Installation: Jet Propulsion Laboratory

5. Est. Design Cost: \$85,000

6. Project Title/Description: Power Plant Addition - 210-Ton Annex Facility, Galveston, Texas

The project provides for the construction of a 5060 square foot power plant addition, together with the procurement and installation of 4-750 KW engine generating sets and associated switch-gear. The project will also provide for an extension of the existing underground power and electrical distribution and all necessary supporting features.

7. Explanation/Justification:

A high powered up-link capability is required to support Pioneer F (1972 launch) and the Viking Mission (1973). In order to assure continuous operation of this communications link, on-station generated primary power will be provided by this project. Commercial power will be used as backup. The on-station generating plant will be expanded to provide the additional power required to operate the high power transmitter.

Estimated future requirements for this or comparable type work none identified at this time.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____
2. Cognizant Office: Tracking and Data Acquisition 4. Est. Construction Cost: \$500,000
3. Cognizant Installation: Goddard Space Flight Center 5. Est. Design Cost: \$50,000

6. Project Title/Description: Relocation of ATS Transportable Facility to European Area

This project provides for the construction of antenna foundations, trailer pads, supporting features, necessary utilities and site improvements.

7. Explanation/Justification:

The ATS transportable station now located in Australia will be relocated to the European area to provide support to the ATS-F mission (launch, early 1972). The ATS requires this station in order to perform its mission. Since this facility must be located at an overseas location, and adequate time must be provided for checkout and training on-site, FY 71 funds are required in order to insure an operational entity during late 1971.

Estimated future requirements for this or comparable type work none identified at this time.

FY 1971 CONSTRUCTION OF FACILITIES

ABBREVIATED PROJECT DESCRIPTION

Date: October 3, 1969

1. No. _____

2. Cognizant Office: Tracking and Data Acquisition

4. Est. Construction Cost: \$500,000

3. Cognizant Installation: Goddard Space Flight Center

5. Est. Design Cost: \$25,000

6. Project Title/Description: Relocation of Manned Space Flight Transportable Facility to Santiago, Chile

This project provides for construction of antenna foundations, trailer pads, supporting features, necessary utilities and site improvements. The new transportable station site will be co-located with the existing STADAN station at Santiago, Chile.

7. Explanation/Justification:

The existing configuration of the Manned Space Flight Network does not permit adequate support to long duration missions of the Apollo Applications Program in the South America area. Consequently, the transportable station presently located on Grand Bahama Island will be relocated to and co-located with the STADAN station at Santiago, Chile. The first AAP workshop will be launched in mid-1972.

Estimated future requirements for this or comparable type work none identified at this time.

FISCAL YEAR 1971

VARIOUS LOCATIONS

REHABILITATION AND MODIFICATION OF FACILITIES

PROJECT PURPOSE:

To provide for major rehabilitation and modification type facilities projects at NASA field installations or in support of NASA activities carried out in government-owned industrial plants. These projects are essential to the protection and preservation of facilities at such installations and plants and to improve the general capabilities or usefulness of these facilities. In many cases the proposed work is directly related to the continued safe, economical and efficient use of the existing NASA physical plant.

The NASA physical plant at initial cost totals about \$4.5 billion. It is composed of two major segments. The first and oldest consists of the research centers and DOD industrial plant which is now over 25 years old. The second segment is composed of the more recent facilities acquired to support the Manned Space Flight and other recent programs. These facilities are for the most part over five years old. Both segments of the plant have been exposed to hard and continued usage and particularly the older segment has experienced a long history of changing utilization and adaptation. Rehabilitation and modification of these facilities on a major scale is required as a continuing program. This is necessary to: (1) protect the capital investment represented by these facilities, (2) insure their continued and reliable operation and (3) improve their capabilities and usefulness to NASA mission accomplishment.

The projects accomplished under this program are carefully selected on the basis of relative urgency and expected return for the investment involved. Only major rehabilitation and modification facilities type work is included, and work of a routine maintenance type, or that involving major additions or new construction are excluded. Also excluded from this program are projects which otherwise qualify for inclusion but which are solely required by a special or specific operational program and not for general capability or use. For the purposes of this program rehabilitation work includes repair, replacement and like work and modification work includes alterations, up-grading and like work.

PROJECT DESCRIPTION:

Projects of the type to be accomplished from this program are attached. This list totals \$17.1 million and is in support of the \$15.0 million requested in FY 1971 for these purposes. This is the second year of this type of program for which \$9.0 million is included in the FY 1970 budget estimates. For the increment proposed for FY 1971 the NASA field installations submitted \$36.6 million of projects for consideration. Initial screening reduced these requests to \$28.0 million. Subsequent screening was accomplished in terms of validating project urgency and return on investment; the relationship of the proposed project to current and future mission needs; the ability of the field installation to carry out the work in the fiscal year time frame and the relationship of the proposed work to other planned work. As a consequence the attached \$17.1 million program resulted as representing pressing essential needs for the FY 1971 rehabilitation and modification program.

Because of the very nature of a program of this type, the passage of time will dictate detailed revisions to items and possibly changes in items. This will be necessary to reflect such factors as changing priorities, the introduction of new and more urgent needs and like considerations which must be accommodated if maximum returns from the program are to be realized.

September 29, 1969

FY 1971 MODIFICATIONS AND REHABILITATION PROJECT
(\$ In Thousands)

	<u>Amount</u>
<u>OFFICE OF MANNED SPACE FLIGHT</u>	<u>\$7,434</u>
I. <u>KENNEDY SPACE CENTER</u>	<u>2,385</u>
A. <u>Launch Complex 39</u>	430
1. <u>Rehabilitation by Painting of Crawler Trans-</u> <u>porter 1. Sandblast to white metal and provide</u> <u>additional corrosion protection to all metal</u> <u>surfaces.</u>	(50)
2. <u>Launch Pad A. Rehabilitate flames trenches,</u> <u>Launch Pad A, by replacing eroded and loose</u> <u>firebrick. Reinforce Pad elevator structure</u> <u>to withstand launch environment.</u>	(380)
B. <u>Utilities Systems Modifications</u>	<u>1,651</u>
1. <u>Rehabilitate Electrical Power System. Rehabili-</u> <u>tate, modify, and improve the primary electrical</u> <u>power systems at Merritt Island, and provide</u> <u>additional industrial electrical power at the</u> <u>Orsion substation.</u>	(275)
2. <u>Rehabilitate Air Conditioning Systems. Rehabili-</u> <u>tate, modify, and improve air conditioning sys-</u> <u>tems. At the Central Instrumentation Facility,</u> <u>replace insulation on air handling units, ducts,</u> <u>and piping. Replace cooling towers at the</u> <u>Missile Assembly Building and Engineering and</u> <u>Laboratory Building.</u>	(250)
3. <u>Building Fire Protection. Rehabilitate, modify,</u> <u>and improve fire protection systems in four</u> <u>buildings to provide improved fire safety. This</u> <u>will include water sprinklers, draft curtains,</u> <u>fire detection and alarm systems at the Central</u> <u>Instrumentation Facility, Communications, Flight</u> <u>Crew Training Building, and Launch Control Center.</u>	(552)
4. <u>Rehabilitate Instrumentation and Communications</u> <u>System. Installation of modifications and improve-</u> <u>ments to the instrumentation and communications</u> <u>systems. This includes the duct bank to the</u> <u>Central Instrumentation Facility, wide bank trans-</u> <u>mission of LC 39 operational intercom, paging,</u> <u>radio frequency, range timing, and data acquisi-</u> <u>tion.</u>	(574)

	<u>Amount</u>
<u>KENNEDY SPACE CENTER (Continued)</u>	
C. <u>Rehabilitation of Roofs and Exterior of Buildings</u>	\$304
Rehabilitation of roofs and exterior of Buildings AB, R&D, and Central Instrumentation. This includes replacing flashing and roofing that has failed, installing traffic paths to roof-mounted equipment, calking, and special waterproofing.	
II. <u>MANNED SPACECRAFT CENTER</u>	<u>680</u>
A. <u>Rehabilitate Air Conditioning Systems</u>	(425)
1. <u>Upgrade Chilled Water System.</u> Rehabilitate deteriorated chilled water lines. Realignment of pipes and add additional supports.	
2. <u>Cooling Tower Rehabilitation.</u> Rehabilitation of deteriorated wood structures and installation of by-pass lines.	
B. <u>Fire Protection Systems</u>	(255)
Provide fire detention and alarm systems for 20 buildings with a water sprinkler system Central Warehouse. Provide a 1,000 G.P.N. fire water booster pump with isolation valves and required piping systems.	
III. <u>MARSHALL SPACE FLIGHT CENTER</u>	<u>2,000</u>
A. <u>Rehabilitate Air Conditioning in the Astrionics Building and Computation Laboratory</u>	850
Replacement of 38 separate air conditioning systems and 50 air handling systems to reduce the excessive maintenance and repair now required. Frequent outages result in excessive downtime of computers and data equipment.	
B. <u>Refurbish Surface Treatment Facility, Building 4760</u>	500
Highly toxic fumes and vapors in this facility have resulted in excessive corrosion and deterioration of mechanical systems. Personnel safety demands the rehabilitation of the air blanketing system.	

	<u>Amount</u>
<u>MARSHALL SPACE FLIGHT CENTER (Continued)</u>	
C. <u>Fire Protection Systems</u>	\$650
<p>Install fire protection systems in 16 buildings and trailers to protect high value equipment. These buildings contain computers, data acquisition, electronic, and communication equipment which are vital to the MSFC mission and should be protected.</p>	
IV. <u>MICHOUD ASSEMBLY FACILITY</u>	<u>250</u>
<u>Rehabilitate Utilities Systems</u>	250
<p>Replace underground sewer lines and mains. The heavy corrosion experienced in these old lines dictates remedial action. Failure of concrete asbestos mains due to settlement requires replacement.</p>	
V. <u>MISSISSIPPI TEST FACILITY</u>	<u>474</u>
<u>Rehabilitate High Pressure Gas Facility</u>	474
<p>The helium, nitrogen, oxygen, and hydrogen transfer piping needs to be rehabilitated due to corrosion and deterioration. Due to stress cycles resulting from pressurization, depression, and high pressures, a rehabilitation program is required at this time.</p>	
VI. <u>VARIOUS LOCATIONS</u>	<u>1,645</u>
A. <u>Edwards Test Facility</u>	145
<p>Rehabilitation of the caps and burns of the test stand flame buckets. Rehabilitation of the roads and paved areas; electrical, fuel and utility systems. Replace weather shielding on Test Stands 1C and 1D.</p>	
B. <u>Seal Beach Assembly Facility</u>	250
<p>Rehabilitation of LN₂ conversion, and helium storages, cranes, platforms, electrical system, space heating, and elevator doors. Rehabilitate building exterior, siding, and roofs.</p>	

	<u>Amount</u>
<u>VARIOUS LOCATIONS (Continued)</u>	
C. <u>Canoga Park Facilities</u>	\$200
Rehabilitation of steam and condensate process water systems, and compressed air systems. Replace air conditioning and heating units. Rehabilitate area storm drainage.	
D. <u>Santa Susana Facilities</u>	150
Rehabilitate air conditioning system and cooling towers; steam, condensate, and water distribution systems. Rehabilitate building floors and ceilings.	
E. <u>Sacramento Test Facility</u>	---
F. <u>NASA Industrial Plant - Downey</u>	900
Rehabilitation of the heating and air conditioning systems by replacing deteriorated small and separate heating, ventilating and cooling systems with a central system. This is a portion of a planned program which was originated in prior years.	

September 29, 1969

FY 1971 MODIFICATIONS AND REHABILITATION PROJECT
(\$ In Thousands)

	<u>Amount</u>
<u>OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY</u>	<u>\$4,621</u>
I. <u>AMES RESEARCH CENTER</u>	<u>795</u>
A. <u>Rehabilitation of Electrical Utilities</u>	<u>280</u>
Rehabilitate the Electrical Distribution System by an additional transformer of 10,000 KVA capacity at the primary substation.	
B. <u>Building Fire Protection Systems</u>	<u>255</u>
Provide water sprinkler with fire protection systems in the computer and hangar areas for the protection of high value equipment.	
C. <u>Rehabilitation of Building 202</u>	<u>260</u>
Rehabilitation of Building 202 library and administrative areas. This will include new floors and ceilings, air conditioning with new doors and an elevator.	
II. <u>FLIGHT RESEARCH CENTER</u>	<u>433</u>
A. <u>Rehabilitation of Buildings 4800, 4801, 4802, 4820 and Fire Protection System</u>	<u>433</u>
1. <u>Rehabilitation of Cooling System in Main Laboratory Building.</u> Replacement of an existing evaporative cooling system in a portion of the Main Laboratory, Building 4800, with refrigerated air conditioning. This includes related electrical power and building modifications to accomplish the air conditioning system.	
2. <u>Rehabilitate and Modernize Fire Protection Systems.</u> Rehabilitate and modernize fire protection systems in computer rooms of Main Laboratory Building by providing improved wet pipe sprinklers.	
3. <u>Rehabilitation of Electric Lighting.</u> Rehabilitate by replacement of existing incandescent lighting in Aircraft Construction and Modification Hangar, Building 4801; Maintenance Hangar, Building 4802; and the High Temperature Loads Calibration Facility, Building 4820. Existing lighting is inadequate.	
4. <u>Replacement of Floor Tile in Main Laboratory, Building 4800.</u> Replacement of floor tile in Main Laboratory Building which is over ten years old and worn. Replacement of individual tiles is uneconomical and original tile is no longer available.	

	<u>Amount</u>
III. <u>LANGLEY RESEARCH CENTER</u>	<u>\$1,516</u>
A. <u>Replacement of Boiler for Heating Plant</u>	699
<p>Rehabilitation by replacement of two oldest boilers (2 and 3) that will no longer pass inspection. The two boilers have a total capacity of 58,000 lbs./hr. at 120 psi with one boiler having a capacity of 140,000 lbs./hr. at 350 psi.</p>	
B. <u>Rehabilitation of Central Fire Alarm and Monitoring Systems</u>	452
<p>A central fire alarm and monitoring system with a tape recorder will be provided in the NASA Fire Station. This system will extend the existing Air Force alarm system to the NASA East Area facilities, and provide a new alarm system for the NASA West Area facilities. Sprinkler and detectors will be provided for five buildings.</p>	
C. <u>Rehabilitation of Buildings 1225, 1232A, and 1148</u>	365
<p>Rehabilitation of Building 1148 will improve 8,000 square feet of office area. Rehabilitation of Building 1225 will upgrade 6,600 square feet of laboratory space. Rehabilitation of Building 1232A will improve 6,000 square feet of office space. These improvements will include lighting, air conditioning, and the exterior of the buildings, as required.</p>	

	<u>Amount</u>
IV. <u>LEWIS RESEARCH CENTER</u>	<u>\$1,431</u>
A. <u>Rehabilitation of 8' x 6' Research and Control Building</u>	327
<p>Rehabilitate and upgrade this building of 44,721 square feet that was built in 1946. This will include rehabilitation of the exterior walls and windows, entrances, and reroofing. The asphalt tile floors and corridor ceilings will be replaced. The heating and air conditioning systems will be improved.</p>	
B. <u>Rehabilitation of Heating Systems</u>	256
<p>1. <u>Rehabilitate by replacement of Boiler No. 5.</u> Boiler No. 5 was installed in 1942 and converted to gas in 1950 with a maximum capacity of 15,000 lbs./hr. The new gas boiler of 75,000 lbs./hr. is required for additional heat load.</p>	
<p>2. <u>Rehabilitation of Steam Condenser Line at Engine Research Building.</u> Rehabilitate by replacement of steam condenser line at the Engine Research Building which is inadequate.</p>	
<p>3. <u>Rehabilitation of Coal and Ash Handling at Heating Plant.</u> Rehabilitate by replacement of coal and ash handling equipment at Central Heating Plant.</p>	
C. <u>Rehabilitation of Dryer and Heat Exchanger at the Engine Research Building and Propulsion Systems Laboratory</u>	567
<p>1. <u>Rehabilitate by Replacement of Cooling Tower Strainer at the Engine Research Building.</u> Provide three self-cleaning strainers for cooling water to improve quality.</p>	
<p>2. <u>Rehabilitation of Combustion Air Dryer at the Engine Research Building.</u> Rehabilitate by replacement of ammonia system to air heat exchanger coils, glycol piping, heat exchanger, and accessory piping systems.</p>	
<p>3. <u>Rehabilitation of Exhaust Gas Cooler at the Propulsion Systems Laboratory.</u> Rehabilitate by replacing 7,400 tubes, 29 feet long, in the Propulsion Systems Laboratory secondary gas cooler. This cooler has been in service 18 years and the water side is badly corroded.</p>	

Amount

LEWIS RESEARCH CENTER (Continued)

- D. Rehabilitation of Administration Building,
Fabrication Shop, and Utility Building \$281

Rehabilitation of the Administration Building which was built in 1942 to upgrade the office, lobby, and auditorium. This will include re-roofing and improvements to the building exterior in addition to the walls, floor, and ceiling. Improve lighting in the Fabrication Shop. Rehabilitate office walls and windows of the Utility Building.

- V. PLUM BROOK STATION 446

Rehabilitation of Utilities

- A. Rehabilitation of the 7,200-Volt Electrical
Distribution System

Rehabilitate by replacement of 2.3 miles of the 7,200-volt electrical system which has been in service 25 years. This will include rehabilitation of the substation, and provide lightning protection for the improved system.

- B. Emergency Evacuation Alarm

Provide emergency evacuation alarm and locating system for the Space Power Facility, Hypersonic Tunnel Facility, Compressor Building, and "K" Site with access control at the Communications Center Building.

- C. Rehabilitation of Underground Pipeline Systems

Rehabilitation by providing corrosion protection to the underground pipeline system which is now 27 years old. Provide cathodic protection to the utility lines.

September 24, 1969

FY 1971 MODIFICATIONS AND REHABILITATION PROJECT
(\$ In Thousands)

	<u>Amount</u>
<u>OFFICE OF SPACE SCIENCE AND APPLICATIONS</u>	<u>\$3,615</u>
I. <u>GODDARD SPACE FLIGHT CENTER</u>	<u>1,340</u>
A. <u>Modifications to the Refrigeration and Steam Systems</u>	570
Provides for modifications to the Central Refrigeration Plant and System, and also provides an additional 3,000-ton unit. Also provides for modifications and upgrading of the steam system.	
B. <u>Modifications to the Electrical and Heating Utility Systems</u>	250
Provides for upgrading of the electrical and heating systems in several Center buildings.	
C. <u>Modifications of the Central Monitoring and Control System</u>	250
Improve central utility monitoring and control system to additional buildings at the Center.	
D. <u>Fire Protection and Safety Modifications</u>	270
Provides for improved safety access and exits, noise reduction, improved lighting, and upgrading the fire protection and alarm systems.	
II. <u>JET PROPULSION LABORATORY</u>	<u>1,010</u>
A. <u>Modification of Road Network and Parking Facilities</u>	750
Repair and rehabilitate 300,000 square feet of paved roadways, walks, parking lots, gutters, and sewer systems.	
B. <u>Rehabilitation of Utilities and Mechanical Systems</u>	
Repair, rehabilitation, and replacement of various electrical systems - transformers, arc circuits, fire-proofing of circuits in manholes, and installation of utility culvert drainage systems. Repair and/or replace various gaseous nitrogen valves and piping throughout the high pressure system; refurbishment of various cooling towers.	

	<u>Amount</u>
<u>JET PROPULSION LABORATORY (Continued)</u>	
C. <u>Modifications of Fire Protection and Detection Systems</u>	\$260
Provides for installation of fire protection alarms and sprinkler systems in Buildings 179, 150, 144, 248, 261, 168, 169, and 198.	
III. <u>WALLOPS STATION</u>	<u>1,015</u>
A. <u>Rehabilitation of Building X-15</u>	210
Enclose 6,450 square feet of area with partitions, raised floor, acoustical treatment, plumbing, heating, air conditioning, and power.	
B. <u>Repair and Replacement of Cable Tray System</u>	165
Repair and replace, as required, approximately 6,000 feet of existing underground duct systems with above ground cable trays.	
C. <u>Modifications to Launch Pad 3</u>	150
Construct a mobile shelter complete with lighting, power, electric drive system, and environmental control to enclose the Pad.	
D. <u>Rehabilitation of Buildings E-106 and E-107</u>	240
Rehabilitate 16,000 square feet of laboratory and office space and provide improved lighting, heating, plumbing, and air conditioning.	
E. <u>Utilities</u>	250
Repair and rehabilitation of utility systems, roads, and airstrip on the Main Base, mainland tracking site, and Wallops Island launch areas.	

	<u>Amount</u>
IV. <u>KSC UNMANNED LAUNCH OPERATIONS</u>	<u>\$250</u>
A. <u>Rehabilitate Industrial Area Emergency Power, Western Test Range</u>	150
<p>Replace present 150 KW generator with new 400 KW generator in order to provide more dependable power to satisfy additional requirements.</p>	
B. <u>Rehabilitate Building 836, Western Test Range</u>	100
<p>Rehabilitate approximately 3,000 square feet of floor space to provide for mission equipment location. Modify utility services, raised floors, and new partitions.</p>	

September 24, 1969

FY 1971 MODIFICATIONS AND REHABILITATION PROJECT
(\$ In Thousands)

	<u>Amount</u>
<u>OFFICE OF TRACKING AND DATA ACQUISITION</u>	<u>\$1,430</u>
I. <u>STADAN NETWORK</u>	<u>370</u>
Modifications to the fire protection and safety systems at the following STADAN Stations:	
Alaska	Quito
Mojave	Santiago
St. Johns, Newf.	Winkfield
Rosman	Johannesburg
Ft. Myers	Madgar
II. <u>MANNED FLIGHT NETWORK</u>	<u>740</u>
Modifications to the fire protection and safety systems at the following Manned Flight Stations:	
Ascension Island	Goldstone
Antigua	Grand Bahama Island
Bermuda	Guam
Canary Island	Guaymas
Cape Kennedy	Hawaii
Carnarvon	Honeysuckle Creek
Corpus Christi	Madrid
III. <u>DEEP SPACE NETWORK</u>	<u>320</u>
Modifications to the fire protection and safety systems at the following Deep Space Network Stations:	
Goldstone	Woomera
Cape Kennedy	Madrid
Johannesburg	

FACILITIES PLANNING AND DESIGN

FISCAL YEAR 1971 ESTIMATES

The funds requested are to provide for the following advance planning and design activities related to facilities projects:

- a. Necessary development and master planning for field installations.
- b. Special facilities siting and other investigations, facilities methodology and other studies, and facilities reports.
- c. Preparation of preliminary engineering reports, cost estimates, and design and construction schedules.
- d. Preparation of preliminary plans and specifications as well as final construction contract plans, specifications and associated cost estimates and schedules.

The general purpose of facility planning and design funds is to permit the accomplishment of these necessary advance planning actions so that adequate details of projects proposed and their costs and schedules may be available for examination during all stages of the budget process.

The \$7.2 million request for facility planning and design for FY 1971 is made up of two major segments:

- a. Regular requirements - \$4.7 million
- b. Special requirements - \$2.5 million

Regular requirements encompass the basic purposes outlined above without regard to individual projects. Special requirements cover special needs which are related to large, complex future potential projects on which significant planning work should be accomplished prior to its inclusion in a budget request.

Regular Requirements

a. Necessary updating of the development and master plans for field installations. This is done on an average of once in three years for each installation with about one-third of the installations being involved in any one fiscal year.	\$150,000
b. Special facilities studies, investigations and reports such as protective coatings, cathodic protection and improved design and construction methodology for application to agency needs.	150,000
c. Preparation of preliminary engineering reports, investigations and studies related to proposed facilities projects to be included in a subsequent FY 1973 Construction of Facilities program now estimated to be in the order of \$90 to \$125 million. These reports are required to permit the early and timely development of the best project required to meet the stated functional need and to provide the related basic data, cost estimates and schedules related to any such future budgetary proposals.	1,100,000
d. Preparation of design, plans, drawings and specifications necessary for the accomplishment of a subsequent FY 1972 Construction of Facilities program now estimated to be in the order of approximately \$100 million.	3,300,000
	<hr/>
Sub-total for Regular Requirements:	\$4,700,000

Special Requirement

NERVA Engine/Stage Test Stand #2 at the Nuclear Rocket Development Station, Nevada. This test complex will consist of a static test stand, control center and ancillary equipment, and is required to test a 75,000 pound thrust nuclear rocket propulsion module in a vertical position under simulated conditions and for sufficient duration. Such a complex is estimated to cost \$40-60 million.	\$2,500,000
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This complex test facility requires additional planning and associated design lead-time well beyond that normally associated with preliminary engineering reports and general facilities projects. For these reasons it is proposed as special requirement. The estimate related to this facility is not included in the construction program cost figures indicated above for possible future FY 1972 and 1973 Construction of Facilities programs.

Sub-total for Special Requirements	<u>2,500,000</u>
Total for Facility Planning and Design	\$ 7,200,000

National Aeronautics and Space Administration
 Research and Program Management
 FY 1971 Budget Submission
 Permanent Civil Service Manpower

<u>Center</u>	<u>FY 1969</u>	<u>FY 1970</u>	<u>FY 1971</u>
Kennedy	2,877	2,779	2,779
Manned	4,384	4,219	4,219
Marshall	<u>6,149</u>	<u>5,985</u>	<u>5,985</u>
MSF	13,410	12,983	12,983
Goddard	4,141	4,412	4,412
Wallops	484	488	488
SSA	<u>4,625</u>	<u>4,900</u>	<u>4,900</u>
Ames	1,992	1,957	2,017
Electronics	802	850	1,000
Flight	539	535	535
Langley	3,912	3,852	4,072
Lewis	4,268	4,200	4,245
SNPO	104	100	100
ART	<u>11,617</u>	<u>11,494</u>	<u>11,969</u>
Headquarters	2,022	2,053	2,053
NAPO	71	70	70
Headquarters	<u>2,093</u>	<u>2,123</u>	<u>2,123</u>
Undistributed			
Reduction	<u>---</u>	<u>-200</u>	<u>-200</u>
NASA Total	<u>31,745</u>	<u>31,300</u>	<u>31,775</u>

National Aeronautics and Space Administration
 Research and Program Management
 FY 1971 Budget Submission
 Obligations in Thousands

<u>Center</u>	<u>FY 1969</u>	<u>FY 1970</u>	<u>FY 1971</u>
Kennedy	95,798	97,145	96,167
Manned	98,839	103,767	106,887
Marshall	<u>116,335</u>	<u>121,125</u>	<u>126,154</u>
MSF	310,972	322,037	329,208
Goddard	73,227	84,718	87,114
Wallops	<u>9,102</u>	<u>9,515</u>	<u>9,733</u>
SSA	82,329	94,233	96,847
Ames	34,033	36,200	33,326
Electronics	17,237	19,451	20,836
Flight	9,697	10,086	10,470
Langley	62,945	67,746	71,374
Lewis	67,845	72,138	75,186
SNPO	<u>2,136</u>	<u>2,210</u>	<u>2,200</u>
ART	193,893	207,831	218,392
Headquarters	59,080	59,606	60,700
NAPO	<u>1,698</u>	<u>1,810</u>	<u>1,853</u>
Supporting Operations	60,778	61,416	62,553
NASA Total	647,972	685,517	707,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION

(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
NASA Total		R&PM		FY- '71
CODE NO.	OBJECT CLASSIFICATION TITLE	FY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	427,899	476,228	489,960
1200	PERSONNEL BENEFITS	32,586	35,999	37,675
1300	BENEFITS FOR FORMER PERSONNEL	263	24	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	15,637	16,514	16,679
2200	TRANSPORTATION OF THINGS	3,709	3,973	3,811
2300	RENT, COMMUNICATIONS AND UTILITIES	44,970	45,040	46,320
2400	PRINTING AND REPRODUCTION	6,651	5,747	6,245
2500	OTHER SERVICES	93,535	83,984	88,246
SERVICES OF OTHER AGENCIES				
2600	SUPPLIES AND MATERIALS	15,623	14,120	14,197
3100	EQUIPMENT	5,421	2,353	2,438
3200	LANDS AND STRUCTURES	1,555	1,448	1,344
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	59	79	74
4200	INSURANCE CLAIMS AND INDEMNITIES	64	8	11
TOTAL DIRECT OBLIGATIONS		647,972	685,517	707,000
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
TOTAL REIMBURSABLE OBLIGATIONS				
TOTAL OBLIGATIONS				

REMARKS:

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION
(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
Office of Manned Space Flight		R&PM		FY- '71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	188,717	205,899	207,753
1200	PERSONNEL BENEFITS	14,031	15,180	15,380
1300	BENEFITS FOR FORMER PERSONNEL	155	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	7,713	7,988	7,927
2200	TRANSPORTATION OF THINGS	1,935	1,917	1,895
2300	RENT, COMMUNICATIONS AND UTILITIES	21,992	22,300	22,395
2400	PRINTING AND REPRODUCTION	4,611	4,048	4,525
2500	OTHER SERVICES	60,766	55,401	60,142
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPLIES AND MATERIALS	8,868	7,714	7,679
3100	EQUIPMENT	1,294	723	744
3200	LANDS AND STRUCTURES	875	849	750
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	15	18	18
4200	INSURANCE CLAIMS AND INDEMNITIES	---	---	---
	TOTAL DIRECT OBLIGATIONS	310,972	322,037	329,208
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
	TOTAL REIMBURSABLE OBLIGATIONS			
	TOTAL OBLIGATIONS			

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION

(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
Kennedy Space Center		R&PM		FY- '71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	40,159	43,110	43,175
1200	PERSONNEL BENEFITS	2,915	3,155	3,185
1300	BENEFITS FOR FORMER PERSONNEL	---	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	1,731	1,826	1,800
2200	TRANSPORTATION OF THINGS	1,495	1,481	1,440
2300	RENT, COMMUNICATIONS AND UTILITIES	7,803	7,525	7,480
2400	PRINTING AND REPRODUCTION	3,226	2,748	3,225
2500	OTHER SERVICES	32,725	32,266	31,062
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPLIES AND MATERIALS	4,413	4,075	4,040
3100	EQUIPMENT	842	344	344
3200	LANDS AND STRUCTURES	475	599	400
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	14	16	16
4200	INSURANCE CLAIMS AND INDEMNITIES	---	---	---
	TOTAL DIRECT OBLIGATIONS	95,798	97,145	96,167
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
	TOTAL REIMBURSABLE OBLIGATIONS			
TOTAL OBLIGATIONS				

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION
(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES	
Manned Spacecraft Center		R&PM		FY- '71	
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>	
DIRECT OBLIGATIONS					
1100	PERSONNEL COMPENSATION	64,170	71,173	72,413	
1200	PERSONNEL BENEFITS	4,720	5,136	5,237	
1300	BENEFITS FOR FORMER PERSONNEL	---	---	---	
2100	TRAVEL AND TRANSPORTATION OF PERSONS	3,769	3,958	3,958	
2200	TRANSPORTATION OF THINGS	356	356	356	
2300	RENT, COMMUNICATIONS AND UTILITIES	8,005	8,100	8,240	
2400	PRINTING AND REPRODUCTION	885	800	800	
2500	OTHER SERVICES	14,111	12,104	13,843	
	SERVICES OF OTHER AGENCIES	---	---	---	
2600	SUPPLIES AND MATERIALS	2,275	1,839	1,739	
3100	EQUIPMENT	191	200	200	
3200	LANDS AND STRUCTURES	357	100	100	
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	---	1	1	
4200	INSURANCE CLAIMS AND INDEMNITIES	---	---	---	
	TOTAL DIRECT OBLIGATIONS	98,839	103,767	106,887	
REIMBURSABLE OBLIGATIONS					
1100	PERSONNEL COMPENSATION				
1200	PERSONNEL BENEFITS				
2100	TRAVEL AND TRANSPORTATION OF PERSONS				
2200	TRANSPORTATION OF THINGS				
2300	RENT, COMMUNICATIONS AND UTILITIES				
2400	PRINTING AND REPRODUCTION				
2500	OTHER SERVICES				
2600	SUPPLIES AND MATERIALS				
3100	EQUIPMENT				
3200	LANDS AND STRUCTURES				
	TOTAL REIMBURSABLE OBLIGATIONS				
	TOTAL OBLIGATIONS				

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION

(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
Marshall Space Flight Center		R&PM		FY- '71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	84,388	91,616	92,165
1200	PERSONNEL BENEFITS	6,396	6,889	6,958
1300	BENEFITS FOR FORMER PERSONNEL	155	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	2,213	2,204	2,169
2200	TRANSPORTATION OF THINGS	84	80	99
2300	RENT, COMMUNICATIONS AND UTILITIES	6,184	6,675	6,675
2400	PRINTING AND REPRODUCTION	500	500	500
2500	OTHER SERVICES	13,930	11,031	15,237
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPLIES AND MATERIALS	2,180	1,800	1,900
3100	EQUIPMENT	261	179	200
3200	LANDS AND STRUCTURES	43	150	250
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	1	1	1
4200	INSURANCE CLAIMS AND INDEMNITIES	---	---	---
	TOTAL DIRECT OBLIGATIONS	116,335	121,125	126,154
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
	TOTAL REIMBURSABLE OBLIGATIONS			
TOTAL OBLIGATIONS				

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION

(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
Office of Space Science & Applications		R&PM		FY- '71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	57,076	69,215	71,677
1200	PERSONNEL BENEFITS	4,307	5,199	5,376
1300	BENEFITS FOR FORMER PERSONNEL	---	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	1,901	2,174	2,259
2200	TRANSPORTATION OF THINGS	1,111	1,093	1,227
2300	RENT, COMMUNICATIONS AND UTILITIES	8,372	8,173	9,243
2400	PRINTING AND REPRODUCTION	182	173	173
2500	OTHER SERVICES	5,625	5,484	4,246
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPLIES AND MATERIALS	2,055	2,048	2,005
3100	EQUIPMENT	1,276	409	406
3200	LANDS AND STRUCTURES	423	264	234
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	---	1	1
4200	INSURANCE CLAIMS AND INDEMNITIES	1	---	---
	TOTAL DIRECT OBLIGATIONS	82,329	94,233	96,847
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
	TOTAL REIMBURSABLE OBLIGATIONS			
TOTAL OBLIGATIONS				

REMARKS

SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION

(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
Goddard Space Flight Center		R&PM		FY- '71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	51,941	63,464	65,717
1200	PERSONNEL BENEFITS	3,911	4,765	4,933
1300	BENEFITS FOR FORMER PERSONNEL	---	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	1,710	1,963	2,038
2200	TRANSPORTATION OF THINGS	990	966	1,100
2300	RENT, COMMUNICATIONS AND UTILITIES	7,935	7,712	8,762
2400	PRINTING AND REPRODUCTION	123	120	120
2500	OTHER SERVICES	4,327	4,242	3,004
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPLIES AND MATERIALS	1,064	1,143	1,100
3100	EQUIPMENT	923	203	200
3200	LANDS AND STRUCTURES	302	140	140
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	---	---	---
4200	INSURANCE CLAIMS AND INDEMNITIES	1	---	---
	TOTAL DIRECT OBLIGATIONS	73,227	84,718	37,114
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
	TOTAL REIMBURSABLE OBLIGATIONS			
TOTAL OBLIGATIONS				

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION

(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
Wallops Station		R&PM		FY- '71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	5,135	5,751	5,960
1200	PERSONNEL BENEFITS	396	434	443
1300	BENEFITS FOR FORMER PERSONNEL	---	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	191	211	221
2200	TRANSPORTATION OF THINGS	121	127	127
2300	RENT, COMMUNICATIONS AND UTILITIES	437	461	481
2400	PRINTING AND REPRODUCTION	59	53	53
2500	OTHER SERVICES	1,298	1,242	1,242
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPLIES AND MATERIALS	991	905	905
3100	EQUIPMENT	353	206	206
3200	LANDS AND STRUCTURES	121	124	94
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	---	1	1
4200	INSURANCE CLAIMS AND INDEMNITIES	---	---	---
TOTAL DIRECT OBLIGATIONS		9,102	9,515	9,733
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
TOTAL REIMBURSABLE OBLIGATIONS				
TOTAL OBLIGATIONS				

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION
(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
PART		R&PM		FY- 71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	147,770	163,181	171,889
1200	PERSONNEL BENEFITS	11,286	12,275	13,149
1300	BENEFITS FOR FORMER PERSONNEL	---	24	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	3,461	3,505	3,642
2200	TRANSPORTATION OF THINGS	388	732	461
2300	RENT, COMMUNICATIONS AND UTILITIES	11,902	11,499	11,597
2400	PRINTING AND REPRODUCTION	414	418	439
2500	OTHER SERVICES	12,906	11,019	11,795
	SERVICES OF OTHER AGENCIES			
2600	SUPPLIES AND MATERIALS	4,157	3,886	4,011
3100	EQUIPMENT	1,325	944	1,038
3200	LANDS AND STRUCTURES	257	335	360
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	9	13	8
4200	INSURANCE CLAIMS AND INDEMNITIES	18	---	3
	TOTAL DIRECT OBLIGATIONS	193,893	207,831	218,392
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
	TOTAL REIMBURSABLE OBLIGATIONS			
	TOTAL OBLIGATIONS			

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION

(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION			BUDGET ESTIMATE
Ames Research Center		R&PM			FY-71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 69	CY-19 70	BY-19 71	
DIRECT OBLIGATIONS					
1100	PERSONNEL COMPENSATION	26,464	28,714	30,349	
1200	PERSONNEL BENEFITS	1,995	2,140	2,280	
1300	BENEFITS FOR FORMER PERSONNEL	---	24	---	
2100	TRAVEL AND TRANSPORTATION OF PERSONS	713	707	732	
2200	TRANSPORTATION OF THINGS	22	32	33	
2300	RENT, COMMUNICATIONS AND UTILITIES	3,041	3,130	3,384	
2400	PRINTING AND REPRODUCTION	6	6	6	
2500	OTHER SERVICES	1,289	792	844	
	SERVICES OF OTHER AGENCIES	---	---	---	
2600	SUPPLIES AND MATERIALS	452	442	482	
3100	EQUIPMENT	40	207	210	
3200	LANDS AND STRUCTURES	2	---	---	
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	9	6	6	
4200	INSURANCE CLAIMS AND INDEMNITIES	---	---	---	
	TOTAL DIRECT OBLIGATIONS	34,033	36,200	38,326	
REIMBURSABLE OBLIGATIONS					
1100	PERSONNEL COMPENSATION				
1200	PERSONNEL BENEFITS				
2100	TRAVEL AND TRANSPORTATION OF PERSONS				
2200	TRANSPORTATION OF THINGS				
2300	RENT, COMMUNICATIONS AND UTILITIES				
2400	PRINTING AND REPRODUCTION				
2500	OTHER SERVICES				
2600	SUPPLIES AND MATERIALS				
3100	EQUIPMENT				
3200	LANDS AND STRUCTURES				
	TOTAL REIMBURSABLE OBLIGATIONS				
	TOTAL OBLIGATIONS				

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION
(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
Electronics Research Center		R&PM		FY- 171
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	11,015	12,695	14,055
1200	PERSONNEL BENEFITS	820	954	1,049
1300	BENEFITS FOR FORMER PERSONNEL	---	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	324	362	411
2200	TRANSPORTATION OF THINGS	54	340	67
2300	RENT, COMMUNICATIONS AND UTILITIES	2,116	1,998	1,664
2400	PRINTING AND REPRODUCTION	88	92	93
2500	OTHER SERVICES	2,243	2,499	2,857
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPLIES AND MATERIALS	380	374	420
3100	EQUIPMENT	196	137	220
3200	LANDS AND STRUCTURES	---	---	---
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	---	---	---
4200	INSURANCE CLAIMS AND INDEMNITIES	1	---	---
TOTAL DIRECT OBLIGATIONS		17,237	19,451	20,836
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
TOTAL REIMBURSABLE OBLIGATIONS				
TOTAL OBLIGATIONS				

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION
(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
Flight Research Center		R&PM		FY- 171
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	6,957	7,601	7,854
1200	PERSONNEL BENEFITS	521	546	597
1300	BENEFITS FOR FORMER PERSONNEL	---	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	201	207	207
2200	TRANSPORTATION OF THINGS	14	15	16
2300	RENT, COMMUNICATIONS AND UTILITIES	204	176	184
2400	PRINTING AND REPRODUCTION	7	10	10
2500	OTHER SERVICES	1,408	1,093	1,143
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPL ES AND MATERIALS	217	240	252
3100	EQUIPMENT	96	122	127
3200	LANDS AND STRUCTURES	72	75	79
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	---	1	1
4200	INSURANCE CLAIMS AND INDEMNITIES	---	---	---
	TOTAL DIRECT OBLIGATIONS	9,697	10,086	10,470
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
	TOTAL REIMBURSABLE OBLIGATIONS			
	TOTAL OBLIGATIONS			

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION
(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
Langley Research Center		R&PM		FY- '71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	47,877	53,023	55,733
1200	PERSONNEL BENEFITS	3,684	4,000	4,300
1300	BENEFITS FOR FORMER PERSONNEL	---	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	1,134	1,140	1,203
2200	TRANSPORTATION OF THINGS	193	210	210
2300	RENT, COMMUNICATIONS AND UTILITIES	2,818	2,695	2,865
2400	PRINTING AND REPRODUCTION	242	250	270
2500	OTHER SERVICES	4,236	3,785	4,101
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPLIES AND MATERIALS	2,154	2,100	2,127
3100	EQUIPMENT	423	278	281
3200	LANDS AND STRUCTURES	183	260	281
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	---	5	---
4200	INSURANCE CLAIMS AND INDEMNITIES	1	---	3
	TOTAL DIRECT OBLIGATIONS	62,945	67,746	71,374
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
	TOTAL REIMBURSABLE OBLIGATIONS			
	TOTAL OBLIGATIONS			

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION
(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
Lewis Research Center		R&PM		FY. '71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	53,763	59,310	62,070
1200	PERSONNEL BENEFITS	4,087	4,451	4,739
1300	BENEFITS FOR FORMER PERSONNEL	---	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	900	901	901
2200	TRANSPORTATION OF THINGS	101	135	135
2300	RENT, COMMUNICATIONS AND UTILITIES	3,723	3,500	3,500
2400	PRINTING AND REPRODUCTION	71	60	60
2500	OTHER SERVICES	3,660	2,850	2,850
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPLIES AND MATERIALS	954	730	730
3100	EQUIPMENT	570	200	200
3200	LANDS AND STRUCTURES	---	---	---
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	---	1	1
4200	INSURANCE CLAIMS AND INDEMNITIES	16	---	---
	TOTAL DIRECT OBLIGATIONS	67,845	72,138	75,186
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
	TOTAL REIMBURSABLE OBLIGATIONS			
	TOTAL OBLIGATIONS			

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION
(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
Space Nuclear Propulsion Office		R&PM		FY-71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	1,694	1,838	1,828
1200	PERSONNEL BENEFITS	179	184	184
1300	BENEFITS FOR FORMER PERSONNEL	---	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	189	188	188
2200	TRANSPORTATION OF THINGS	4	---	---
2300	RENT, COMMUNICATIONS AND UTILITIES	---	---	---
2400	PRINTING AND REPRODUCTION	---	---	---
2500	OTHER SERVICES	70	---	---
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPLIES AND MATERIALS	---	---	---
3100	EQUIPMENT	---	---	---
3200	LANDS AND STRUCTURES	---	---	---
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	---	---	---
4200	INSURANCE CLAIMS AND INDEMNITIES	---	---	---
	TOTAL DIRECT OBLIGATIONS	2,136	2,210	2,200
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
	TOTAL REIMBURSABLE OBLIGATIONS			
	TOTAL OBLIGATIONS			

REMARKS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION
(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES	
		R&PM		FY- '71	
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>	
Supporting Operations					
	DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	34,336	37,933	38,641	
1200	PERSONNEL BENEFITS	2,962	3,345	3,770	
1300	BENEFITS FOR FORMER PERSONNEL	108	---	---	
2100	TRAVEL AND TRANSPORTATION OF PERSONS	2,562	2,847	2,851	
2200	TRANSPORTATION OF THINGS	275	231	228	
2300	RENT, COMMUNICATIONS AND UTILITIES	2,704	3,068	3,085	
2400	PRINTING AND REPRODUCTION	1,444	1,108	1,108	
2500	OTHER SERVICES	14,238	12,080	12,063	
	SERVICES OF OTHER AGENCIES				
2600	SUPPLIES AND MATERIALS	543	472	502	
3100	EQUIPMENT	1,526	277	250	
3200	LANDS AND STRUCTURES	---	---	---	
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	35	47	47	
4200	INSURANCE CLAIMS AND INDEMNITIES	45	8	8	
	TOTAL DIRECT OBLIGATIONS	60,778	61,416	62,553	
	REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION				
1200	PERSONNEL BENEFITS				
2100	TRAVEL AND TRANSPORTATION OF PERSONS				
2200	TRANSPORTATION OF THINGS				
2300	RENT, COMMUNICATIONS AND UTILITIES				
2400	PRINTING AND REPRODUCTION				
2500	OTHER SERVICES				
2600	SUPPLIES AND MATERIALS				
3100	EQUIPMENT				
3200	LANDS AND STRUCTURES				
	TOTAL REIMBURSABLE OBLIGATIONS				
	TOTAL OBLIGATIONS				

REMARKS

SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION

(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES	
NASA Headquarters		R&PM		FY. '71	
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>	
	DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	33,269	36,800	37,474	
1200	PERSONNEL BENEFITS	2,889	3,260	3,680	
1300	BENEFITS FOR FORMER PERSONNEL	103	---	---	
2100	TRAVEL AND TRANSPORTATION OF PERSONS	2,499	2,779	2,779	
2200	TRANSPORTATION OF THINGS	246	190	190	
2300	RENT, COMMUNICATIONS AND UTILITIES	2,615	2,962	2,962	
2400	PRINTING AND REPRODUCTION	1,443	1,105	1,105	
2500	OTHER SERVICES	13,961	11,790	11,790	
	SERVICES OF OTHER AGENCIES				
2600	SUPPLIES AND MATERIALS	456	420	420	
3100	EQUIPMENT	1,519	245	245	
3200	LANDS AND STRUCTURES	---	---	---	
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS	35	47	47	
4200	INSURANCE CLAIMS AND INDEMNITIES	45	8	8	
	TOTAL DIRECT OBLIGATIONS	59,080	59,606	60,700	
	REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION				
1200	PERSONNEL BENEFITS				
2100	TRAVEL AND TRANSPORTATION OF PERSONS				
2200	TRANSPORTATION OF THINGS				
2300	RENT, COMMUNICATIONS AND UTILITIES				
2400	PRINTING AND REPRODUCTION				
2500	OTHER SERVICES				
2600	SUPPLIES AND MATERIALS				
3100	EQUIPMENT				
3200	LANDS AND STRUCTURES				
	TOTAL REIMBURSABLE OBLIGATIONS				
	TOTAL OBLIGATIONS				

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
SUMMARY OF REQUIREMENTS BY OBJECT CLASSIFICATION
(In thousands of dollars)

NAME OF INSTALLATION		APPROPRIATION		BUDGET ESTIMATES
NASA Pasadena Office		R&PM		FY- '71
CODE NO.	OBJECT CLASSIFICATION TITLE	PY-19 <u>69</u>	CY-19 <u>70</u>	BY-19 <u>71</u>
DIRECT OBLIGATIONS				
1100	PERSONNEL COMPENSATION	1,067	1,133	1,167
1200	PERSONNEL BENEFITS	73	85	90
1300	BENEFITS FOR FORMER PERSONNEL	5	---	---
2100	TRAVEL AND TRANSPORTATION OF PERSONS	63	68	72
2200	TRANSPORTATION OF THINGS	29	41	38
2300	RENT, COMMUNICATIONS AND UTILITIES	89	106	123
2400	PRINTING AND REPRODUCTION	1	3	3
2500	OTHER SERVICES	277	290	273
	SERVICES OF OTHER AGENCIES	---	---	---
2600	SUPPLIES AND MATERIALS	87	52	82
3100	EQUIPMENT	7	32	5
3200	LANDS AND STRUCTURES			
4100	GRANTS, SUBSIDIES AND CONTRIBUTIONS			
4200	INSURANCE CLAIMS AND INDEMNITIES			
	TOTAL DIRECT OBLIGATIONS	1,698	1,810	1,853
REIMBURSABLE OBLIGATIONS				
1100	PERSONNEL COMPENSATION			
1200	PERSONNEL BENEFITS			
2100	TRAVEL AND TRANSPORTATION OF PERSONS			
2200	TRANSPORTATION OF THINGS			
2300	RENT, COMMUNICATIONS AND UTILITIES			
2400	PRINTING AND REPRODUCTION			
2500	OTHER SERVICES			
2600	SUPPLIES AND MATERIALS			
3100	EQUIPMENT			
3200	LANDS AND STRUCTURES			
	TOTAL REIMBURSABLE OBLIGATIONS			
	TOTAL OBLIGATIONS			

REMARKS

National Aeronautics and Space Administration

RESEARCH AND PROGRAM MANAGEMENT
FY 1971 BUDGET SUBMISSION
ANALYSIS OF FY 1971 INCREASES

The Research and Program Management appropriation includes funding for research in Government laboratories, management of programs and other activities of the National Aeronautics and Space Administration. The principal activities of the appropriation are to:

Provide the personnel staff necessary for in-house research and to plan, manage, and support the Research and Development programs.

Provide operational capability to the laboratories and facilities for in-house research and planning, directing, and executing out-of-house research, development, and mission operations effort; general purpose computer capability and such necessary logistics support, as travel and transportation; maintenance and operation of facilities; and technical and administrative support.

The Research and Program Management appropriation request is subdivided into six functional categories, as follows:

1. Personnel Related Costs which is comprised of salaries and benefits for civil service personnel, over 70% of whom are technical, and for personnel of other government agencies detailed to NASA; and includes supporting personnel costs; i.e., the cost of moving expenses, as provided by law, the cost of recruiting and personnel investigation services provided by the Civil Service Commission, and personnel training.

2. Travel includes the cost of travel required for direction, coordination, and management of research and development and construction of facilities program activities, flight mission support and overseas travel to launch and tracking sites, and travel to meetings and technical seminars.
3. Automatic Data Processing includes the cost of the lease, purchase and maintenance of equipment, and the cost of providing contract services for programming and operations for general purpose computer capability.
4. Facilities Services includes the cost of leasing research laboratories and facilities, minor construction, maintenance and related services; custodial services; facility operations; and range operations at the John F. Kennedy Space Center, NASA.
5. Technical Services includes the cost of certain engineering services, the dissemination of scientific and technical information derived from the technology utilization program, and education programs.
6. Administrative Support includes the cost of communications, administrative printing, administrative supplies, materials, equipment, transportation support, and other support services.

Installations are under the management direction of the Associate Administrator having primary responsibility for the research and development programs conducted at the installation. The Associate Administrator for Manned Space Flight is responsible for the Kennedy Space Center, Manned Spacecraft Center, and Marshall Space Flight Center; the Associate Administrator for

Space Science and Applications is responsible for the Goddard Space Flight Center and Wallops Station; and the Associate Administrator for Advanced Research and Technology is responsible for the Ames Research Center, Electronics Research Center, Flight Research Center, Langley Research Center, Lewis Research Center, and the Space Nuclear Propulsion Office. The Associate Administrator for Organization and Management is the institutional director for NASA Headquarters.

The request for R&PM for FY 1971 is \$707.0 million, an increase of \$21.5 million over the FY 1970 plan. The major portion of the increase, \$15.5 million, is for Personnel costs and is the net result of the costs of 475 additional people in FY 1971, the annualization in FY 1971 of the costs of the July 1969 pay raise and FY 1970 career development and within grade increases, and the partial year costs of within grade and career development increases in FY 1971. All of these increases are partially offset by the annualization in FY 1971 of savings resulting from positions abolished in FY 1970.

The minor increase of \$175 thousand in Travel is related to the 475 additional positions in FY 1971 and the annualization in FY 1971 of the AJAX conversions at Goddard Space Flight Center, as partially offset by a small decrease in manned space flight requirements.

The increase in Automatic Data Processing of \$909 thousand is related to the full year's funding of leased equipment at the Goddard Space Flight Center for their IBM 360 systems, and for minor increases related to system improvements at several other centers.

The \$4.9 million increase in Facilities Services, Technical Services, and Administrative Services is related to the requirement to provide a full year's funding for support contracts which were only funded for a partial year in FY 1970 with FY 1970 funds. The requirement to "live off" the uncosted carryover from FY 1969 into FY 1970 was necessitated by the unanticipated large overage in on-board employment at most of our centers at the end of FY 1969, the severe Congressional reductions, and an unanticipated cost increase related to the general nationwide inflationary trend. Funds must be provided in FY 1971 to fund these support contracts for a full year. Further significant reductions in the level of support would be clearly inconsistent with programmatic requirements.

National Aeronautics and Space Administration

RESEARCH AND PROGRAM MANAGEMENT

FY 1971 BUDGET SUBMISSION
ANALYSIS OF INCREASED CIVIL SERVICE
MANPOWER REQUIREMENTS

For the past three fiscal years, NASA has sustained repeated reductions in its civil service employment in permanent positions. From its peak employment in July 1967 through the end of FY 1969 2,850 permanent positions have been abolished. Planned reductions in the FY 1970 budget, a reduction of 100 positions in the Bureau of the Budget allowance of April 22, 1969 and subsequent assessing of 200 positions will require NASA to abolish 941 permanent positions in FY 1970. This action, coupled with previous actions, brings the total number of abolished permanent positions to 3,791. To accomplish the directed FY 1970 reduction, NASA must not only replace less than 50% of its estimated attrition, but it is almost certain that an involuntary reduction in force will be required to meet the end FY 1970 target of 31,300.

The FY 1970 reductions extend to three years the period of severely restricted hiring practices. In FY 1968, NASA replaced only about one out of two separations and in FY 1969 only about two out of five. At specific installations, the rate in FY 1969 was as low as one out of

fourteen (Marshall Space Flight Center), and one out of five (Langley and Lewis Research Centers). This situation has led to a severe maladjustment in our workforce and the inability to bring in the "new blood" in proper numbers to maintain the vitality of the Centers.

A contributing factor to the workforce imbalance is the pattern of separations by occupational specialities. Against an overall agency separation rate of 6.4% in FY 1969, the annual separation rate for scientists and engineers is 3.9%, for administrative professionals 6.7%, for clerical employees 16.4%, and for wage board and technicians 4.2%.

Such restricted hiring practices, as well as the continued reduction in civil service strength, have created a situation in which almost the last vestige of flexibility available to NASA is gone. On this background, and because of program adjustments and increases, NASA is requesting an end year FY 1971 civil service personnel level of 31,775, an increase of 475 from the planned FY 1970 end year strength of 31,300. These increases are required as follows:

An increase of 150 for ERC would bring their end FY 1971 level to 1,000. The initial staffing of the center has been severely constrained from that originally planned so that the permanent civil service complement on-board at the end of FY 1969 was 802, less than 40% of the original plan for that time. The planned end year strength for FY 1970 is 850. We believe that 1,000 civil service employees are necessary to achieve a balanced

capability on an interim basis and provide minimum fulfillment of the Center's missions and program commitments. As a result, 150 positions are being requested at this time for FY 1971.

An increase for Project Viking of 215 in FY 1971 will be distributed as follows:

180 to Langley and 35 to Lewis. Because of its national importance as a major step in planetary explorations, and because of the urgency of the schedule to meet the Mars encounter opportunity in 1973, a nucleus of highly skilled and experienced personnel are being assigned to Viking project management during FY 1969 and FY 1970. The new positions in FY 1971 will be used to augment this core group to meet the full requirements as well as to strengthen the engineering and other Viking support elements and to replace the necessary support of other important programs from which skilled talent was diverted for the initial Viking buildup. The Langley increase is needed because this Center has the overall project management responsibility as well as the complete responsibility for the spacecraft lander system development. The Lewis increment relates to its responsibility for the Titan-Centaur launch vehicle, which will be used to launch the Viking spacecraft.

The manpower in support of the aeronautics program increases by 100 in FY 1971 (60 at Ames and 40 at Langley). This increase reflects the growing programmatic effort being applied to all phases of aeronautics by NASA in recognition of its increasing national importance as reflected by the Congress, high level advisory groups, and other internal groups. Without this additional in-house manpower, the control and supervision of this growing effort cannot be adequately staffed and the unique advanced research capability, upon which the DOD and DOT rely for the future, cannot be staffed to meet their requirements and urging.

Ten additional positions are required for the NASA Aerospace Safety Research and Data Institute (ASRDI). The ASRDI has been established at Lewis and will integrate the experience of all elements of NASA, its contractors, and other organizations to provide basic, applied, and operational data related to ground-based and flight safety experience. The ASRDI will establish a data bank for analysis and dissemination of information to all interested organizations, both government and non-government. To date, eight employees have been assigned to ASRDI at Lewis and, as the data bank becomes operational in FY 1971 and the demands for services increase, additional personnel will be required to provide the specialized services necessary to operate the data bank and provide for required analyses.

Analysis of staffing increases by Center is as follows:

Ames Research Center

Ames is one of the three principal centers responsible for implementing the aircraft research and technology program. Since its peak employment level in FY 1966, the Ames Research Center has been reduced by 267 positions. Through strict control of their limited replacement capability, the level of scientists and engineers has remained relatively constant; however, technicians and supporting personnel for the operation of facilities have been reduced to extremely difficult levels. In addition, personnel with experience and training in the new and expanding research areas are required.

The limited hiring capability against separations will be used to replace engineers and scientists in on-going areas. The 60 additional positions requested in this budget for Ames will be used to hire supporting personnel to help rebalance the workforce and to hire scientists and engineers for fundamental work aimed at unsteady aerodynamic flow and studies of advanced analytical methods to improve aerodynamic theory.

Electronics Research Center

The Electronics Research Center was established in 1965 to provide a focus for a comprehensive program of basic and applied aerospace electronics research and technology. This mission will be accomplished by a combination of in-house research and the management of the effort of industry and universities. Initial estimates were that approximately 2,000 civil servants and appropriate contractor support would be required to fulfill this mission.

The initial staffing of the Center has been severely restrained from that originally anticipated so that the permanent civil service complement on-board at the end of FY 1969 was only 802 positions, a level less than 40% of the original plan for that time. The planned end-of-year strength for FY 1970 is 850 positions. A total of 1,000 civil service employees are now necessary to achieve a balanced capability on an interim basis and provide the minimum fulfillment of the Center's mission and program commitments. Therefore, 150 additional positions are being requested in this budget. These positions will be used primarily to support the program areas of air traffic control systems, bioinstrumentation, optical communications, and the fundamental advancement of electronics components.

The following chart reflects the planned ERC staffing by types of positions:

ERC STAFFING SUMMARY

<u>Type of Position</u>	<u>Present Level</u>	<u>Level 6/30/70</u>	<u>Level 6/30/71</u>
Scientists & Engs.	430	451	537
Prof. Admin.	118	120	129
Technicians	106	119	159
Clerical	<u>156</u>	<u>160</u>	<u>175</u>
Total	810	850	1,000

The proposed program distribution for the 107 additional scientists and engineers to be hired from now until the end of FY 1971 is as follows:

	20	Air Traffic Control
	15	Hazard Avoidance
	8	Guidance and Control
	8	Optical Communications
	8	Bioinstrumentation
	8	Aircraft Power Conditioning
	12	Microcircuit Technology
	<u>28</u>	Basic Research in Advanced Electronic Components
Total	107	

Langley Research Center

During a period of a decreasing Center personnel complement, LRC has assumed the major role of overall project management of project Viking and the total development responsibility for the Viking spacecraft lander system. This has required the diversion of experienced Center personnel from other programs during the latter part of FY 1969 and continuing throughout FY 1970 to establish the basic Viking Project Office capability and to provide the engineering and other support in organizational elements outside the project office.

Approximately 50 of the 180 positions requested for Viking at LRC in FY 1971 will be used to augment this basic capability to meet the full requirements of Viking. The remaining 130 of the 180 Viking positions will be used to restore the engineering strength which was diverted to Viking as an expedient from important technology programs (specifically 50 for Space Shuttle Technology, 20 for Space Station Technology, and 60 for Aviation Technology).

In addition to the restoration of 60 positions to meet Aviation Technology commitments, 40 positions are requested to strengthen fundamental research in aircraft structures. This brings the total requested for LRC to 220.

The importance of this fundamental research in aircraft structures is illustrated by the fact that excess structural weight has been the principal reason for delays in the Supersonic Transport development.

Fourteen of the 40 positions will be assigned for development and utilization of new materials such as high modulus boron or graphite filaments. This work offers great potential for improving structural efficiency while reducing structural weight.

Automation of the structural design process by utilizing large digital computers is now feasible. An advance in this area is urgently needed to develop the technological base on which assessments of the influences of structural geometry and vehicle configuration on structural weight can be made. Twelve of the 40 positions will be used for this research.

Problems introduced by new materials such as composites, more severe structural environments such as supersonic flight, and the requirement for extended aircraft lifetimes have created a need for expanded research on structural fatigue. Langley's facilities for conducting fatigue research are currently under-utilized because of a shortage of trained researchers. Six of the 40 positions will be assigned to this area.

Aviation is characterized by long term trends to larger and larger airplanes and more refined and lighter weight structures. Both trends produce relatively greater airframe flexibility, aeroelastic, and dynamic effects. Incorporation into design of satisfactory gust response, flutter margins, fatigue resistance, stability and control, and even passenger ride comfort becomes progressively more difficult. The use of an active control system to alleviate flexibility effects is very

promising, but its successful adoption requires assessment of the effects of such a system on all these design problems. Eight employees will be assigned to an expanded wind tunnel program involving testing of dynamically scaled models.

Lewis Research Center

A small number of engineers will be working on Viking in FY 1970 at Lewis to plan the launch vehicle requirements resulting from the spacecraft design and mission requirements. It will be necessary to expand this group in FY 1971 to establish a Viking Launch Vehicle Project Office with the full range and quality of skills necessary to perform a total project management function. Thirty-five additional positions are required in FY 1971 to staff this office. These personnel will be responsible for procurement of the Titan/Centaur launch vehicle, giving technical direction to the launch vehicle contractor, delivery of the vehicle to Cape Kennedy, and vehicle checkout. They will also assist in the integration of spacecraft and launch vehicle, launch operations, and in evaluation of post-launch data.

Ten additional positions are required at Lewis for the NASA Aerospace Safety Research and Data Institute (ASRDI). Although this Institute has been established at Lewis, it will call on all elements of NASA, its contractors, and other organizations to provide basic, applied, and operational data related to ground-based and flight safety experience. The ASRDI will establish a data bank for analysis and dissemination to

all user elements in NASA. To date, eight employees at Lewis have been working with ASRDI. As the data bank becomes operational in FY 1971 and demands for the services increase, additional personnel will be required to provide the specialized services necessary to operate a data bank and provide analysis for the users.

National Aeronautics and Space Administration

RESEARCH AND PROGRAM MANAGEMENT
FY 1971 BUDGET SUBMISSION
FUNCTIONAL DISTRIBUTION BY INSTALLATION
(Thousands of Dollars)

	<u>Subtotal</u> <u>OMSF</u>	<u>KSC</u>	<u>MSC</u>	<u>MSFC</u>
<u>OMSF</u>				
<u>Function</u>				
<u>Personnel</u>				
1969	204,078	43,326	69,285	91,467
1970	222,353	46,518	76,756	99,079
1971	224,482	46,613	78,097	99,772
<u>Travel</u>				
1969	6,417	569	3,726	2,122
1970	6,513	674	3,709	2,130
1971	6,463	674	3,709	2,080
<u>ADP</u>				
1969	12,424	1,044	5,470	5,910
1970	14,763	1,050	5,728	7,985
1971	14,838	1,050	5,845	7,943
<u>Facilities Services</u>				
1969	58,691	40,157	10,162	8,372
1970	53,302	38,769	8,186	6,347
1971	55,192	37,321	9,398	8,473
<u>Technical Services</u>				
1969	3,982	---	2,355	1,627
1970	3,454	---	2,117	1,337
1971	4,255	---	2,221	2,034
<u>Administrative Support</u>				
1969	25,380	10,702	7,841	6,837
1970	21,652	10,134	7,271	4,247
1971	23,978	10,509	7,617	5,852
<u>Total</u>				
1969	310,972	95,798	98,839	116,335
1970	322,037	97,145	103,767	121,125
1971	329,208	96,167	106,887	126,154

National Aeronautics and Space Administration
 RESEARCH AND PROGRAM MANAGEMENT
 FY 1971 BUDGET SUBMISSION
 FUNCTIONAL DISTRIBUTION BY INSTALLATION
 (Thousands of Dollars)

<u>OSSA</u>	<u>Subtotal</u> <u>OSSA</u>	<u>GSFC</u>	<u>W.S.</u>
<u>Function</u>			
<u>Personnel</u>			
1969	61,802	56,200	5,602
1970	74,865	68,635	6,230
1971	77,505	71,057	6,448
<u>Travel</u>			
1969	1,812	1,695	117
1970	2,080	1,944	136
1971	2,164	2,018	146
<u>ADP</u>			
1969	6,067	5,987	80
1970	5,131	5,064	67
1971	5,818	5,751	67
<u>Facilities Services</u>			
1969	7,222	4,951	2,271
1970	8,120	5,822	2,298
1971	7,476	5,188	2,288
<u>Technical Services</u>			
1969	967	914	53
1970	812	750	62
1971	762	700	62
<u>Administrative Support</u>			
1969	4,459	3,480	979
1970	3,225	2,503	722
1971	3,122	2,400	722
<u>Total</u>			
1969	82,329	73,227	9,102
1970	94,233	84,718	9,515
1971	96,847	87,114	9,733

National Aeronautics and Space Administration

RESEARCH AND PROGRAM MANAGEMENT
FY 1971 BUDGET SUBMISSION
FUNCTIONAL DISTRIBUTION BY INSTALLATION
(Thousands of Dollars)

<u>OART</u>	<u>Function</u>	<u>Subtotal</u>						
		<u>OART</u>	<u>ARC</u>	<u>ERC</u>	<u>FRC</u>	<u>LRC</u>	<u>LeRC</u>	<u>SNPO</u>
	<u>Personnel</u>							
	1969	159,745	28,478	11,979	7,522	51,899	57,987	1,880
	1970	176,176	30,908	13,815	8,162	57,366	63,900	2,025
	1971	185,764	32,659	15,300	8,466	60,376	66,948	2,015
	<u>Travel</u>							
	1969	3,435	694	321	200	1,134	898	188
	1970	3,463	700	351	192	1,140	895	185
	1971	3,600	725	400	192	1,203	895	185
	<u>ADP</u>							
	1969	2,953	324	1,206	58	933	432	---
	1970	1,832	439	730	85	295	283	---
	1971	1,979	439	760	85	412	283	---
	<u>Facilities Services</u>							
	1969	20,071	3,659	1,822	1,257	6,394	6,939	---
	1970	19,071	3,511	2,177	996	6,318	6,069	---
	1971	19,476	3,806	1,986	1,044	6,571	6,069	---
	<u>Technical Services</u>							
	1969	1,832	41	866	47	73	737	68
	1970	1,257	22	981	73	96	85	---
	1971	1,495	24	1,213	77	96	85	---
	<u>Administrative Support</u>							
	1969	5,857	637	1,043	612	2,512	852	---
	1970	6,032	620	1,397	578	2,531	906	---
	1971	6,078	673	1,177	606	2,716	906	---
	<u>Total</u>							
	1969	193,893	34,033	17,237	9,697	62,945	67,845	2,136
	1970	207,831	36,200	19,451	10,086	67,746	72,138	2,210
	1971	218,392	38,326	20,836	10,470	71,374	75,186	2,200

National Aeronautics and Space Administration
 RESEARCH AND PROGRAMS
 FISCAL YEAR 1971 BUDGET SUBMISSION
 FUNCTIONAL DESCRIPTION OF FUND ALLIGATION
 (Thousands of Dollars)

<u>NASA Total & Hqtrs.</u>	<u>Subtotal Hdqtrs.</u>	<u>Hqtrs.</u>	<u>NAPO</u>	<u>Total NASA</u>
<u>Function</u>				
<u>Personnel</u>				
1969	38,002	36,853	1,149	463,627
1970	41,838	40,612	1,226	515,232
1971	42,971	41,706	1,265	530,722
<u>Travel</u>				
1969	2,540	2,477	63	14,204
1970	2,827	2,759	68	14,883
1971	2,831	2,759	72	15,058
<u>ADP</u>				
1969	2,336	2,336	---	23,780
1970	1,556	1,556	---	23,282
1971	1,556	1,556	---	24,191
<u>Facilities Services</u>				
1969	425	408	17	86,409
1970	326	309	17	80,819
1971	326	309	17	82,470
<u>Technical Services</u>				
1969	11,611	11,517	94	18,392
1970	9,546	9,418	128	15,069
1971	9,546	9,418	128	16,058
<u>Administrative Support</u>				
1969	5,864	5,489	375	41,560
1970	5,323	4,952	371	36,232
1971	5,323	4,952	371	38,501
<u>Total</u>				
1969	60,778	59,080	1,698	647,972
1970	61,416	59,606	1,810	685,517
1971	62,553	60,700	1,853	707,000