

FISCAL YEAR 19 70 BUDGET ESTIMATES

NASA INSTALLATION

All

COGNIZANT PROGRAM OFFICE FOR INSTALLATION

Office of Organization and Management

LOCATION OF INSTALLATION

COUNTY

NEAREST CITY

INSTALLATION MISSION

PROJECT LINE ITEM

**COGNIZANT
OFFICE**

FY 19 59
THRU
CURRENT YR

FY 1970
(Estimated)

**FUTURE
YEARS
(Estimated)**

**TOTAL
ALL YEARS
(Estimated)**

Facility Planning and Design

O&M

53,865

3,500

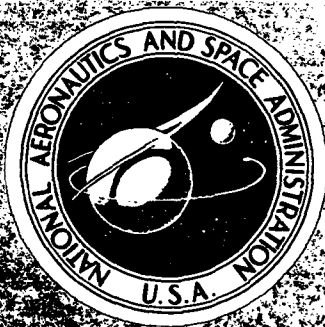
Not
Applicable

TOTAL

3,500

1970 Congressional Budget
Estimates Construction of Facilities
Vol III

National Aeronautics and Space Administration



BUDGET ESTIMATES

FISCAL YEAR 1970
Volume III

CONSTRUCTION OF FACILITIES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

GENERAL STATEMENT

This appropriation provides for contractual services for the design, construction, and modification of facilities; the purchase of equipment related to construction and modification; major modifications and rehabilitations to existing facilities; and advance design of facilities planned for future authorization. The principal projects in the 1970 program are described below:

MANNED SPACE FLIGHT: This activity includes funding for modifications to launch facilities, utility installations, and other facilities at the John F. Kennedy Space Center, NASA, Kennedy Space Center, Fla.; and a power generation facility at the Manned Spacecraft Center, Houston, Tex.

SCIENTIFIC INVESTIGATIONS IN SPACE: The estimates for this activity provide for modifications to facilities for fire protection and prevention at the Goddard Space Flight Center, Greenbelt, Md.; a flight information control and analysis laboratory at Wallops Station, Wallops Island, Va.; and modifications to the space launch complex at the Western Test Range, Vandenberg Air Force Base, Calif.

SPACE APPLICATIONS: No 1970 projects.

SPACE TECHNOLOGY: Funds for this activity will provide for a computer-instrumentation research laboratory and extension to the center support facilities at the Electronics Research Center, Cambridge, Mass.

AIRCRAFT TECHNOLOGY: This activity includes funding for an aircraft noise reduction laboratory at the Langley Research Center, Hampton, Va.

SUPPORTING ACTIVITIES: This activity includes funds for facility planning and design; completion of two 210-foot-diameter antenna systems at Canberra, Australia, and Madrid, Spain; and modifications and rehabilitations to facilities at NASA installations and at plants operated by contractors for NASA.

The appropriation for FY 1969 was \$21,800,000 and the authorization was \$39,600,000. The request for 1970 is \$58,200,000, an increase of \$36,400,000 over the 1969 appropriation. Total expenditures are estimated to be \$60,000,000 in FY 1970, a decrease of \$10,000,000 from the \$70,000,000 estimated for FY 1969.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1970 ESTIMATES

SUMMARY OF CONSTRUCTION OF FACILITIES BUDGET PLAN AS
RECONCILED TO FINANCING SCHEDULE

	<u>Fiscal Year 1968</u>	<u>Fiscal Year 1969</u>	<u>Fiscal Year 1970</u>
<u>Budget Activity</u>			
1. Manned Space Flight.....	\$21,340,000	\$10,414,000	\$14,250,000
2. Scientific Investigations in Space.....	3,595,000	1,925,000	1,595,000
3. Space Applications.....	---	---	---
4. Space Technology.....	2,115,000	386,000	8,088,000
5. Aircraft Technology.....	3,170,000	---	4,767,000
6. Supporting Activities.....	<u>3,285,000</u>	<u>22,975,000</u>	<u>29,500,000</u>
Total Budget Plan.....	<u>\$33,505,000</u>	<u>\$35,700,000</u>	<u>\$58,200,000</u>
<u>Financing:</u>			
Appropriation.....	\$35,900,000	\$21,800,000	\$58,200,000
Transferred from other accounts.....	<u>1,900,000</u>	<u>13,900,000</u>	---
Appropriation (adjusted)..<	\$37,800,000	\$35,700,000	\$58,200,000
Reprogramming to prior year budget plans.....	<u>-4,295,000</u>	---	---
Total financing of budget plan.....	<u>\$33,505,000</u>	<u>\$35,700,000</u>	<u>\$58,200,000</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1970 ESTIMATES

SUMMARY OF CONSTRUCTION OF FACILITIES BUDGET PLAN BY BUDGET ACTIVITY SHOWING LOCATION TOTALS INCLUDED IN EACH ACTIVITY

	<u>Fiscal Year</u> <u>1968</u>	<u>Fiscal Year</u> <u>1969</u>	<u>Fiscal Year</u> <u>1970</u>
1. MANNED SPACE FLIGHT.....	<u>\$21,340,000</u>	<u>\$10,414,000</u>	<u>\$14,250,000</u>
John F. Kennedy Space			
Center, NASA.....	19,342,000	7,364,000	12,500,000
Manned Spacecraft Center....	750,000	1,333,000	1,750,000
Marshall Space Flight Center	823,000	---	---
Michoud Assembly Facility...	425,000	400,000	---
Various Locations.....	---	1,317,000	---
2. SCIENTIFIC INVESTIGATIONS IN			
SPACE.....	<u>\$3,595,000</u>	<u>\$1,925,000</u>	<u>\$1,595,000</u>
Goddard Space Flight Center.	565,000	---	670,000
John F. Kennedy Space			
Center, NASA.....	2,290,000	1,650,000	---
Wallops Station.....	740,000	275,000	500,000
Various Locations.....	---	---	425,000
3. SPACE APPLICATIONS.....	<u>---</u>	<u>---</u>	<u>---</u>
4. SPACE TECHNOLOGY.....	<u>\$2,115,000</u>	<u>\$386,000</u>	<u>\$8,088,000</u>
Ames Research Center.....	---	386,000	---
Electronics Research Center.	---	---	8,088,000
Lewis Research Center.....	2,115,000	---	---
5. AIRCRAFT TECHNOLOGY.....	<u>\$3,170,000</u>	<u>---</u>	<u>\$4,767,000</u>
Ames Research Center.....	3,170,000	---	---
Langley Research Center.....	---	---	4,767,000
6. SUPPORTING ACTIVITIES.....	<u>\$3,285,000</u>	<u>\$22,975,000</u>	<u>\$29,500,000</u>
Jet Propulsion Laboratory...	1,930,000	---	---
Various Locations.....	---	21,975,000	26,000,000
Facility Planning and Design	1,355,000	1,000,000	3,500,000
TOTAL PLAN.....	<u>\$33,505,000</u>	<u>\$35,700,000</u>	<u>\$58,200,000</u>

SUM 3

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

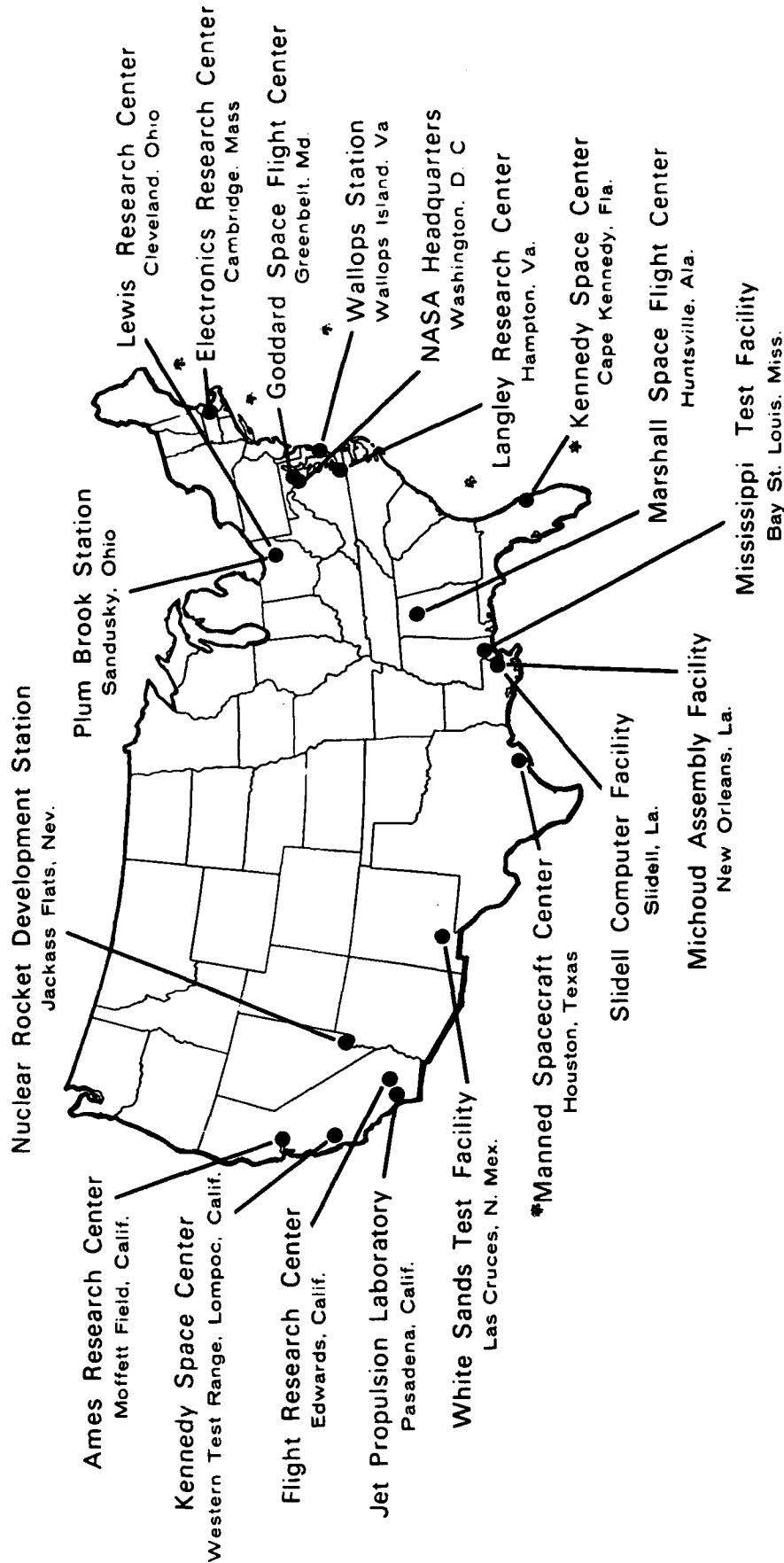
FISCAL YEAR 1970 ESTIMATES

SUMMARY OF CONSTRUCTION OF FACILITIES BUDGET PLAN BY LOCATION

<u>Location</u>	<u>Fiscal Year 1968</u>	<u>Fiscal Year 1969</u>	<u>Fiscal Year 1970</u>
Ames Research Center.....	\$3,170,000	\$386,000	---
Electronics Research Center.....	---	---	\$8,088,000
Goddard Space Flight Center.....	565,000	---	670,000
Jet Propulsion Laboratory.....	1,930,000	---	---
John F. Kennedy Space Center, NASA	21,632,000	9,014,000	12,500,000
Langley Research Center.....	---	---	4,767,000
Lewis Research Center.....	2,115,000	---	---
Manned Spacecraft Center.....	750,000	1,333,000	1,750,000
Marshall Space Flight Center.....	823,000	---	---
Michoud Assembly Facility.....	425,000	400,000	---
Wallops Station.....	740,000	275,000	500,000
Various Locations.....	---	23,292,000	26,425,000
Facility Planning and Design.....	<u>1,355,000</u>	<u>1,000,000</u>	<u>3,500,000</u>
Total Plan.....	<u>\$33,505,000</u>	<u>\$35,700,000</u>	<u>\$58,200,000</u>

The geographic location of NASA installations is shown on the following page. Installations for which construction projects are requested in the fiscal year 1970 budget are identified.

NASA INSTALLATIONS



* Installations for which construction projects are requested in the FY 1970 budget estimates.

CAPITALIZED VALUE OF NASA'S FACILITIES
AS OF JUNE 30, 1968
(IN-HOUSE AND CONTRACTOR-HELD FACILITIES)
(\$ in thousands)

Date : January 13, 1969

Reporting Installation	Land	Buildings	Other Structures and Facilities	Leasehold Improvements	Plant Equipment	Fixed Assets in Progress	Total
OFFICE OF MANNED SPACE FLIGHT							
Kennedy Space Center	\$ 60,516	\$ 242,915	\$ 378,948	\$ -	\$ 44,805	\$ 240,231	\$ 967,415
Western Test Range Operation Div	-	-	-	-	2,841	-	2,841
Various Locations (Contractor-Held)	5,443	125,701	26,769	-	80,254	-	80,254
Manned Spacecraft Center	-	8,651	17,272	-	106,758	47,477	312,148
White Sands Test Facility	3,572	24,436	5,383	8	4,487	1,193	31,603
Various Locations (Contractor-Held)	95	102,632	39,418	161	43,728	-	77,127
Marshall Space Flight Center	7,502	63,212	24,251	-	147,243	42,352	331,901
Michoud Assembly Facility	15,224	61,394	152,685	-	41,338	5,097	141,400
Mississippi Test Facility	63	4,406	824	-	24,846	32,363	286,452
Slidell Computer Facility	3,707	20,457	42,552	23	311	-	5,604
Various Locations (Contractor-Held)	\$ 96,122	\$ 653,804	\$ 688,042	\$ 192	\$ 585,443	\$ 393,353	\$ 2,416,961
Total							
OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY							
Ames Research Center	\$ 2,372	\$ 161,816	\$ 2,383	\$ -	\$ 52,421	\$ 6,470	\$ 225,462
Various Locations (Contractor-Held)	-	-	-	-	1,249	-	1,249
Electronics Research Center	1,099	1,671	9	-	13,224	4,151	20,154
Various Locations (Contractor-Held)	-	-	-	-	3	-	3
Flight Research Center	-	7,627	1,900	-	32,313	960	42,800
Various Locations (Contractor-Held)	-	-	-	-	19	-	19
Langley Research Center	110	103,393	130,877	-	88,583	17,780	340,743
Various Locations (Contractor-Held)	6	15,177	25	-	2,657	-	17,865
Lewis Research Center	310	106,752	38,632	147	53,149	24,632	223,622
Plum Brook Station	1,287	68,854	17,238	-	8,152	12,370	107,901
Various Locations (Contractor-Held)	99	4,228	4,019	8	35,583	10,273	54,210
Space Nuclear Propulsion Office	-	19,680	5,110	-	3,770	502	29,062
Various Locations (Contractor-Held)	-	-	125	-	20,638	27	20,790
Total	\$ 5,283	\$ 489,198	\$ 200,318	\$ 155	\$ 311,761	\$ 77,165	\$ 1,083,880
OFFICE OF SPACE SCIENCE AND APPLICATIONS							
Goddard Space Flight Center	\$ 1,200	\$ 64,415	\$ 11,142	\$ 276	\$ 147,888	\$ 110,817	\$ 335,738
* Tracking Stations	335	16,561	38,254	-	194,123	-	249,273
Various Locations (Contractor-Held)	-	88	45	31	29,685	-	29,849
Jet Propulsion Laboratory	799	42,509	6,450	408	77,745	-	127,911
Tracking Stations (Deep Space Networks)	-	7,947	21,066	-	26,051	-	55,064
Wallops Station	611	21,107	39,381	-	31,054	4,220	96,373
Various Locations (Contractor-Held)	-	2,558	270	-	4,187	-	7,015
Total	\$ 2,945	\$ 155,185	\$ 116,608	\$ 715	\$ 510,733	\$ 115,037	\$ 901,223
OTHER							
Headquarters	\$ -	\$ -	\$ -	\$ -	\$ 5,132	\$ -	\$ 5,132
Various Locations (Contractor-Held)	-	-	-	-	5,078	-	5,078
Total	-	-	-	-	10,210	-	10,210
Grand Total	\$104,350	\$1,298,187	\$1,004,968	\$1,062	\$1,418,152	\$585,555	\$4,412,274

* Includes capital type facilities of the MSF and STADA networks and other supporting activities including equipment aboard ships and aircraft

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

ELECTRONICS RESEARCH CENTER

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Summary.....	CF 1-2
Office of Advanced Research and Technology Projects:	
Computer/instrumentation research laboratory.....	CF 1-3
Center support facilities III.....	CF 1-11

**ELECTRONICS RESEARCH CENTER
FISCAL YEAR 1970 ESTIMATES
LOCATION PLAN
CAMBRIDGE, MASS.**

EXISTING FY 1965/1966

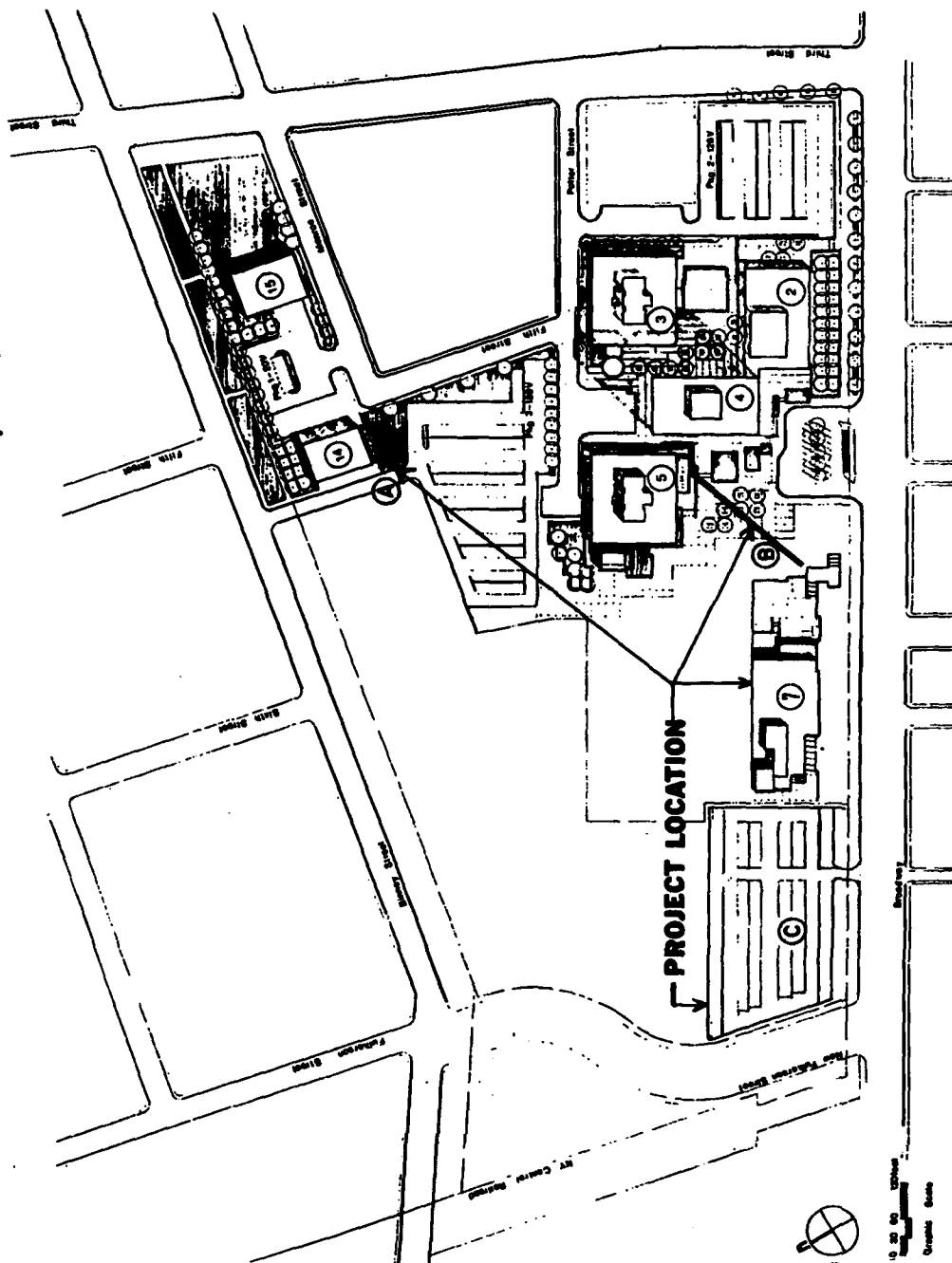
- 2. Auditorium
- 4. High Rise Laboratory
- 14. Center Service Building

EXISTING FY 1967

- 3. Optics Laboratory
- 5. Guidance Laboratory
- 15. Shipping and Receiving Facility

PROPOSED FY 1970

- 7. **COMPUTER/INSTRUMENTATION
RESEARCH LABORATORY
CENTER SUPPORT FACILITIES III**
 - A. BLDG. 14 ADDITION
 - B. UTILITY TUNNEL ADD.
 - C. PARKING AREA 6



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 70 BUDGET ESTIMATES

(Dollars in thousands)

NASA INSTALLATION		COGNIZANT PROGRAM OFFICE FOR INSTALLATION	
Electronics Research Center		Advanced Research and Technology	
LOCATION OF INSTALLATION	COUNTY	NEAREST CITY	
Cambridge, Massachusetts	Middlesex	Cambridge, Massachusetts	

INSTALLATION MISSION

The mission of the Electronics Research Center is to increase the nation's capability in space by providing the knowledge and advanced technology needed to improve performance and reliability of space and aeronautical electronic systems and components. The Center organizes, manages, and conducts a comprehensive program of basic and applied aerospace electronics research. It also provides a focal point for national aerospace electronics research, coordinating nation-wide research efforts and sponsoring electronics research conducted by industry, universities, and private institutions.

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 19 <u>59</u> THRU CURRENT YR	FY 19 <u>70</u> (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Computer/Instrumentation Research Laboratory	ART	255	6,962		7,217
Center Support Facilities III	ART	66	1,126		1,192
TOTAL			8,088		

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

COMPUTER/INSTRUMENTATION RESEARCH LABORATORY

AUTHORIZATION LINE ITEM: Electronics Research Center

PROGRAM OFFICE FOR THE PROJECT: Office of Advanced Research and Technology

LOCATION OF PROJECT: Cambridge, Middlesex County, Massachusetts

COGNIZANT NASA INSTALLATION: Electronics Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1969 and Prior Years	\$255,000
FY 1970 Estimate	<u>6,962,000</u>
Total Funding Through FY 1970	<u>\$7,217,000</u>

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>				<u>\$3,900,000</u>
Site development	LS	---	\$16,000	16,000
Building	Sq. Ft.	79,000	44.04	3,479,000
Utilities and electrical distribution	LS	---	57,000	57,000
Special construction features	LS	---	348,000	348,000
<u>Equipment</u>				<u>\$3,062,000</u>
Computer Research Laboratory				
Special purpose equipment	LS	---	765,000	765,000
Instrumentation Research Laboratory				
Special purpose equipment	LS	---	2,297,000	2,297,000
<u>Design</u>	---	---	---	---
<u>Fallout Shelter</u>	---	---	---	-0-
		TOTAL		<u><u>\$6,962,000</u></u>

PROJECT PURPOSE:

This project will provide permanent facilities and equipment necessary for conducting coordinated computer and instrumentation research leading to advancement and integration of computer, data processing, measurement and instrumentation techniques.

PROJECT DESCRIPTION:

This project provides for construction of an office laboratory structure which will enclose a gross area of approximately 79,000 square feet and provide laboratory and office space for a technical staff of approximately 160 people. The facility will be constructed of incombustible material with special environmental control provided for unique laboratory or operational functions. Elevators will provide vertical transportation of heavy equipment, supplies, and personnel. The building will be complete with all required utilities, including connections to centrally located utilities services.

PROJECT JUSTIFICATION:

Computers and instrumentation required to support aerospace missions are growing in complexity and capacity. They are concurrently experiencing rapid changes in state-of-the-art development. In order to effectively meet the demands of future missions for advanced instrumentation and computing systems, the Electronics Research Center has been assigned a leading role for research and development in both areas. In the field of advanced instrumentation and measurement it is essential that the efforts of a highly qualified interdisciplinary group of physical and life scientists be applied to the critical measurement problems of space and aeronautics. Similarly, in the field of computer systems, hardware, software, and programming technology are considered to be pacing items in the development and use of future ground and spaceborne systems. By using an experimental interactive computing system as a base, an intensive effort will be made to formalize and automate the software development process, develop more flexible and universal computer language, and evaluate software-hardware tradeoffs.

Currently, the organizations to perform these tasks are in being; however, they are concentrated in 21,000 square feet of leased space which is totally inadequate for the difficult and complex tasks associated with computer and instrumentation technology. There is insufficient space to permit installation of needed, additional equipment. Since the facilities being temporarily occupied were not constructed as laboratories, supporting facilities necessary for advanced research cannot be accommodated. Therefore, a new facility is a necessary foundation to the continued creativity and effectiveness of the computer and instrumentation effort within NASA. The facility will be committed to a coordinated research effort to provide the advancement of computer and instrumentation technology required for support of increasingly complex aerospace missions.

Typical of the work to be performed in this laboratory facility are the following:

Computer Research Laboratory:

The Experimental Multiprocessing Facility will provide a research test bed to achieve controlled performance and reliability in automatic reorganization of internal computer functions to meet changing computation needs or accommodate component failures.

The Advanced Memory Research Facility will provide a capability to investigate techniques for highly reliable data storage systems of extreme capacity and low power.

The Microcircuit Facility will provide a capability to develop and evaluate the functional circuit designs for advanced spaceborne and airborne data processing systems.

The Voice Communications Facility will provide the facilities and research equipment for investigation of advanced computing systems which will accept and interpret voice commands and respond in natural human language.

The Computer and Display Area will provide the facilities to house a display-oriented research computer system with multiple input/output devices that will be used to improve man's ability to communicate with a computer in graphical or pictorial form.

The Visual Perception Area will be utilized to study human response to various computer generated display characteristics and to measure information capacity and effectiveness of varying visual presentations.

The Data Compression Facility will permit the evolution of compaction and compression techniques for reducing the amount of data that must be transmitted from earth-orbiting satellites to the ground station.

The Biocybernetics Area will be used to investigate computer techniques based on the information processing functions of biological organisms to develop self-contained, goal-directed explorer systems which process inputs from many peripheral sensors in real time, forming hypotheses and strategies and taking appropriate action.

Instrumentation Research Laboratory:

The Atraumatic, Physiological Monitoring Facility will provide the facilities and equipment to study and develop new measurement techniques capable of monitoring the physiological condition of pilots and astronauts without the necessity for surgical implantation or physical attachment of sensors. In addition, advanced instrumentation will be developed for monitoring mental alertness and other indices of pilot/astronaut performance.

The Aeronomy and Meteorology Facility will provide a capability for the advancement of badly needed new measurement techniques such as laser backscatter and high frequency radiometry in support of the technology requirements for future weather satellites and advanced aeronautical missions.

The Total Atmospheric Simulator Facility will provide a capability to physically recreate the complex combinations of neutral atoms and molecules, ions and electrons that exist in the earth's atmosphere, to calibrate atmospheric probes as well as to generate new measurement techniques for the analysis of planetary atmospheres. This facility will be unique not only within NASA but within the free world.

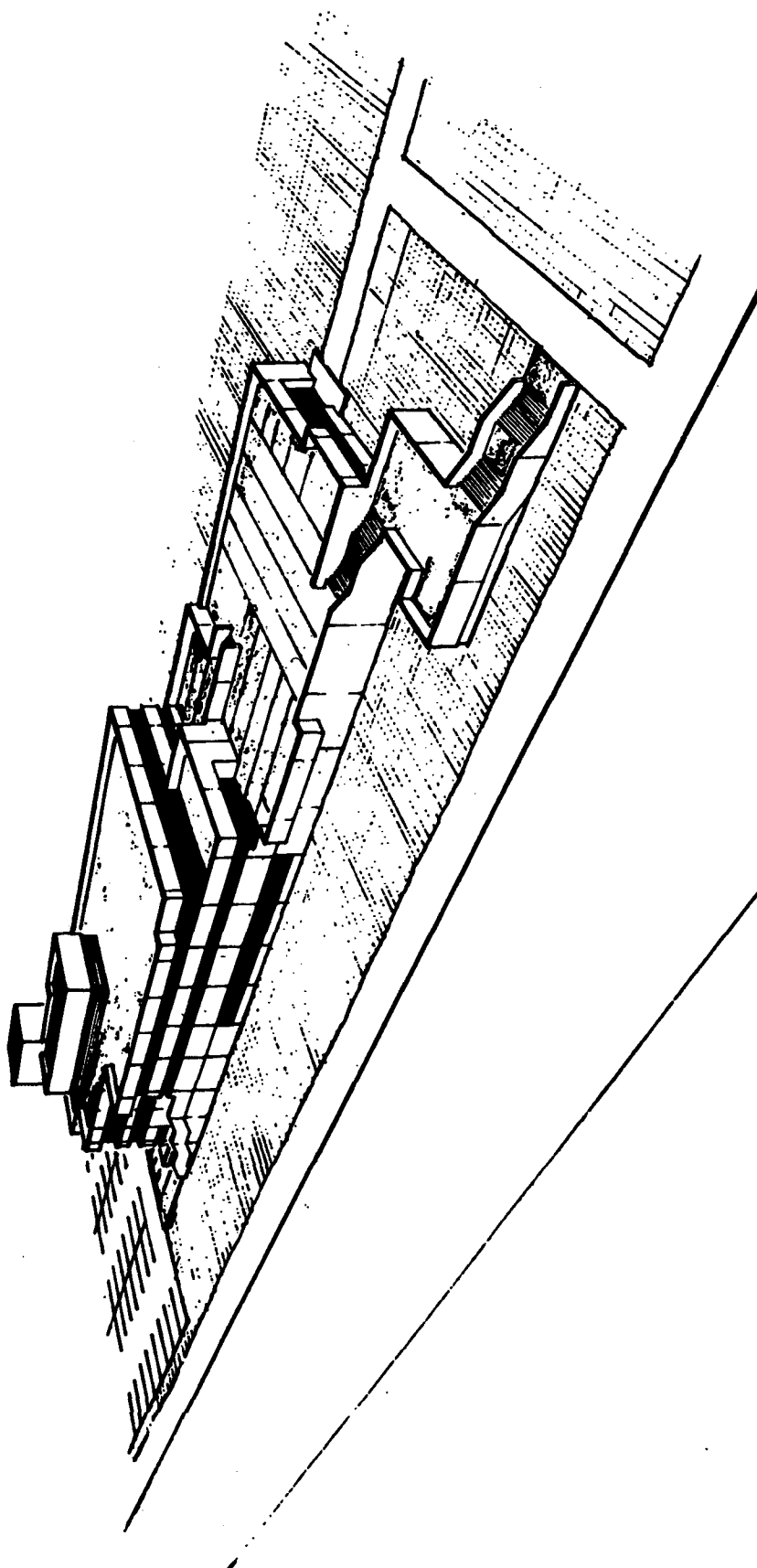
An Ultraviolet and Soft X-ray Facility will provide a capability for basic work in the detection and analysis of the short wavelength portion of the solar electromagnetic spectrum in which correct instrumentation is notably deficient.

The High Vacuum Research Facility will permit advanced research to develop a more fundamental understanding of the physical characteristics of the space environment and related measurement technology for the probes, orbiters and landers of future space missions.

The Avionics Instrumentation Facility will provide the capability to advance measurement techniques unique to the operation and maintenance of supersonic, commercial, and general aircraft. This facility is expected to play a leading role in the evolution of a new generation of aeronautical measurements concepts and their instrumentation counterparts.

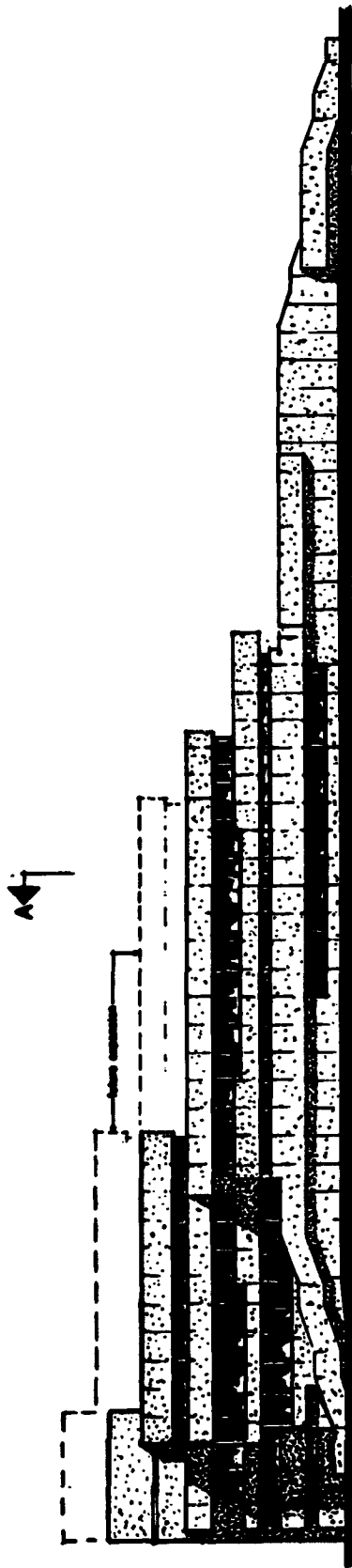
ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: No additional requirements are currently identified; however, future changes and technology or programmatic needs may generate future needs for this facility.

**ELECTRONICS RESEARCH CENTER
FISCAL YEAR 1970 ESTIMATES
COMPUTER/INSTRUMENTATION RESEARCH LABORATORY**

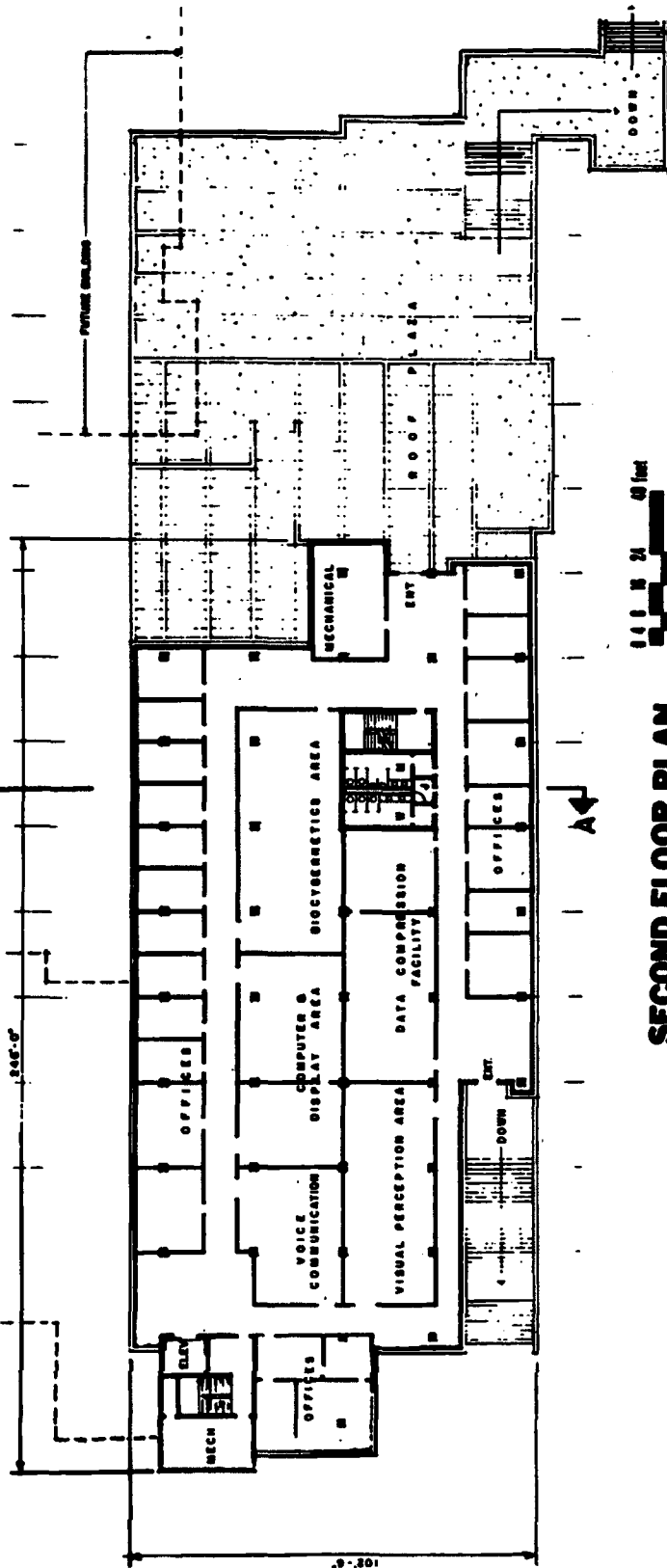


PERSPECTIVE

**ELECTRONICS RESEARCH CENTER
FISCAL YEAR 1970 ESTIMATES
COMPUTER/INSTRUMENTATION RESEARCH LABORATORY**

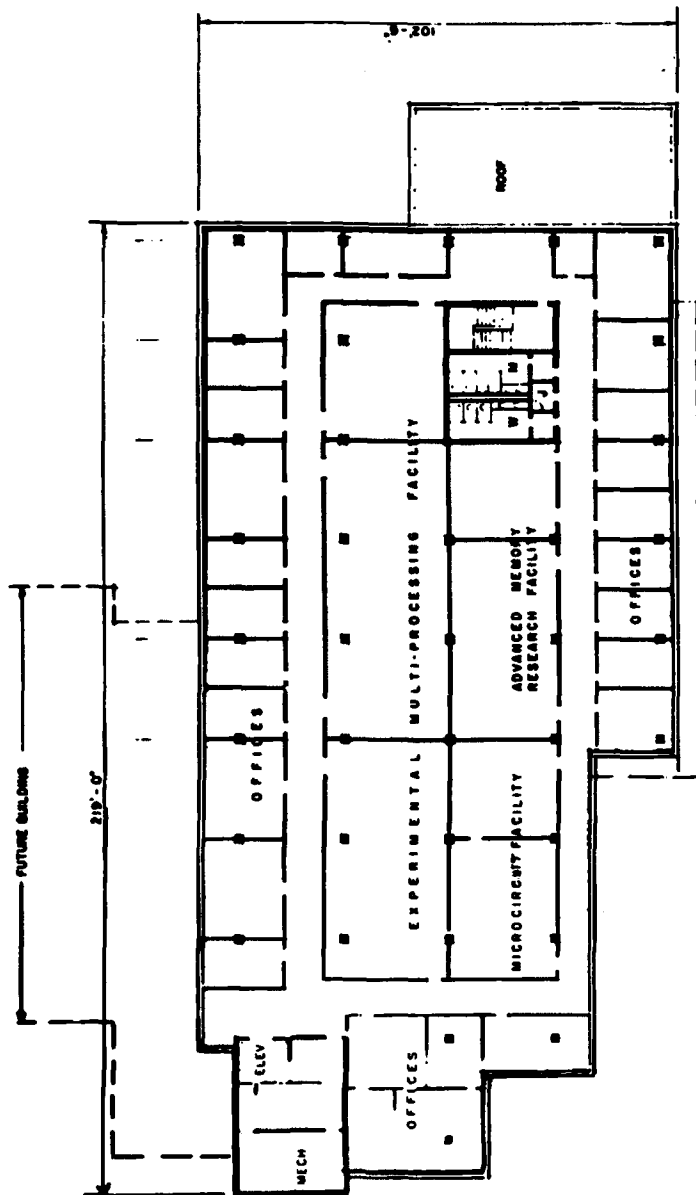


ELEVATION



SECOND FLOOR PLAN

ELECTRONICS RESEARCH CENTER
FISCAL YEAR 1970 ESTIMATES
COMPUTER/INSTRUMENTATION RESEARCH LABORATORY



THIRD FLOOR PLAN

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1970 ESTIMATES
CENTER SUPPORT FACILITIES III

AUTHORIZATION LINE ITEM: Electronics Research Center

PROGRAM OFFICE FOR THE PROJECT: Office of Advanced Research and Technology

LOCATION OF PROJECT: Cambridge, Middlesex County, Massachusetts

COGNIZANT NASA INSTALLATION: Electronics Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1969 and Prior Years	\$66,000
FY 1970 Estimate	<u>1,126,000</u>
Total Funding Through FY 1970	<u>\$1,192,000</u>

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>				<u>\$1,126,000</u>
Building	Sq. Ft.	2,580	\$38.76	100,000
Utility tunnel	LF	448	950	426,000
Paving	LS	---	65,000	65,000
Site development	LS	---	185,000	185,000
Site utilities	LS	---	50,000	50,000
Refrigeration system	LS	---	270,000	270,000
Emergency power system	LS	---	30,000	30,000
<u>Equipment</u>	---	---	---	---
<u>Design</u>	---	---	---	---
<u>Fallout Shelter</u>	---	---	---	-0-
		TOTAL		<u><u>\$1,126,000</u></u>

PROJECT PURPOSE:

To extend existing utility systems and provide for general site development in support of the FY 1970 Facilities program.

PROJECT DESCRIPTION:

This project will provide for the general expansion and extension of all utility systems, and provide additional paving and site development to service the laboratory and support facilities included in the FY 1970 construction program.

The work includes a 2,580 square foot extension to the existing Center Service Building to house an additional steam absorption water chiller, a single cell water cooling tower, pumping and emergency power equipment, electrical switchgear, and auxiliary equipment. An existing underground utility tunnel will be extended to serve the new laboratory with chilled water supply and return, steam and condensate return, compressed air and laboratory vacuum, telephone, and electric power systems. Domestic/fire water and natural gas will be furnished by underground piping. The sanitary sewer systems will also be extended to service the new laboratories. Exterior lighting will be extended for site security and personnel safety. Off-street parking will be provided as a part of this project. Other paving will include vehicular circulation and service drives to the new laboratory.

PROJECT JUSTIFICATION:

This extension of utility systems, parking capacity and site development forms the third increment of center support facilities required to support the phased construction of laboratories at the Center. These supporting systems are necessary to make the FY 1970 facilities operational and to assure the orderly development of the total complex.

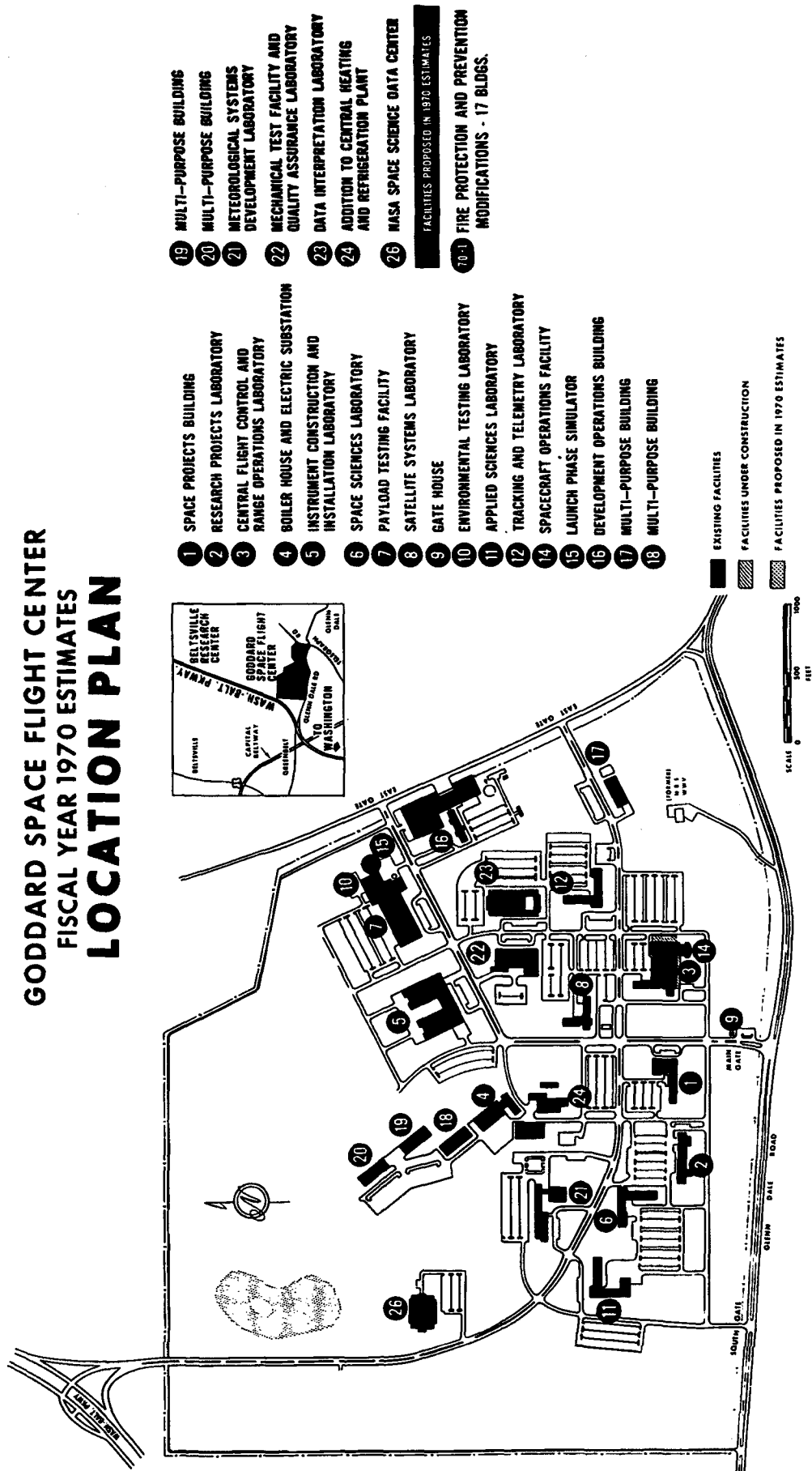
ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None currently identified; however, since this relates to the Center activity as a whole, future mission adjustments may require additional funding for this facility.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1970 ESTIMATES
GODDARD SPACE FLIGHT CENTER

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GODDARD SPACE FLIGHT CENTER FISCAL YEAR 1970 ESTIMATES LOCATION PLAN



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 70 BUDGET ESTIMATES

(Dollars in thousands)

NASA INSTALLATION Goddard Space Flight Center		COGNIZANT PROGRAM OFFICE FOR INSTALLATION Space Science and Applications	
LOCATION OF INSTALLATION Greenbelt, Maryland	COUNTY Prince George's	NEAREST CITY Greenbelt, Maryland	

INSTALLATION MISSION

This Center is responsible for complete development of unmanned sounding rockets and orbiting spacecraft experiments in basic and applied science. The work covers scientific satellites, and communications and weather satellites which orbit in cislunar space (region between the earth and moon). In addition, the Center manages NASA's Delta rocket and two world-wide tracking, data acquisition and data reduction networks.

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 19 <u>59</u> THRU CURRENT YR	FY 19 <u>70</u> (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Fire Protection and Prevention Modifications	SSA	57	670		727
TOTAL			670		

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

FIRE PROTECTION AND PREVENTION MODIFICATIONS

AUTHORIZATION LINE ITEM: Goddard Space Flight Center

PROGRAM OFFICE FOR THE PROJECT: Office of Space Science and Applications

LOCATION OF PROJECT: Greenbelt, Prince George's County, Maryland

COGNIZANT NASA INSTALLATION: Goddard Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Alteration

FUNDING:

FY 1969 and Prior Years	\$57,000
FY 1970 Estimate	<u>670,000</u>
Total Funding Through FY 1970	<u>\$727,000</u>

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>				<u>\$670,000</u>
New sprinkler systems	LS	---	597,000	597,000
Smoke detection systems	LS	---	31,500	31,500
Special partitions, fire doors, and appurtenances	LS	---	41,500	41,500
<u>Equipment</u>	---	---	---	---
<u>Design</u>	---	---	---	---
<u>Fallout Shelter (Not feasible)</u>	---	---	---	<u>None</u>
		TOTAL		<u>\$670,000</u>

PROJECT PURPOSE:

To provide for additional fire protection improvements in some 17 mission critical, high value buildings at the Goddard Space Flight Center. Such added protection will limit the probability of a single fire loss to no more than \$100,000, or a down time of critical operations not in excess of 24 hours.

PROJECT DESCRIPTION:

This project proposes alterations and improvements for fire protection and prevention in some 17 critical, high value buildings at Goddard Space Flight Center.

The work to be performed includes the installation of new sprinkler systems, smoke detectors, and fire-rated windows, doors, and partitions. Specific existing smoke detection systems will be improved by the relocation of existing detector heads and/or the addition of new detector heads.

Sprinkler systems will be tied into the existing domestic water supply systems located in each building. Smoke detectors will be installed which will provide both local warning and a tie-in to the existing central monitoring panel located in the central heating and refrigeration plant. The perimeter of certain critical, high value areas will be upgraded to a one hour fire-resistant rating. Where space and operating functions permit, one hour fire-rated partitions will be installed to subdivide and localize high risk areas.

PROJECT JUSTIFICATION:

In order to provide a rational and logical basis for fire protection improvements at the Goddard Space Flight Center, NASA retained nationally known experts in the field of fire and property protection engineering. These experts developed fire protection criteria, established the degree of required fire protection, and made appropriate recommendations for corrective actions. As a result of these studies, an evaluation of all mission critical and high value laboratory facilities was made. This study led to the fundamental concept that it was a realistic goal that the loss in such facilities from any one particular fire should be limited to \$100,000 or down time not in excess of 24 hours. Specific corrective work was also developed for the 17 buildings included in this project. The following are two examples of the reduction in fire loss potential which will be achieved by this project:

1. Building 7 contains a mixture of occupancies ranging from clean room operations to the reliability testing of satellites and spacecraft. The dollar density (average value in dollars per square foot) in these areas is extremely high. For example, at one point in time, the OAO spacecraft valued at \$65,000,000 was located in this high bay clean room for

electronic integration and checkout. An automatic fire protection system is needed for such an area. Such a system will reduce the possibility of a serious fire and the resultant excessive damage.

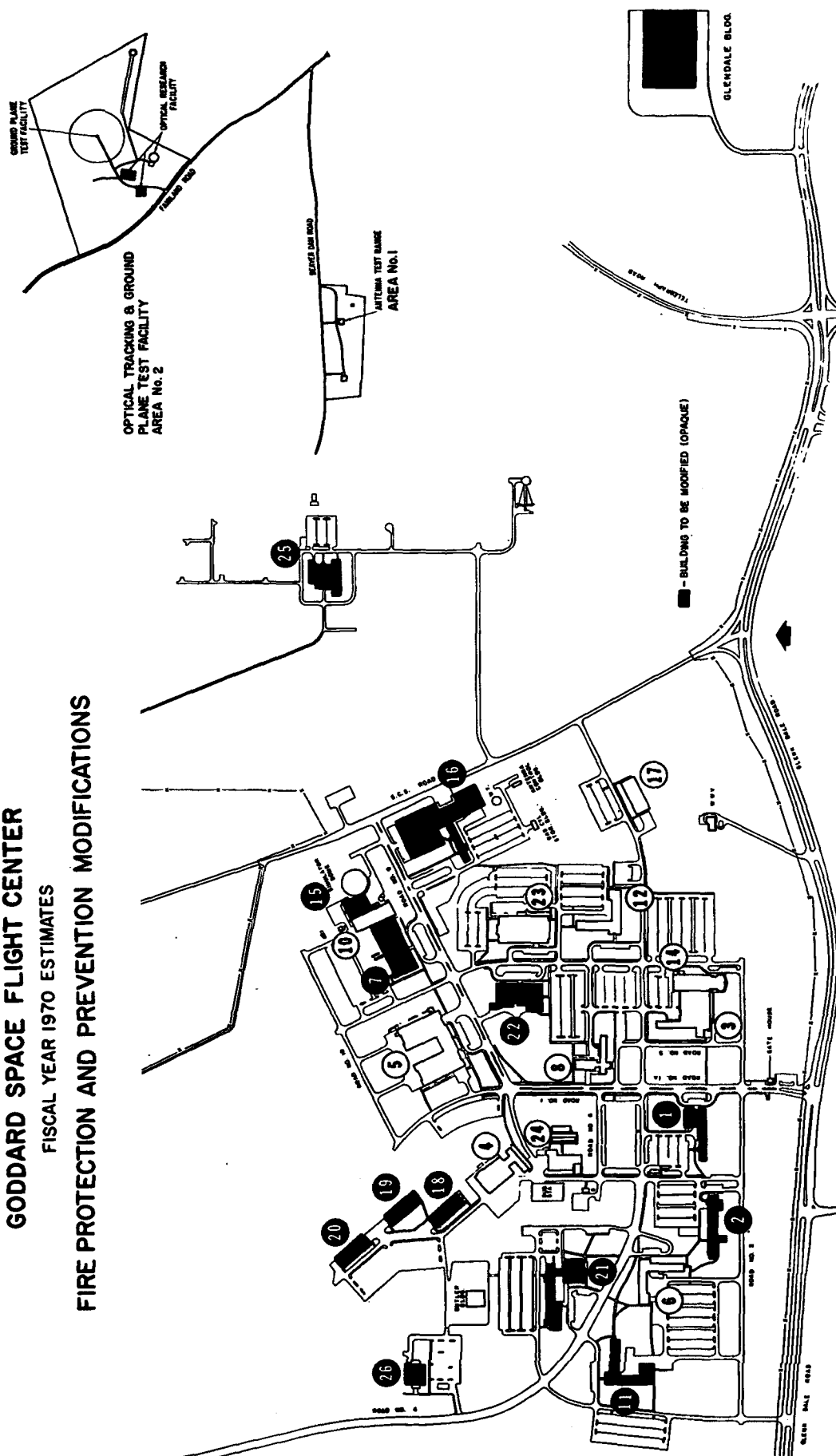
2. Computer operations, electronic laboratories, and research facilities are all located in Building 21. The average property values range from \$1,000 to \$2,000 per square foot. A fire involving a small floor area could result in property loss in excess of \$250,000 plus the interruption of research activities. The design of this building does not permit confinement of a fire to a small area. Thus the complete building is considered as one common fire potential area, involving a multimillion dollar investment. Heat and smoke can do considerable damage to electronic labs and equipment. This could result from a fire originating in and confined to the basement. Sprinkler and smoke detection are included in this project. The addition of doors and protected areas for computer tape staging, will reduce the existing risks to acceptable limits. More importantly, the added fire protection will ensure that research programs will not be interrupted by fire and its resultant damage.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None for these facilities.

GROUND PLANE
TEST FACILITY

FISCAL YEAR 1970 ESTIMATES

FIRE PROTECTION AND PREVENTION MODIFICATIONS



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

JOHN F. KENNEDY SPACE CENTER, NASA

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JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1970 ESTIMATES

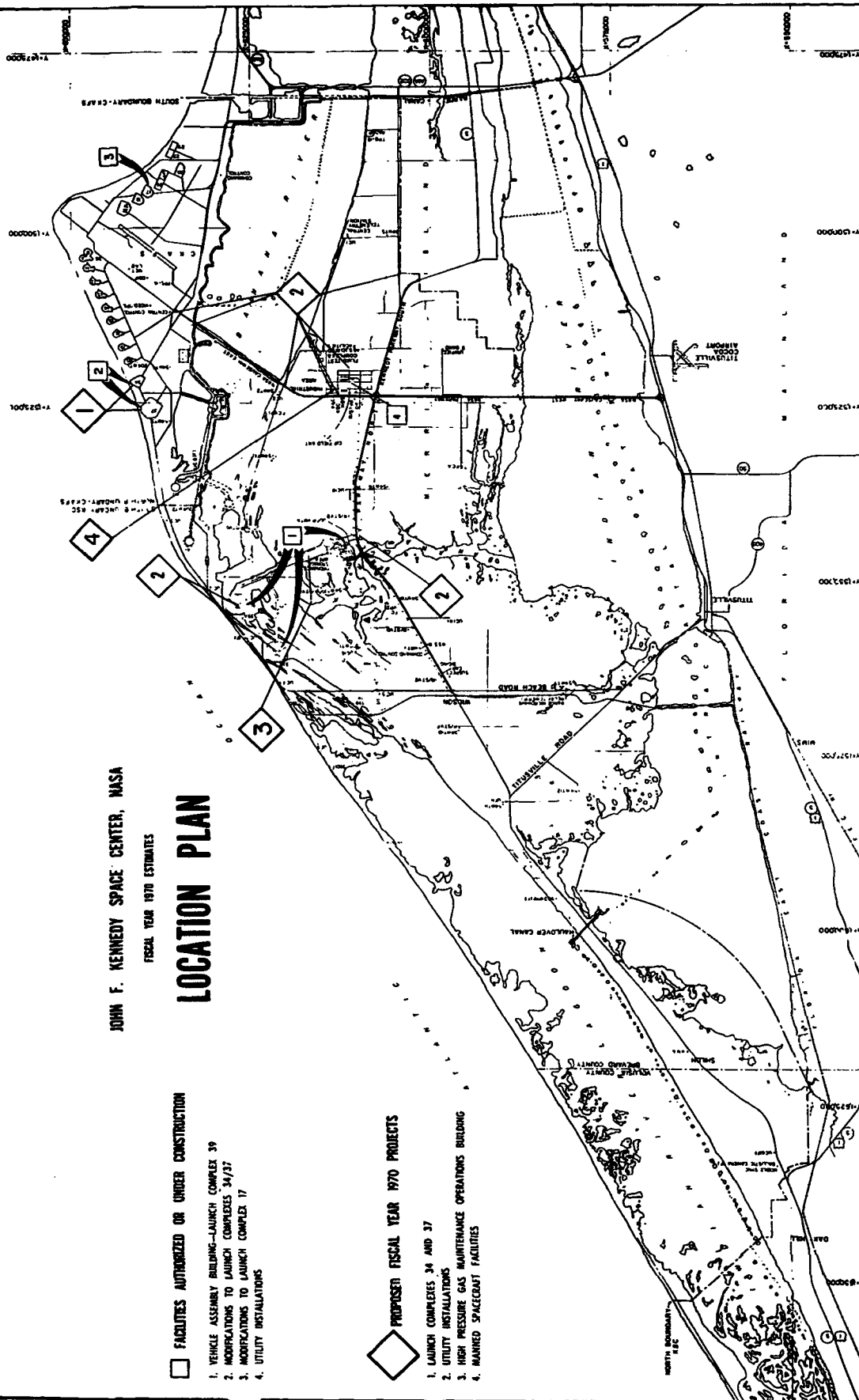
LOCATION PLAN

□ FACILITIES AUTHORIZED OR UNDER CONSTRUCTION

1. VEHICLE ASSEMBLY BUILDING—LAUNCH COMPLEX 39
2. MODIFICATIONS TO LAUNCH COMPLEXES 34/37
3. MODIFICATIONS TO LAUNCH COMPLEX 17
4. UTILITY INSTALLATIONS

◇ PROPOSED FISCAL YEAR 1970 PROJECTS

1. LAUNCH COMPLEXES 34 AND 37
2. UTILITY INSTALLATIONS
3. HIGH PRESSURE GAS MAINTENANCE OPERATIONS BUILDING
4. MANNED SPACECRAFT FACILITIES



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
INSTALLATION SUMMARY
CONSTRUCTION OF FACILITIES
FISCAL YEAR 19 70 BUDGET ESTIMATES

(Dollars in thousands)

NASA INSTALLATION John F. Kennedy Space Center, NASA		COGNIZANT PROGRAM OFFICE FOR INSTALLATION Manned Space Flight	
LOCATION OF INSTALLATION Merritt Island, Florida	COUNTY Brevard	NEAREST CITY Cocoa Beach, Florida	
INSTALLATION MISSION			

The Center conducts overall planning and supervision of the integration, test, checkout and launch of NASA space vehicle systems at the Air Force Eastern and Western Test Ranges and Merritt Island, and provides support services for all NASA elements located in the area.

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 19 <u>59</u> THRU CURRENT YR	FY 19 <u>70</u> (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Launch Complexes 34 and 37	MSF	104,168	8,000		112,168
Manned Spacecraft Facilities Modifications	MSF	46,205	1,000		47,205
Utility Installations	MSF	66,313	3,300		69,613
High Pressure Gas Maintenance Facility	MSF	12	200		212
TOTAL			12,500		

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

LAUNCH COMPLEXES 34 AND 37

AUTHORIZATION LINE ITEM: John F. Kennedy Space Center, NASA

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

COGNIZANT NASA INSTALLATION: John F. Kennedy Space Center, NASA

TYPE OF CONSTRUCTION PROJECT: Alteration

FUNDING:

FY 1969 and Prior Years	\$104,167,929
FY 1970 Estimate	<u>8,000,000</u>
Total Funding through FY 1970	<u>\$112,167,929</u>

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>				<u>\$8,000,000</u>
Modifications to LC 34				1,890,000
Umbilical tower	LS	---	\$760,000	(760,000)
Service structure	LS	---	265,000	(265,000)
Pad area	LS	---	865,000	(865,000)
Modifications to LC 37				6,110,000
Umbilical tower	LS	---	3,520,000	(3,520,000)
Service structure	LS	---	1,800,000	(1,800,000)
Pad area	LS	---	790,000	(790,000)
<u>Equipment</u>	---	---	---	---
<u>Design</u>	---	---	---	---
<u>Fallout Shelter (Not feasible)</u>	---	---	---	<u>None</u>
			TOTAL	<u><u>\$8,000,000</u></u>

PROJECT PURPOSE:

This project provides for modifications to Launch Complexes 34 and 37 to support the requirements of the Apollo Applications project within the Space Flight Operations program.

PROJECT DESCRIPTION:

Modifications to Launch Complexes 34 and 37 will be necessary during the Fiscal Year 1970 time frame to adapt these launch facilities to the needs of this project. The following are examples of essential modifications which must be performed at each complex:

Launch Complex 34

Umbilical Tower - Increase propellant thermal conditioning and flow capability, modify pneumatic distribution lines to provide the special hazard proof characteristics required by the Apollo Applications project. Install additional cables and fluid lines on swing arms and umbilical tower structure. Install additional equipment or replace existing equipment at various levels of the tower. Install additional gaseous nitrogen and gaseous helium lines and additional electrical lines.

Service Structure - Modify the structure to support new and relocated equipment. Relocate portions of operational television, water, and hazard monitoring systems. Reconfigure the piping and electrical controls serving the hypergolic and cryogenic systems of the spacecraft to permit those systems to handle the increased fuel requirements of the spacecraft.

Pad Area - Relocate oxidizer storage and transfer units to satisfy safety requirements. Install new spacecraft liquid nitrogen lines, additional liquid oxygen, liquid hydrogen, pneumatic and electrical lines to the new ground support equipment; and modify the cryogenic system. Add a remote control capability at the existing converter compressor facility.

Launch Complex 37

Umbilical Tower - Add a new swing arm to be used for purging the spacecraft nose cone. Reconfigure the Lunar Module swing arm and install the necessary cabling, service lines, equipment and water spray system. Alter the S-IVB hydrogen loading system, pneumatic distribution system and environmental control system.

Service Structure - Modify the structure to permit installation of a new swing arm. Fabricate new and relocated equipment platform cutouts for modified space vehicle configuration and for emergency egress. Relocate and modify portions of the operational television, operational intercom, water and hazards monitoring systems. Extend environmental purges to new equipment and the new swing arm. Install additional propellant piping for the Workshop Attitude Control System.

Pad Area - Relocate fuel and oxidizer storage and transfer units to reduce safety hazards. Provide new spacecraft handling equipment and erection fixtures.

PROJECT JUSTIFICATION:

Launch Complexes 34 and 37 are currently capable of launching Saturn IB vehicles, with an S-IVB second stage, a Command and Service Module (LC 34) and a Lunar Module (LC 37). In order to launch the payloads peculiar to Apollo Applications project 1 and 2 (Orbital Workshop, Airlock Module/Multiple Docking Adapter), 3A (Revisit), and 3 and 4 (Modified Lunar Module Ascent Stage and Apollo Telescope Mount), modifications to and reconfiguration of the complexes will be necessary.

Launch Complex 34 must be reconfigured to provide launch capability for the modified Apollo Block II Command and Service Module to be used for Apollo Application projects 1, 3A and 3. The modifications are necessary to support increased liquid hydrogen, liquid oxygen, Reaction Control System, and Acceptance Checkout Equipment requirements of the missions. The modifications must also support relocation of existing equipment due to expanded Command and Service Module support and checkout requirements.

Launch Complex 37 must be reconfigured to provide a launch capability for the Orbital Workshop and Airlock Module/Multiple Docking Adapter payload of mission 2 and the modified Lunar Module Ascent Stage/Apollo Telescope Mount payload for mission 4. The modifications at Complex 37 are necessary to provide a nose cone purge access, and relocation of Lunar Module access for mission 2, and subsequent relocation of swing arms for mission 4. Additional modifications are required to support increased propellant requirements for both missions and to meet the stringent cleanliness requirements of the Apollo Telescope Mount.

The modifications proposed by this project must be initiated during Fiscal Year 1970. Analysis of the time required for procurement, fabrication, equipment installation, facility checkout, and vehicle erection and checkout indicates that about twenty months of lead time will be necessary to support missions 1 and 2. Construction economy as well as the support of scheduled Space Flight Operations missions require that all of the work be accomplished concurrently, and prior to the first launch.

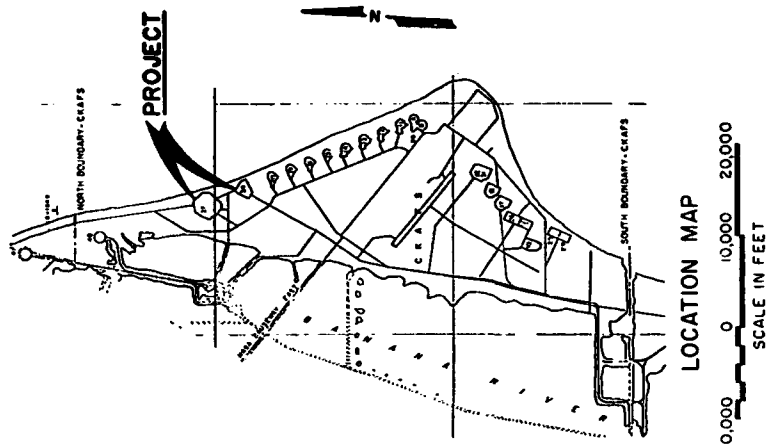
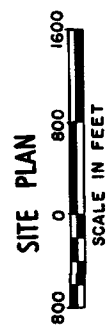
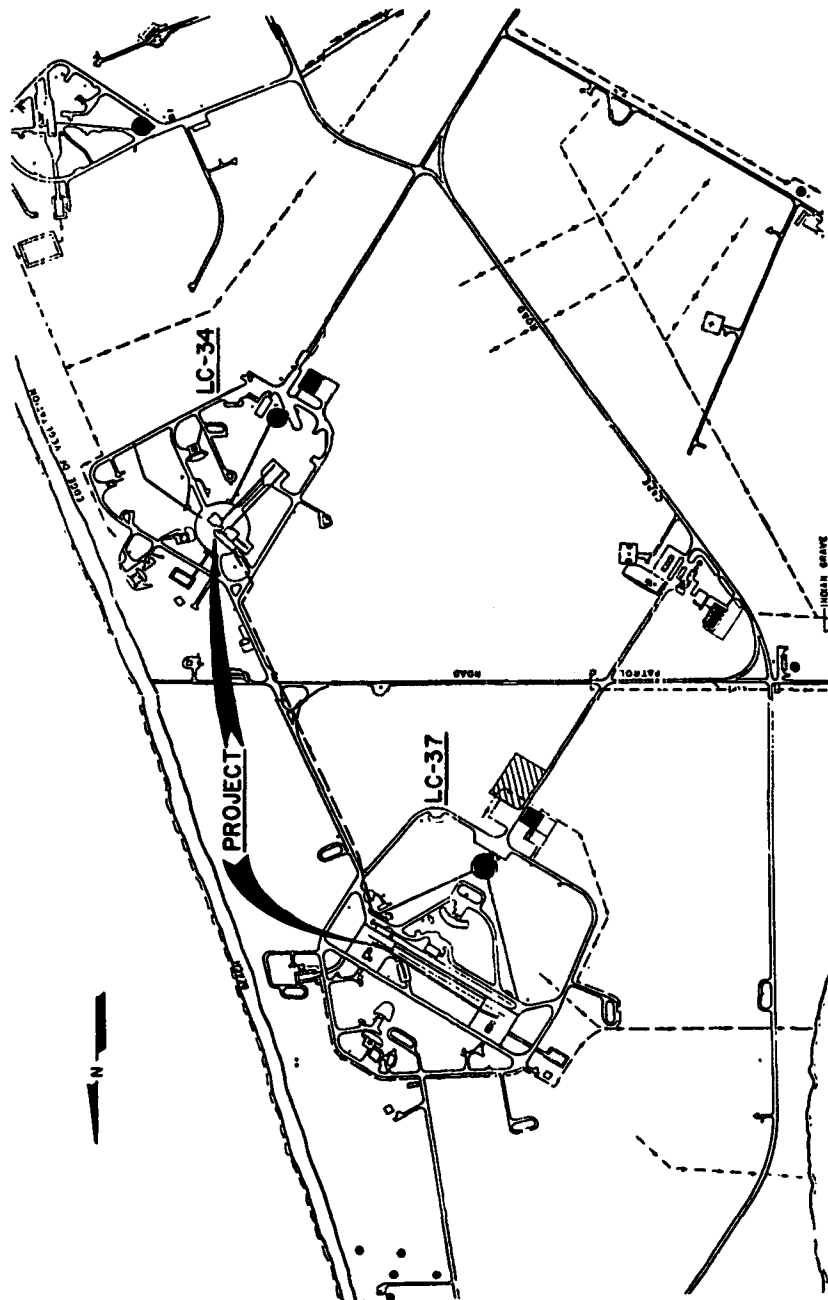
CF3-5

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: This requirement will be dependent upon the extent of follow-on and future programs. An estimated yearly expenditure of between \$1,000,000 and \$2,000,000 will be required to safeguard the current investment in this launch complex.

JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1970 ESTIMATES

LAUNCH COMPLEXES 34 AND 37



LOCATION MAP

10,000 0 10,000 20,000
SCALE IN FEET

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

MANNED SPACECRAFT FACILITIES MODIFICATIONS

AUTHORIZATION LINE ITEM: John F. Kennedy Space Center, NASA

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

COGNIZANT NASA INSTALLATION: John F. Kennedy Space Center, NASA

TYPE OF CONSTRUCTION PROJECT: Alteration

FUNDING:

FY 1969 and Prior Years	\$46,205,022
FY 1970 Estimate	<u>1,000,000</u>
Total Funding Through FY 1970	<u>\$47,205,022</u>

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>				<u>\$1,000,000</u>
Modifications to laboratories, utility tunnel, and assembly and test area	LS	---	\$250,000	250,000
Modifications to test stand area	LS	---	260,000	260,000
Modifications to provide air-lock module/multiple docking adapter checkout position	LS	---	180,000	180,000
Class 10,000 clean room	LS	---	250,000	250,000
Services to lunar module ascent stage work stand area	LS	---	60,000	60,000
<u>Equipment</u>	---	---	---	---
<u>Design</u>	---	---	---	---
<u>Fallout Shelter</u> (Not feasible)	---	---	---	None
			TOTAL	<u><u>\$1,000,000</u></u>

PROJECT PURPOSE:

To provide for modifications to spacecraft checkout facilities that are necessary to support Space Flight Operations missions.

PROJECT DESCRIPTION:

This project will provide for the following types of work within the Operations and Checkout Building and/or the Cryogenic and Hypergolic Test Facilities in order to permit checkout of the spacecraft and associated experiments in support of scheduled Apollo Applications missions:

- a. Installation of new and/or modification of existing fluid lines, power circuits, instrumentation circuits, environmental control equipment and operational intercom systems.
- b. Installation of power, radio frequency, communications and environmental control systems, with appropriate control equipment to support the Airlock Module/Multiple Docking Adapter and Command Module checkout operations.
- c. Modification of the East Integrated Test Stand Area, including relocation of platforms, power and signal leads, ground support equipment, lighting, crane hook assembly and gas systems to permit checkout of the mission 4 spacecraft.
- d. The installation of a Class 10,000 clean room to meet the stringent cleanliness requirements for the assembly and checkout of the Apollo Telescope Mount of mission 4.
- e. Installation of power, cooling, and operational intercom systems within the Lunar Module Ascent workstand to permit installation of the Apollo Telescope Mount control and display panels.

PROJECT JUSTIFICATION:

The Airlock Module/Multiple Docking Adapter, Apollo Telescope Mount, Block II Command and Service Module (CSM), and Lunar Module Ascent Stage of the various Apollo Applications missions must be checked out in the Operations and Checkout Building and/or the Cryogenic and Hypergolic Test Facilities. Since the capability for checkout of the basic Command and Service Modules and Lunar Module of the Apollo program already exists, all of the required basic systems are in place, so that modifications will be limited to the specific requirements of Apollo Applications missions.

The Block II CSM Reaction Control System is configured differently from the Block I and will require checkout under hazardous conditions. The necessary facilities exist, but must be adapted to the revised configuration.

The Airlock Module/Multiple Docking Adapter of mission 2 will be extremely complex and much more sophisticated than the present Apollo spacecraft. To permit docking checkout with the Command Module in a horizontal position, a new test stand will be provided by the spacecraft contractor, but the various services must be made available for interconnection with the stand.

The Apollo Telescope Mount will require modifications to the East Integrated Test Stand to permit adequate servicing and testing. Since the Apollo Telescope Mount must be handled under extremely clean conditions, a Class 10,000 clean room large enough to accommodate the Apollo Telescope Mount while on the test stand must be installed. All other Class 10,000 clean rooms at Kennedy Space Center are too small to serve this purpose.

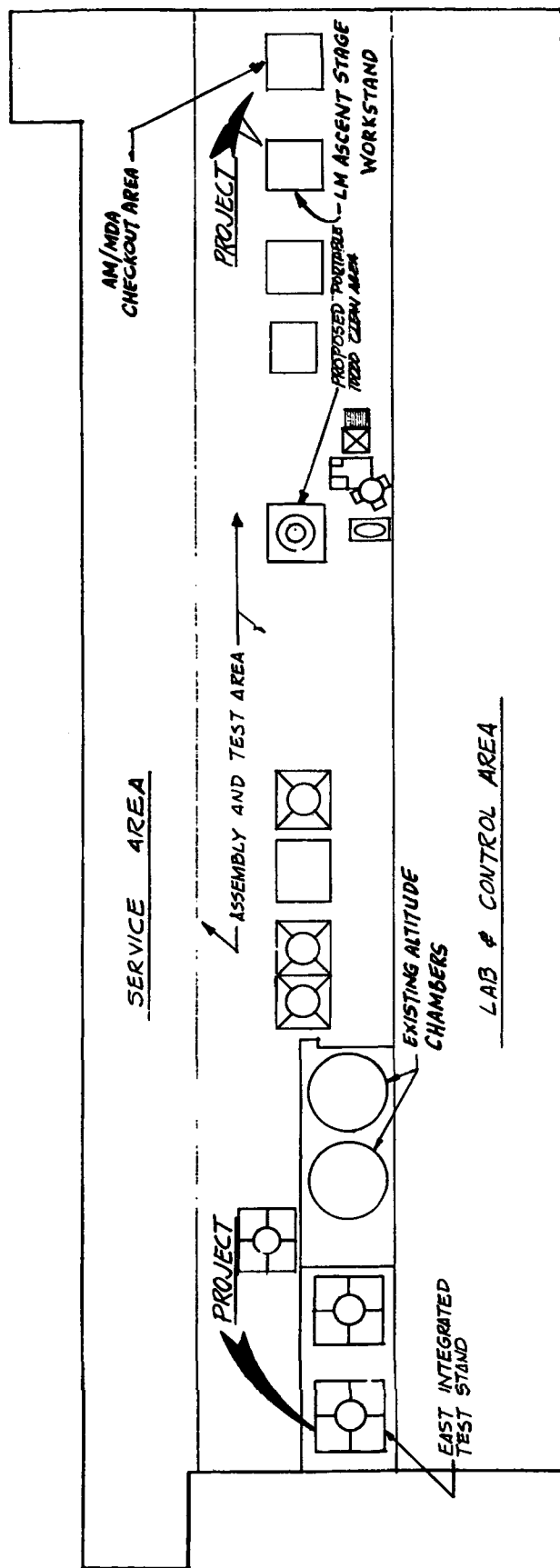
All of the work must be accomplished prior to delivery of the first Space Flight Operations spacecraft, since insufficient time will be available to make modifications between spacecraft checkout intervals.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: This requirement will be dependent upon the needs of follow-on and future programs.

JOHN F. KENNEDY SPACE CENTER, NASA

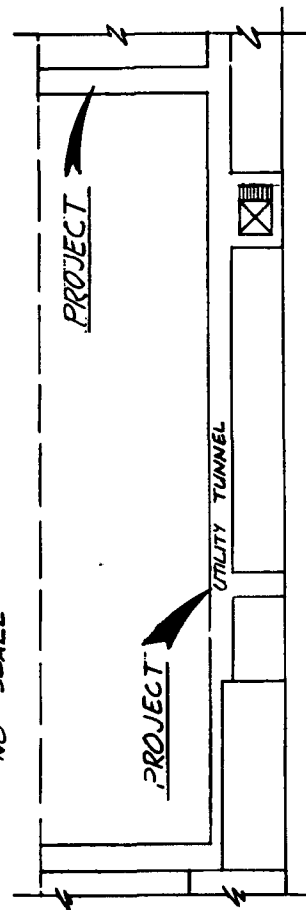
FISCAL YEAR 1970 ESTIMATES

MANNED SPACE CRAFT FACILITIES



ASSEMBLY AND TEST AREA, O&C BUILDING

NO SCALE



PIT AND TUNNEL AREA

NO SCALE



PROJECT PURPOSE:

To provide for improvements to the electrical power generation systems that will enhance reliability and at the same time effect operating economies.

PROJECT DESCRIPTION:

Power Generating Stations - This project will provide for the replacement of many small, portable, widely separated power generating units with a small number of large generating stations totalling 7700 kilovolt (kv). At Launch Complex 39, thirty-eight generators will be replaced with eight 750 kilowatt (kw) generators located at three different locations - Pad A, Pad B, and the Vehicle Assembly Building substation. In the industrial area, eight existing generators will be replaced by two 750 kw generators located one each at the Central Telephone Office and the Operations and Checkout Building, and two 100 kw generators - one each at the Banana River and South Repeater Buildings. The generator stations will be permanently installed in enclosed shelters which will prolong life, increase reliability and keep maintenance costs at the lowest possible levels. Also included will be the necessary controls and accessories required to make the stations operational.

Central Power Monitoring and Control System - This project will provide for the installation of a power monitoring capability for the NASA power system. It will include the installation of instrument transformers, meter conditioning equipment, and communications equipment to monitor, collect and transmit power system data from each of the five 115 kv substations at KSC and Cape Kennedy Air Force Station (CKAFS), as well as the CKAFS Critical Power Plant, and each of the emergency power generating stations. Both load and switching data will be monitored at the substations and telemetered to the central office which will be housed in a 1,000 square foot addition to the Complex 39 substation control house.

Information to be monitored and displayed includes the position of all commercial, primary, secondary and emergency power circuit breakers and the kilowatts and kilovars supplied to the substations and 13 kv bus voltage. The equipment will be a solid state type, and of modular construction to permit simplified future expansion, should this become necessary.

PROJECT JUSTIFICATION:

Power Generating Stations - The reliability of the presently available portable generators is deteriorating to the point where dependable emergency power cannot be provided through calendar year 1970 except at great effort and expense. Since normal commercial power sources can fail for many reasons, reliable redundant systems are required for all critical electrical systems supporting vehicle checkout, launch countdown, and actual launch. A redundant power source consisting of permanently installed generators of adequate size will reduce these hazards. The existing high speed diesel generators are frequently relocated for use in other areas. The movement

CF3-13

degrades the overall reliability and shortens life so that frequent repair and/or replacement is necessary. Permanent installation will increase longevity and reliability. In addition, by consolidating into larger and fewer units, the cost of operation and maintenance will be reduced substantially.

Central Power Monitoring and Control System - Operation of a closed transmission system which supplies commercial and/or emergency power to launch loads at CKAFS, and launch and instrumentation loads at KSC requires a close and continual surveillance of load, voltage and switching data, to assure that system disturbances are minimal. It also requires that system switching operations be coordinated with launch activities and other critical operations to insure continuity of power. With the power monitoring system, timely action can be initiated to reduce or eliminate system disturbances and outages which could cause an interruption of tests, countdown, or launch activities. Further, the monitoring of the power system demand factors will enable the center to program the startup of units having large "starting loads" and thus be able to lower power charges by reducing demand peaks.

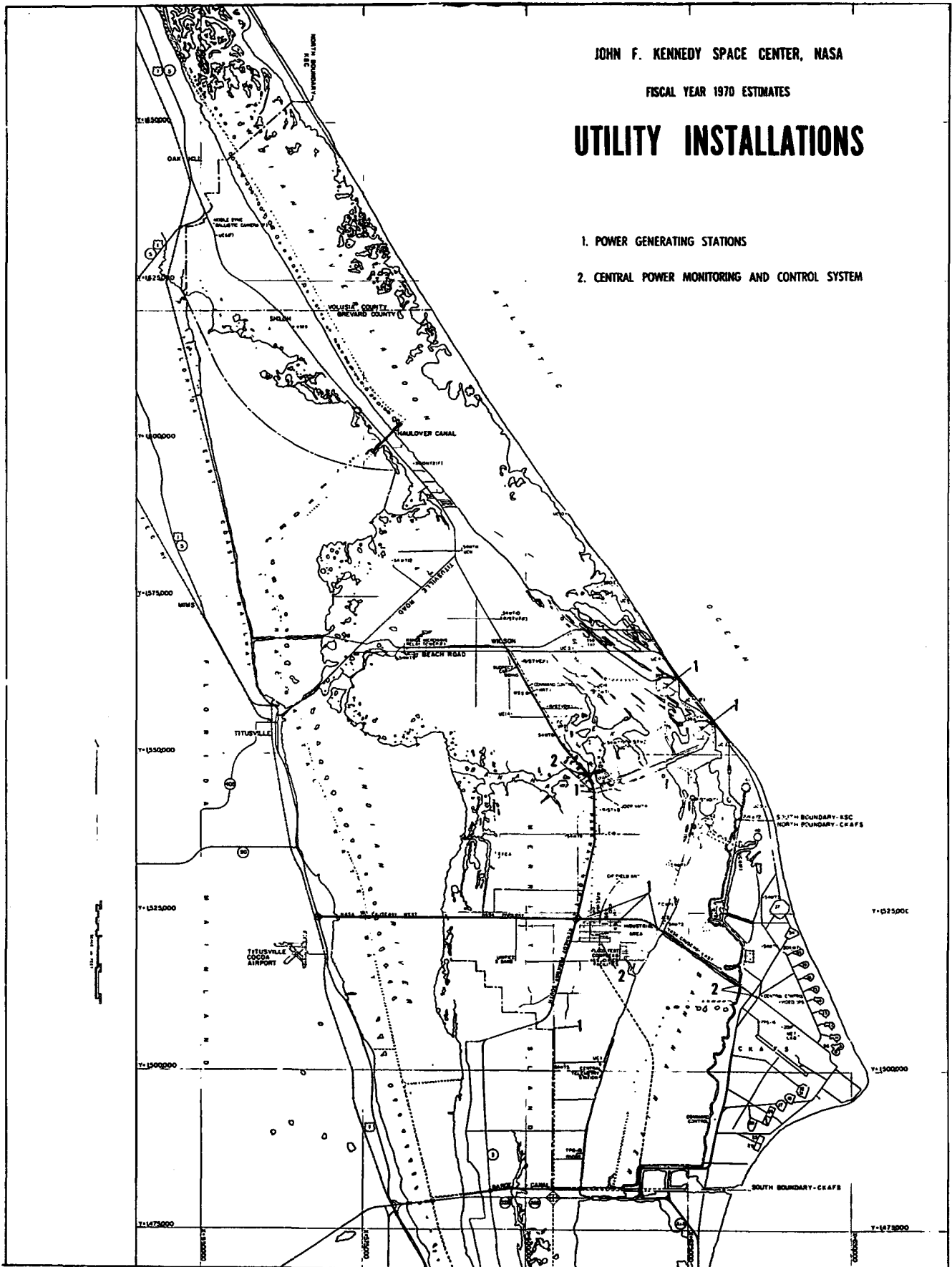
The communications network connecting all substations will permit immediate, reliable information and instructions to flow between operators at KSC, Cape Kennedy Air Force Station, and the commercial power source.

Without this installation, disturbances can occur without knowledge of the system dispatcher who is the only individual in a position to initiate timely corrective action. Time lost in determining system anomalies and in establishing proper corrective action based on system configuration and loading could cause unnecessary delays during critical test or launch periods.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: It is anticipated that additional funds will be required for utilities to support any future construction programs and/or major modification.

FISCAL YEAR 1970 ESTIMATES

1. POWER GENERATING STATIONS
2. CENTRAL POWER MONITORING AND CONTROL SYSTEM



CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

HIGH PRESSURE GAS MAINTENANCE OPERATIONS FACILITY

AUTHORIZATION LINE ITEM: John K. Kennedy Space Center, NASA

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

COGNIZANT NASA INSTALLATION: John F. Kennedy Space Center, NASA

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1969 and Prior Years	\$12,000
FY 1970 Estimate	<u>200,000</u>
Total Funding Through FY 1970	<u>\$212,000</u>

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>				<u>\$185,000</u>
Building, including internal utilities	Sq. Ft.	8,000	\$17.25	138,000
Site preparation	LS	---	13,000	13,000
Utilities	LS	---	34,000	34,000
<u>Equipment</u>	LS	---	15,000	<u>\$15,000</u>
<u>Design</u>	---	---	---	---
<u>Fallout Shelter</u> (Not feasible)	---	---	---	<u>None</u>
		TOTAL		<u><u>\$200,000</u></u>

PROJECT PURPOSE:

To provide for the construction of a facility to house personnel responsible for the maintenance and operation of the Launch Complex 39 high pressure gas systems.

PROJECT DESCRIPTION:

This project provides for the construction of an 8,000 square foot facility that will accommodate about 70 employees who are responsible for the maintenance and operation of the high pressure gas systems at Launch Complex 39. Also included will be the necessary parking, access roads, utilities, and site preparation.

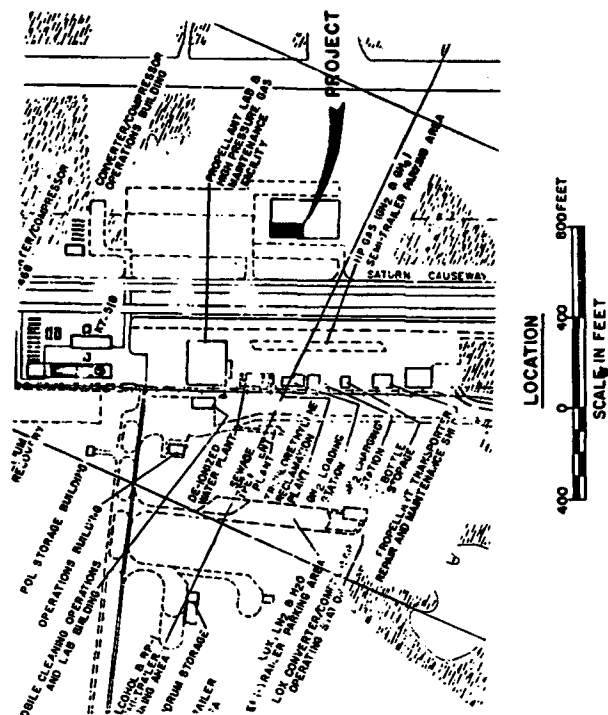
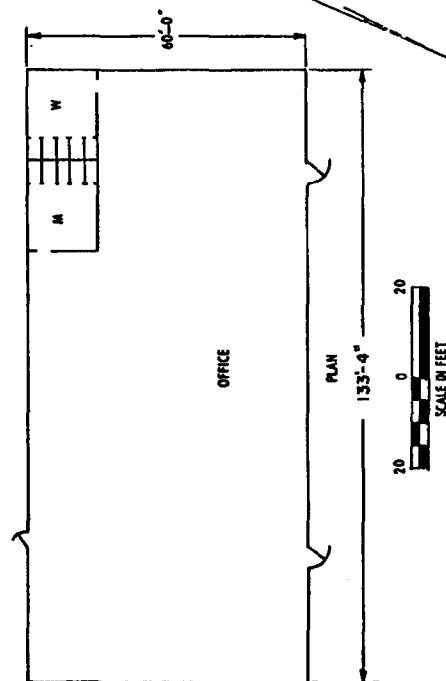
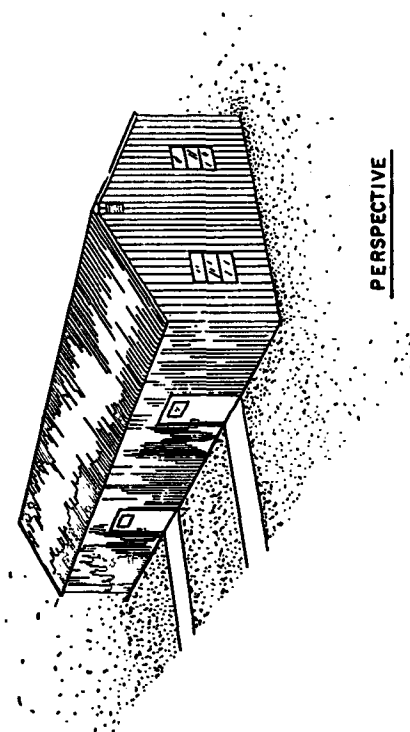
PROJECT JUSTIFICATION:

This facility is required to provide adequate work space for some 70 engineering, planning, scheduling, inspection and supervisory personnel who are responsible for the operation and maintenance of the Launch Complex 39 high pressure gas systems. This is a most important and highly specialized function which will continue indefinitely. The people were housed in trailers because the tasks to be performed, the size of the job, and the necessary location for best performance evolved gradually and left no other immediate solution than the use of trailers. The trailer site is crowded and without reasonably adequate sanitary facilities. In addition, the trailers will be at least nine years old by Fiscal Year 1970 and since the normal useful life of a trailer in the area is generally eight years or less, replacement of some type will be necessary in the near term. This factor, coupled with the pressing need to improve sanitary facilities, makes the construction of a more permanent facility the most economical and effective solution to the problem.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

FISCAL YEAR 1970 ESTIMATES

HIGH PRESSURE GAS MAINTENANCE OPERATIONS BUILDING



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

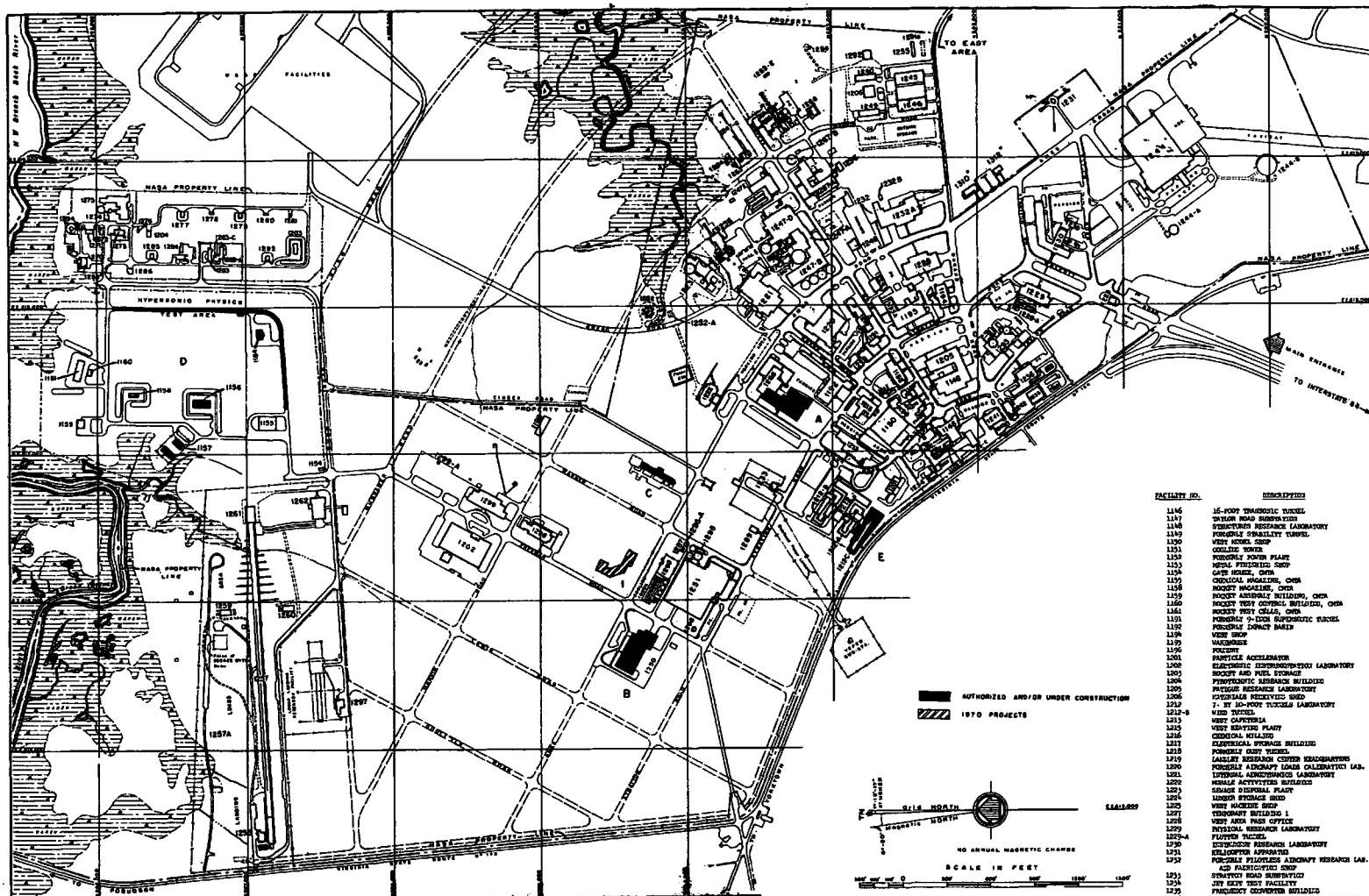
FISCAL YEAR 1970 ESTIMATES

LANGLEY RESEARCH CENTER

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Aircraft noise reduction laboratory.....	CF 4-4

LANGLEY RESEARCH CENTER FISCAL YEAR 1970 ESTIMATES

LOCATION PLAN



FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

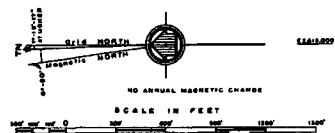
A FLIGHT CONTROL RESEARCH FACILITY
B LIFE SUPPORT TECHNOLOGY LABORATORY
C REACTIVE CHEMICAL SUPPLEMENTAL AREA
D REACTIVE CHEMICAL SUPPLEMENTAL AREA
E VEHICLE TRANSPORTATION RESEARCH VIBRO TUNNEL

PROPOSED FISCAL YEAR 1970 PROJECTS

1. AIRCRAFT WING RESEARCH LABORATORY

FACILITY NO.	DESCRIPTION
1146	15-FOOT TRANSDUCENT TUNNEL
1147	TRAILER ROAD SUBSTATION
1148	STRUCTURAL RESEARCH LABORATORY
1149	FLIGHT FACILITY TUNNEL
1150	VEHICLE TEST CELL
1151	COLLISION TOWER
1152	FLIGHT POWER PLANT
1153	NETS, PRECISION SHOP
1154	GATE HOUSE, OPEN
1155	CHEMICAL MAGAZINE, OPEN
1156	ROCKET MAGAZINE, OPEN
1157	ROCKET ASSEMBLY BUILDING, OPEN
1158	ROCKET TEST CELL BUILDING, OPEN
1159	ROCKET TEST CELL, OPEN
1160	FLIGHT FACILITY TUNNEL
1161	VEHICLE TRANSPORTATION RESEARCH VIBRO TUNNEL
1162	VEHICLE TRANSPORTATION RESEARCH VIBRO TUNNEL
1163	VEHICLE TRANSPORTATION RESEARCH VIBRO TUNNEL
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1198	VEHICLE TRANSPORTATION RESEARCH VIBRO TUNNEL
1199	VEHICLE TRANSPORTATION RESEARCH VIBRO TUNNEL
1200	VEHICLE TRANSPORTATION RESEARCH VIBRO TUNNEL

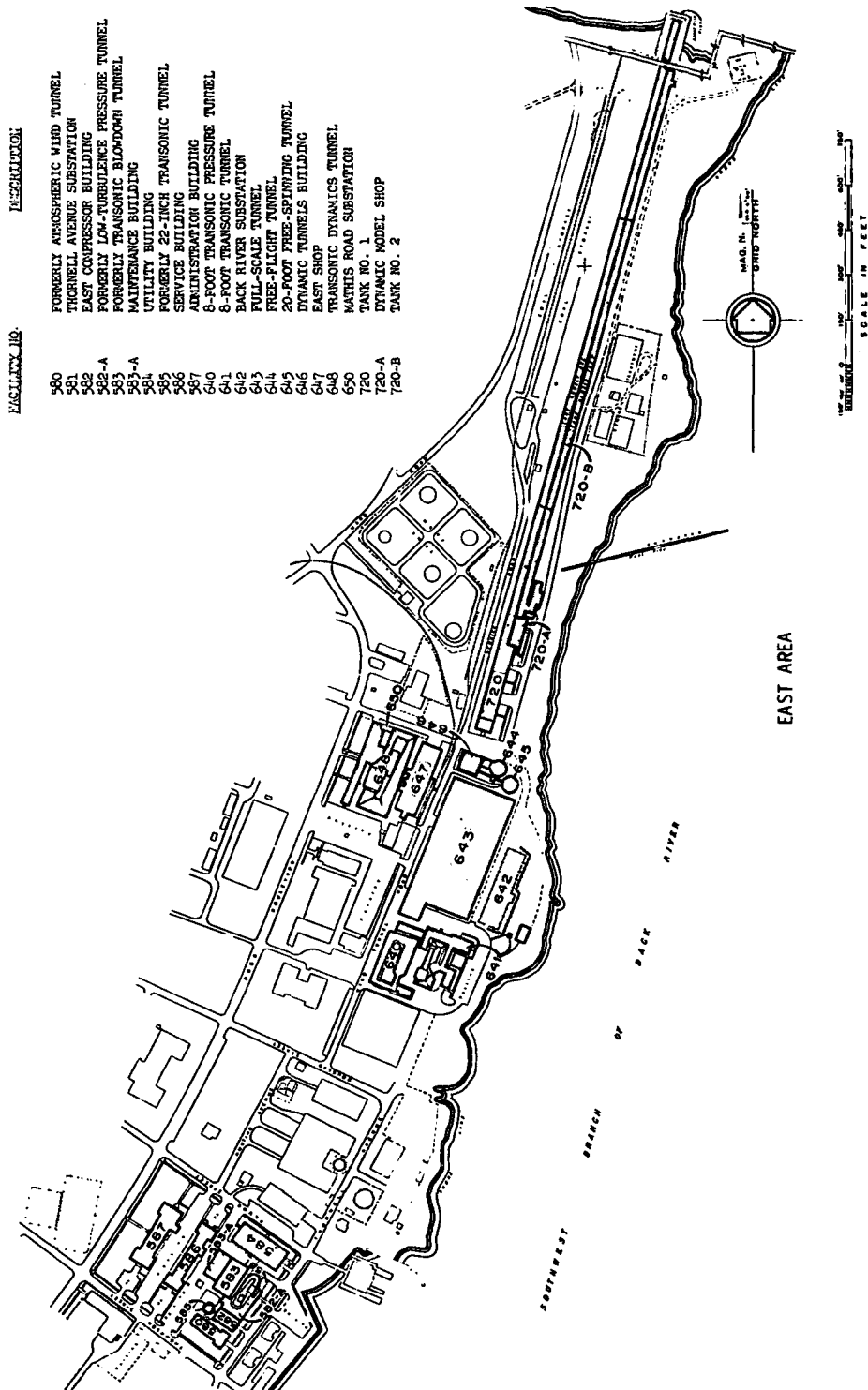
FACILITY NO.	DESCRIPTION
1201	TRANSPORTATION RESEARCH VIBRO TUNNEL
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1240	TRANSPORTATION RESEARCH VIBRO TUNNEL



WEST AREA

LANGLEY RESEARCH CENTER FISCAL YEAR 1970 ESTIMATES

LOCATION PLAN



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY CONSTRUCTION OF FACILITIES FISCAL YEAR 19 70 BUDGET ESTIMATES

(Dollars in thousands)

NASA INSTALLATION Langley Research Center		COGNIZANT PROGRAM OFFICE FOR INSTALLATION Advanced Research and Technology	
LOCATION OF INSTALLATION Langley Station Hampton, Virginia	COUNTY ---	NEAREST CITY Hampton, Virginia	
INSTALLATION MISSION			

The Center undertakes research to provide a technical base for such missions as:
(1) Manned and unmanned exploration of space; (2) Improvement of performance and utility of airborne flight. The Center plans, develops, and operates necessary facilities; generates new and advanced concepts; provides research advice and assistance to other branches of the government; disseminates scientific and technical information; searches for and identifies potential industrial applications involved in the course of research.

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 19 <u>59</u> THRU CURRENT YR	FY 19 <u>70</u> (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Aircraft Noise Reduction Laboratory	ART	332	4,767		5,099
TOTAL			4,767		

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

AIRCRAFT NOISE REDUCTION LABORATORY

AUTHORIZATION LINE ITEM: Langley Research Center

PROGRAM OFFICE FOR THE PROJECT: Office of Advanced Research and Technology

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT NASA INSTALLATION: Langley Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1969 and Prior Years	\$332,000
FY 1970 Estimate	<u>4,767,000</u>
Total Funding Through FY 1970	<u>\$5,099,000</u>

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>				<u>\$3,180,000</u>
Site preparation, paving	LS	---	\$144,000	144,000
Outside utilities	LS	---	283,000	283,000
Architectural and structural	Sq. Ft.	34,600	29.27	1,013,000
Piling	LS	---	95,000	95,000
Laboratory foundations	LS	---	70,000	70,000
Integral test chambers	LS	---	670,000	670,000
Integral mechanical	LS	---	730,000	730,000
Integral electrical	LS	---	175,000	175,000
<u>Equipment</u>				<u>\$1,587,000</u>
Test stand	LS	---	424,000	424,000
Applications area	LS	---	416,000	416,000
Physics area	LS	---	695,000	695,000
Non-technical collateral equipment	LS	---	52,000	52,000

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Design</u>	---	---	---	---
<u>Fallout Shelter</u>	---	---	---	-0-
		TOTAL		<u>\$4,767,000</u>

PROJECT PURPOSE:

This project will provide research facility capability for directly attacking the problems of noise created by aircraft, including fundamental research in the generation and physical measurement of noise, human reactions to noise, and techniques for noise reduction.

PROJECT DESCRIPTION:

A coordinated program of research in the fundamentals of noise generation and reduction will require that the Aircraft Noise Reduction Laboratory possess a three fold capability. First the facility must be capable of making physical measurements relating to noise; secondly, it must be equipped to apply such measurements to the development of noise reduction devices; and finally the necessary simulation laboratories must be available for the determination of human reactions to those modified noise levels effected within the laboratory. In order to provide this capability the laboratory will be divided into four major areas, namely physics, applications, simulation, and engineering support. The following is a more complete description of each major area:

Physics Area - The Physics Area will provide a capability for basic physical measurements relating to materials which may be used in the aircraft noise reduction program. A special Acoustic Physics Laboratory will be included for studying the properties of materials by making measurements under conditions simulating their intended use. An acoustic tube will be provided to permit basic measurements of acoustic properties of materials with the flow of air, either by, or through, the samples, under conditions that simulate the use of materials within engine inlet and exhaust environments. This laboratory will be equipped with the necessary electronic and acoustic apparatus to obtain the required measurements. It will also include facilities for instrumentation and instrument calibration work as well as the study of the dynamic response of structures to acoustic excitation.

Applications Area - The Applications Area will provide the facilities for testing the application of noise reduction materials, devices and techniques evolved in the Physics Area. It will include two major rooms, the Anechoic Room and Reverberation Room, to be used for the study and reduction of noise produced by devices such as aircraft engines and other support equipment. As the noise level in both rooms will be relatively high, acoustic isolation will be necessary. Each room

will be mounted on its own foundation completely isolated from the surrounding structure. Each room will be contained within a double walled structure to provide a noise reduction in excess of 60 decibels. The area immediately surrounding these two rooms will be used for support functions with reasonable noise levels when experiments are underway in either, or both test rooms. The rooms will be isolated from each other by two pairs of double walls to achieve at least 100 decibels of isolation. This will be accomplished by separating the rooms and by locating each room within an outer structure with considerable sound attenuating characteristics. Each test room will be provided with a control room equipped with electronic equipment suitable for controlling the generation of noise. The instrumentation will also provide a capability for precise measurement and analysis of noise with respect to magnitude, frequency, and spatial characteristics.

Simulation Area - The third major area within the proposed facility will be concerned with the reaction of people to noise. The final test of a noise reduction program must be in the form of public reaction. In order to investigate human reactions, it will be necessary to provide controlled noise environments which adequately simulate actual conditions experienced by the public. Two special rooms will be designed for this purpose. One will be designated as the Exterior Effects Simulation Laboratory in which it will be possible to simulate the noise patterns produced by aircraft as they fly over a given location. In ordinary experimental facilities, the noises are reproduced by loudspeakers allowing the person to hear the sound as he would have at a given location near an airport. The proposed room will be designed to introduce those spatial characteristics produced by a plane flying overhead. The sound source will first come from the front of the room, then transfer to overhead, and finally behind the listening audience. The sound system will use recordings prepared to achieve this realism. Further control will give a capability to alter the characteristics of the noise so that design goals may be established on the basis of public acceptance. Facilities for visual, as well as auditory, sensations will be included. The second room, designated as the Interior Effects Simulation Laboratory will be designed to simulate excitations, as produced by aircraft which would be experienced by indoor subjects. Special experiments, such as those involving sonic booms, requires not only noise but a mechanical excitation of the walls and floors. This special room will provide control for both mechanical and acoustical excitation of subjects to obtain their reactions. To support both special simulation facilities, apparatus will be provided for the analysis of actual noises and vibrations produced by aircraft. Equipment capable of both analog and digital synthesizing of noises, and vibrations which might be produced by future aircraft will also be provided, including special instrumentation.

Engineering Support Area - The Engineering Support Area will consist of a two-story, partial basement, reinforced concrete structure housing about 12,700 square feet of study and design areas to be used by engineers and scientists working in the proposed facility. For proximity, it will be located between the Applications and Physics Areas. However, to minimize interference from sound and vibration generated by testing in these laboratories, it will be external to both. Mechanical and electrical utility equipment serving the Physics Area and the Engineering Support Area will be located in the partial basement.

PROJECT JUSTIFICATION:

The rapid growth of aviation, particularly since the introduction of jet aircraft, has been accompanied by a nation-wide concern for the concurrent increase in noise levels, particularly within communities surrounding airports.

In 1951 the Douglas DC-6B generated noise levels of about 105 decibels during an approach, and 106 decibels on takeoff. By 1963 the Boeing 707-320B was generating noise levels of 121 decibels on an approach and 130 decibels during takeoff. Since noise levels above 120 decibels cause discomfort and levels over 135 decibels normally cause pain, the problem to communities surrounding airports is now acute.

This problem will not diminish, since it is highly probable that the introduction of new generations of aircraft may produce even higher noise levels. Therefore, it is essential that the problem of noise be attacked directly with a research program that will permit the development of more quiet aircraft and concurrently increase our knowledge concerning human response to different characteristics of noise.

There is in existence today, a considerable body of empirical knowledge and scientific theory concerning the sources of aircraft noise and technology relating to partial control. However, the scientific basis for understanding primary noise generating mechanisms and human reaction to noise has not experienced any significant development. The research that is underway today is not primarily aimed at the fundamental physical problems of jet noise generation and propagation, but of necessity is limited to trial and error attempts to alleviate the grosser aspects of the noise problem. It is envisioned that within this proposed facility the fundamental research will be performed to resolve the problems of excessive noise.

No existing facilities are suitable for this type of fundamental noise research. NASA's facilities are geared to launch vehicle noise problems structural response and sonic fatigue studies, jet exhaust and compressor noise research, and mobile equipment which is used for flyover-noise and sonic boom measurements. Facilities available to other government agencies, universities and industry are similarly deficient. The foregoing is true to such an extent that it has been necessary to use facilities located in English universities for the performance of some needed work. This is not the real answer to our national problems.

In order to permit the orderly advance of noise research, a highly specialized laboratory facility is essential. The structure proposed under this project will be designed to accommodate experiments relating to both the basic properties and the practical applications of noise reduction. It will include facilities for the study of not only the physical aspects of sound, but to evaluate the effects of noise as experienced by people.

The location of this major facility at the Langley Research Center is considered to be in the best interest of rapid progress in noise research. The Langley Research Center has an extensive background in noise research. It has pioneered many of the nation's efforts in noise reduction at the source as well as the definition of acceptable noise levels. Thus, availability of the facility proposed by this project will result in maximum utilization of the capabilities of scientists and engineers associated with noise reduction. In this way, one of our more prominent community environmental problems, namely "noise pollution" can be frontally attacked and hopefully brought within the limits of acceptability.

Research on the source and acceptability levels of noise is not limited, in its application, to aircraft only. The development of a scientific basis for understanding noise generation and human reaction will permit its application to more general problems associated with industry and the home. More quiet turbomachinery, transportation systems, air conditioning units, and improved noise insulation for the home become distinct possibilities with a concerted program of research.

Without such a facility as proposed by this project an orderly advance in noise research and the solution of our national noise-related problems is not possible.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

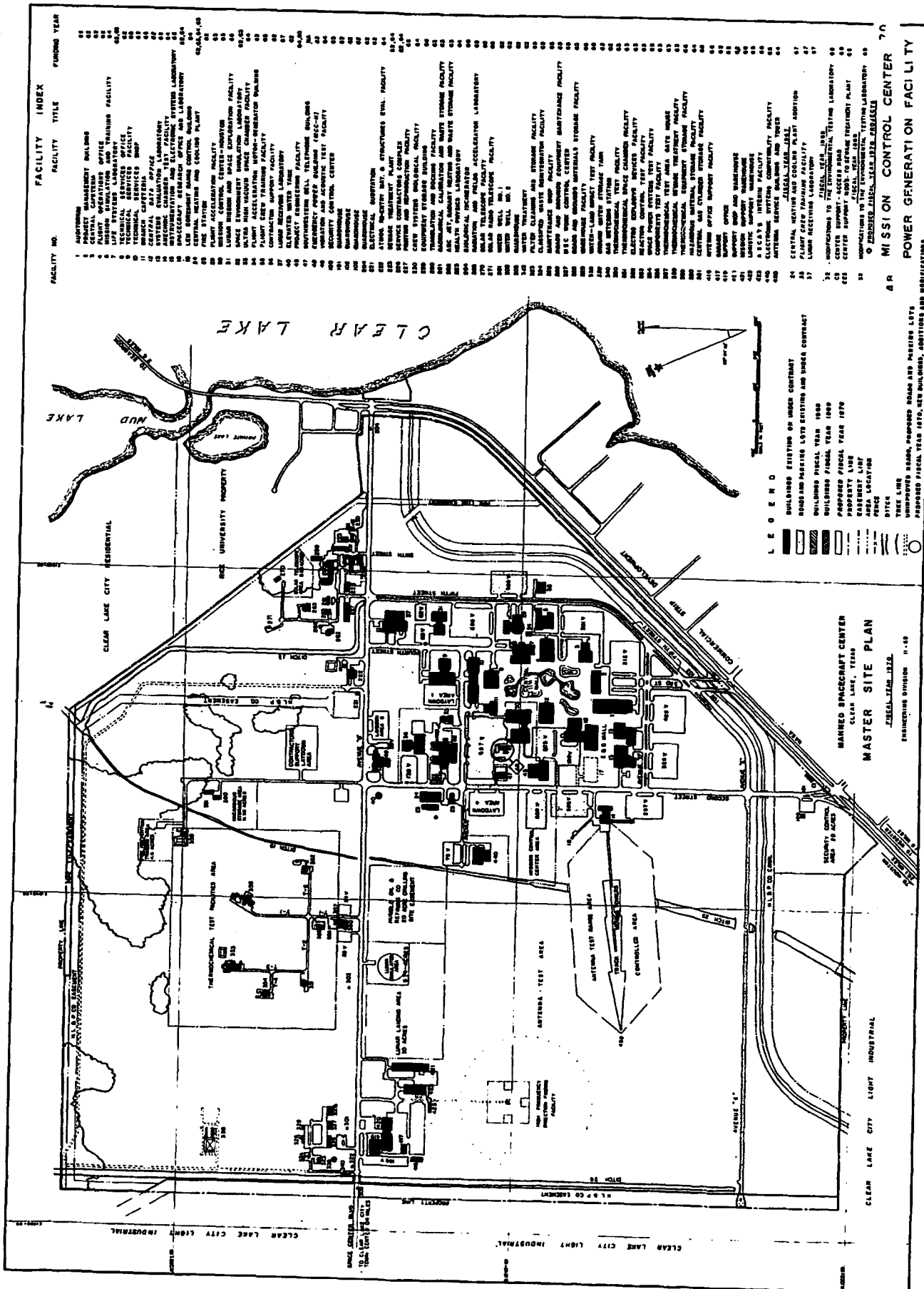
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

MANNED SPACECRAFT CENTER

	<u>Page No.</u>
Location plan.....	CF 5-1
Summary.....	CF 5-2
Office of Manned Space Flight Project:	
Mission control center power generation facility.....	CF 5-3



(Dollars in thousands)

NASA INSTALLATION Manned Spacecraft Center		COGNIZANT PROGRAM OFFICE FOR INSTALLATION Manned Space Flight	
LOCATION OF INSTALLATION Houston, Texas	COUNTY Harris	NEAREST CITY Houston, Texas	
INSTALLATION MISSION			

The Manned Spacecraft Center has as its primary mission the development of spacecraft for manned space flight programs. The Center is also responsible for manned space flight operations, conduct of astronaut training, and earth resources programs.

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 19 <u>59</u> THRU CURRENT YR	FY 19 <u>70</u> (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Mission Control Center Power Generation Facility	MSF	2,198	1,750		3,948
TOTAL			1,750		

FISCAL YEAR 1970 ESTIMATES

AUTHORIZATION LINE ITEM: Manned Spacecraft Center

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT NASA INSTALLATION: Manned Spacecraft Center

TYPE OF CONSTRUCTION PROJECT: Extension

FY 1969 and Prior Years	\$2,198,275
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FY 1970 Estimate	1,750,000
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Total Funding Through FY 1970	<u>\$3,948,275</u>
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	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>				<u>\$405,000</u>
Building	Sq. Ft.	8,300	\$28.91	240,000
Site preparation	LS	---	60,000	60,000
Utilities and tunnel	LS	---	105,000	105,000
<u>Equipment</u>				<u>1,345,000</u>
350 kw diesel generator	Each	1	117,000	117,000
350 kw motor generator	Each	1	61,200	61,200
1360 kw diesel generator	Each	1	374,000	374,000
Distribution system	LS	---	290,000	290,000
Electrical control system	LS	---	187,800	187,800
Cooling system	LS	---	315,000	315,000
<u>Design</u>	---	---	---	---
<u>Fallout Shelter</u> (Not feasible)	---	---	---	None

TOTAL	<u>\$1,750,000</u>
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CF5-3

PROJECT PURPOSE:

To provide additional noninterruptible power and other critical utility support to the Mission Control Center (MCC) operations.

PROJECT DESCRIPTION:

This project provides for a 6,700 square foot extension to the north end of the Power Generation Building to house additional noninterruptible and stand-by power generation equipment. It also includes a 1,600 square foot extension to the south end of the building to house chilled water equipment, which is required to support new equipment to be added to the Communication System and Real Time Computer Complex of the Mission Control Center. The building addition totalling approximately 8,300 square feet, will consist of precast exposed aggregate facing panels. Equipment to be installed includes a 350 kilowatt (kw) diesel generator and a 350 kw motor generator for non-interruptible power, a 1360 kw diesel generator as back-up for commercial power, and refrigeration equipment for environmental control of mission essential electronic equipment in the Mission Control Center.

PROJECT JUSTIFICATION:

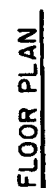
The Mission Control Center is critical to Manned Space Flight operations as it is the command center for Apollo and Space Flight Operations. Critical information relating to spacecraft, launch vehicle and ground systems, as well as aeromedical parameters from a world-wide network of stations, ships and aircraft is processed and displayed in the MCC. Based on analysis of this continuous display of information, flight controllers in the MCC must assess the spacecraft flight status and progress. In a real time mode they must determine the continuation, alteration or termination of a space flight. Flight controllers in making such instantaneous decisions, must rely on the continuous operation of the computers for the computation of tracking and telemetry data received by the world-wide network for the retrieval of preplanned alternative courses of action from the computer complexes.

In order to assure the continuous operation of these critical command and control systems, a closely regulated noninterruptible power supply is necessary to preclude sudden power surges, voltage drops, or electrical outages. An electrical failure of even a fraction of a second will throw preplanned flight procedures out of phase with the actual flight pattern and possibly jam or permanently damage the computers. This dangerously increases the chance for a mission abort. The requirement for noninterruptible power has increased steadily during the three years that the Mission Control Center has been in operation. This growth is the result of necessary updating of electronic systems. Essential electronic equipment, with expanded capability and improved reliability that is scheduled to be installed through FY 1972, will exceed the noninterruptible power capability of the existing generating facility by early 1971. Thus, it is essential that this project be executed in this time frame, in order to insure necessary non-interruptible power capability in support of Manned Space Flight operations.

As additional electronic equipment is added, it is also necessary to provide added emergency cooling capability. This project includes such an augmentation. The project also includes additional emergency stand-by electric power of sufficient capacity to operate the additional cooling equipment as well as the motor-generator set provided in this project.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

**MANNED SPACECRAFT CENTER
FISCAL YEAR 1970 ESTIMATES**



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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

WALLOPS STATION

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Location plan.....	CF 6-1
Summary.....	CF 6-2
Office of Space Science and Applications Project:	
Flight information control and analysis laboratory.....	CF 6-3

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY
CONSTRUCTION OF FACILITIES
FISCAL YEAR 19 70 BUDGET ESTIMATES*(Dollars in thousands)*

NASA INSTALLATION Wallops Station		COGNIZANT PROGRAM OFFICE FOR INSTALLATION Space Science and Applications	
LOCATION OF INSTALLATION Eastern Shore of Virginia	COUNTY Accomack	NEAREST CITY Temperanceville, Virginia	
INSTALLATION MISSION			

The basic mission of the Station is to prepare, assemble, and launch scientific experiments; achieve the desired position and velocity in space; and track, acquire and record the data sought. These data are processed and reduced to meaningful form and analyzed.

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 19 <u>59</u> THRU CURRENT YR	FY 19 <u>70</u> (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Flight Information Control and Analysis Laboratory	SSA	30	500		530
TOTAL			500		

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

FLIGHT INFORMATION CONTROL AND ANALYSIS LABORATORY

AUTHORIZATION LINE ITEM: Wallops Station

PROGRAM OFFICE FOR THE PROJECT: Office of Space Science and Applications

LOCATION OF PROJECT: Wallops Station, Accomack County, Virginia

COGNIZANT NASA INSTALLATION: Wallops Station

TYPE OF CONSTRUCTION PROJECT: Alteration

FUNDING:

FY 1969 and Prior Years	\$30,000
FY 1970 Estimate	<u>500,000</u>
Total Funding Through FY 1970	<u>\$530,000</u>

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>				<u>\$431,600</u>
Site development	LS	---	\$18,100	18,100
Utilities	LS	---	103,900	103,900
Building alteration	Sq. Ft.	17,200	18.00	309,600
<u>Equipment</u>				<u>68,400</u>
Air conditioning equipment	LS	---	68,400	68,400
<u>Design</u>	---	---	---	---
<u>Fallout Shelter</u> (Not feasible)	---	---	---	<u>None</u>
		TOTAL		<u>\$500,000</u>

PROJECT PURPOSE:

To provide adequate space for the Wallops Flight Information Control and Analysis Laboratory which is now temporarily housed in limited and inadequate space.

PROJECT DESCRIPTION:

This project provides for the modification of an existing and presently unoccupied building (N-161). This building was originally constructed by the Navy in 1958 as a small, two position hangar.

A two floor structure will be constructed within one of the large bays utilizing the existing walls and approximately 4900 square feet of the existing high bay space. Computer space will be provided on the first floor by using the existing concrete slab to support a raised floor. A second floor will be constructed of lightweight steel framing supported from the existing overhead trusses. The added floor will provide approximately 4900 square feet of office space for computer operations personnel.

Seventy-four hundred square feet of existing space surrounding the high bay area will be renovated to provide for magnetic tape storage and computer maintenance activities.

The installed air conditioning equipment will be modified to serve the new office areas. New air conditioning equipment with the necessary temperature and humidity control required by the computer, will be provided for the ground floor computer room.

PROJECT JUSTIFICATION:

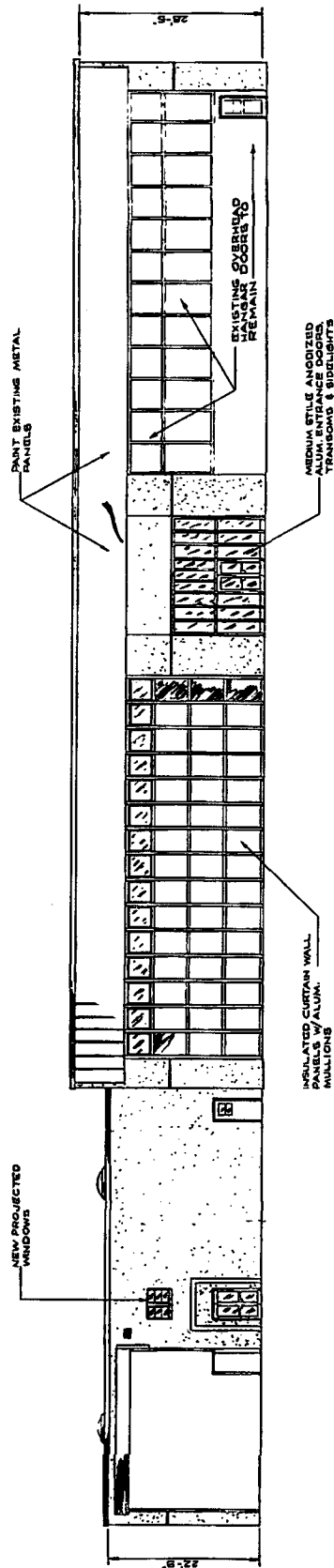
The Wallops Flight Information Control and Analysis Laboratory is a key facility in station operations. It provides computation requirements for real time mission control, range safety impact prediction, post-flight data reduction, mission analysis, engineering analysis, and business applications. For this reason, it is essential that adequate space be provided, as soon as possible, to assure effective operation of this facility. The proposed facility will provide a total of 17,200 square feet to house all equipment and provide shop and office space for approximately 50 personnel.

Presently, this function is housed in a portion of the Range Control Center (Building N-159). The existing computer room is too small which makes it unsatisfactory for effective operations. The air conditioning system, which was originally installed for an IBM-650 computer, has proven to be inadequate for the present General Electric 625 computer even with the addition of twelve auxiliary air conditioning units. The General Electric 625 system is designed to be cooled by room air instead of a direct air system. In addition, the cost of maintaining the existing air conditioning units is excessively high.

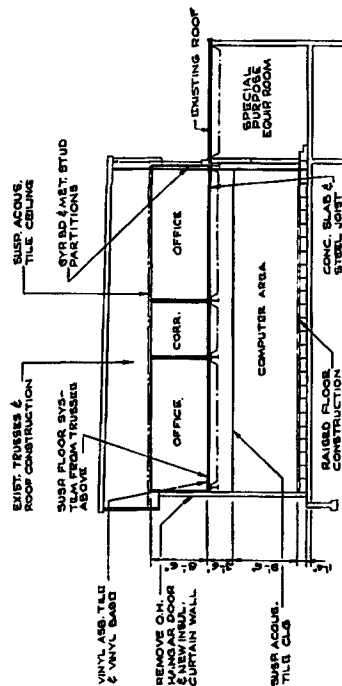
The present facility cannot be economically altered to meet present requirements. A trade-off study shows that the Flight Information Control and Analysis Laboratory can be relocated to the building proposed by this project at a lower unit cost per square foot, and with less down time for the computer operation, than expansion and renovation of the existing facility.

The present computer facility will be utilized to provide office and shop space for visiting scientists and engineers with payloads to be launched from Wallops Island.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None



SOUTHEAST ELEVATION
SCALE 1/8" = 1'-0"



CROSS SECTION
SCALE 1/8" = 1'-0"

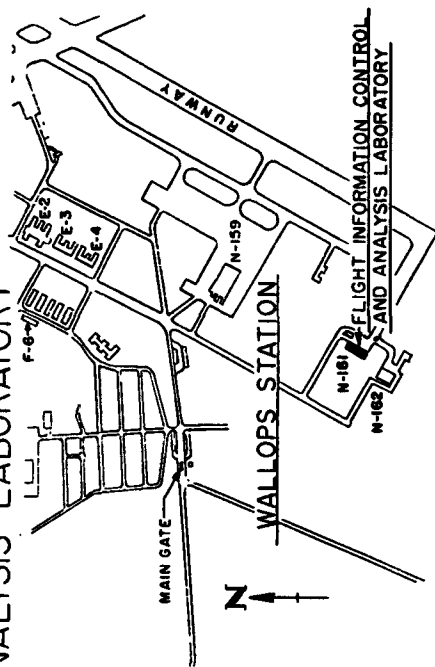
PRELIMINARY ARCHITECTURAL REPORT 87-0170	
FOR A	
FLIGHT INFORMATION CONTROL AND ANALYSIS LABORATORY	
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	
WASHINGTON, D.C.	
ARCHITECTURAL	
DATE: 12/27/87	
BY: J. J. J.	
3792	

DATE	BY	SCALE	DESCRIPTION
12/27/87	J. J. J.	1/8" = 1'-0"	FLIGHT INFORMATION CONTROL AND ANALYSIS LABORATORY
12/27/87	J. J. J.	1/8" = 1'-0"	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
12/27/87	J. J. J.	1/8" = 1'-0"	WASHINGTON, D.C.
12/27/87	J. J. J.	1/8" = 1'-0"	ARCHITECTURAL
12/27/87	J. J. J.	1/8" = 1'-0"	DATE: 12/27/87
12/27/87	J. J. J.	1/8" = 1'-0"	BY: J. J. J.
12/27/87	J. J. J.	1/8" = 1'-0"	3792

WALLOPS STATION

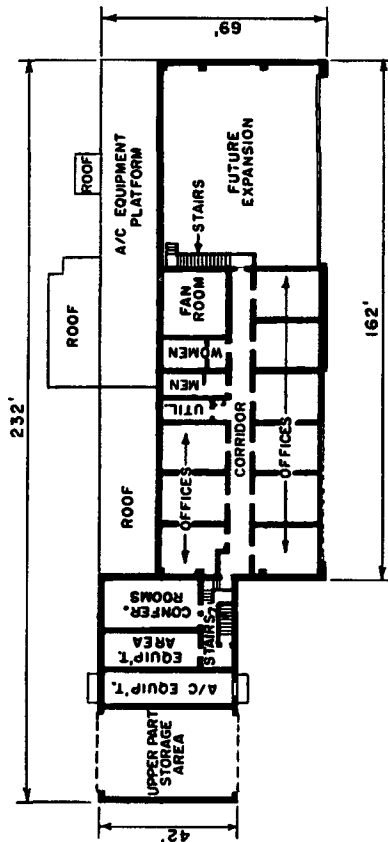
FISCAL YEAR 1970 ESTIMATES

FLIGHT INFORMATION CONTROL AND ANALYSIS LABORATORY

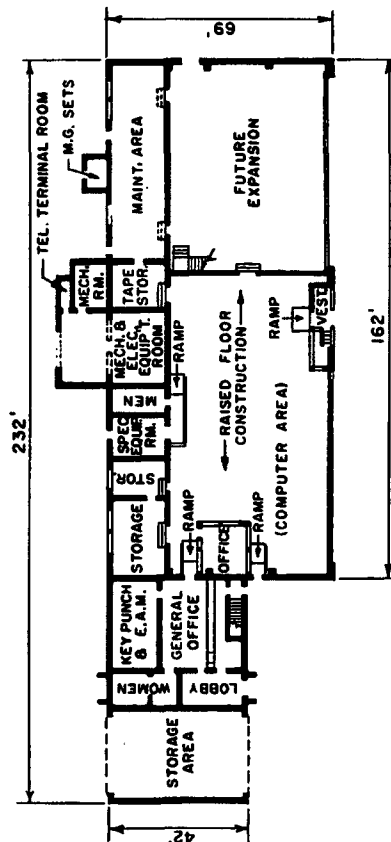


LOCATION PLAN

SCALE 0' 500' 1000' 2000'

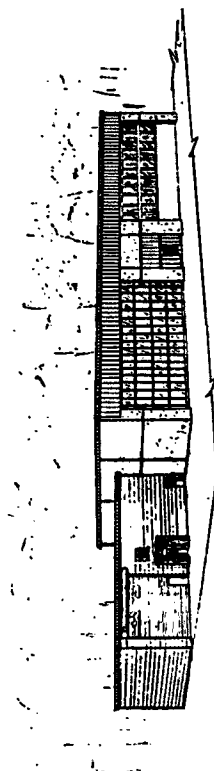


SECOND FLOOR PLAN



FIRST FLOOR PLAN

SCALE 0' 10' 20' 40' 60'



PERSPECTIVE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

VARIOUS LOCATIONS

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Summary.....	CF 7-1
Office of Organization and Management Project:	
Modifications and rehabilitations at all locations.....	CF 7-2
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Space launch complex 2 modifications.....	CF 7-7
Office of Tracking and Data Acquisition Project:	
Deep space antenna (210 foot) facilities.....	CF 7-13

(Dollars in thousands)

NASA INSTALLATION Various Locations		COGNIZANT PROGRAM OFFICE FOR INSTALLATION Various	
LOCATION OF INSTALLATION Not Applicable	COUNTY Not Applicable	NEAREST CITY Not Applicable	
INSTALLATION MISSION			

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 19 <u>59</u> THRU CURRENT YR.	FY 19 <u>70</u> <i>(Estimated)</i>	FUTURE YEARS <i>(Estimated)</i>	TOTAL ALL YEARS <i>(Estimated)</i>
Modifications and Rehabilitations at All Locations	O&M	540	9,000		9,540
Space Launch Complex 2, Modifications	SSA	1,029	425		1,454
Deep Space Antenna (210 Foot) Facilities	TDA	17,540	17,000		34,540
TOTAL			26,425		

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

MODIFICATIONS AND REHABILITATIONS AT ALL LOCATIONS

AUTHORIZATION LINE ITEM: Various Locations

PROGRAM OFFICE FOR THE PROJECT: Office of Organization and Management

LOCATION OF PROJECT: Various Locations

TYPE OF CONSTRUCTION PROJECT: Alteration

FUNDING:

FY 1969 and Prior Years	\$540,000
FY 1970 Estimate	<u>9,000,000</u>
Total Funding Through FY 1970	<u>\$9,540,000</u>

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>	LS	---	\$9,000,000	\$9,000,000
<u>Equipment</u>	---	---	---	---
<u>Design</u>	---	---	---	---
<u>Fallout Shelter (Not feasible)</u>	---	---	---	---
		TOTAL		<u>\$9,000,000</u>

PROJECT PURPOSE:

To provide for major improvements, rehabilitation, and alteration of government-owned facilities. This work is required at all NASA installations and in support of NASA activities carried out in government-owned industrial plants. This work is related to the continued safe, economical, and efficient utilization of these facilities.

PROJECT DESCRIPTION:

This project provides for major items of improvement, rehabilitation, and alteration, to the NASA plant during the budget year. Typical examples, representative of the major work to be accomplished through this project, are as follows:

Test Facilities and Structures - Rehabilitate, alter and improve test and checkout facilities; particularly such items as waste and burn ponds, flame deflectors, concrete spillway aprons, deluge water systems, and fuel handling systems. Modify and improve hydraulic, pneumatic and high pressure gas systems to include improved gauges and valves for increased reliability and safety of operating personnel. Examples of work required at specific locations are as follows;

At the Eastern and Western Test Ranges the project provides for essential modifications and rehabilitations to launch and checkout facilities. At Launch Complex 39, typical examples consist of the installation of a redundant 6000 gallons-per-minute pump on the fire protection system, the replacement of the dangerously corroded and pitted aluminum hydrogen burn pond vent header system with stainless steel; the modifications to the VAB S-IVB Checkout Cell to support checkout of the Orbital Workshop; the complete rehabilitation of one Launcher Umbilical Tower (LUT) and the Mobile Service Structure (MSS) which includes a complete sandblasting and painting of the structure with an improved, long-life, zinc rich paint; the replacement of corroded floor panels and structural members; the complete overhaul of elevator cables, machinery, and equipment to offset the effects of several launches; and the refurbishment of the environmental control system through the installation of increased capacity to support increased heat loads and to offset launch damages; the replacement of the existing unsafe, inefficient platform rings with new lighter ones that will provide improved work platforms. Also included is a complete overhaul of KSC spacecraft altitude simulation chambers. The work will include rehabilitation or replacement when necessary, of pumps, valves, blowers, gaskets, compressors, gauges, switches and other elements of the chambers.

At Edwards Test Facility, rehabilitation of the concrete spillways and the refurbishment and desilting of the reclamation pond are essential during this period to prevent further erosion in these areas and possible damage to the structures.

Laboratory, Fabrication and Support Facilities - Recondition, modify and improve water treatment and conditioning systems, chemical, air and gas systems for continued compliance with environmental and quality standards for testing and production. Improvements to chemical waste handling systems and toxic air streams to comply with federal, state and local regulatory agencies for control of pollutants. Examples of work required at specific locations are as follows:

At Goddard Space Flight Center building roofs that have deteriorated due to their continued use to support R&D and test equipment require reroofing to assure weather tight protection.

At Wallops Station the high pressure air system, which was installed in 1946, has corroded to the point where repeated failure is commonplace; thus replacement of major portions of the system is required for continued operation.

At the Jet Propulsion Laboratory the gaseous nitrogen lines in the propulsion test area, which were installed prior to 1945, have experienced wasteful leaks and about 1,000 feet of piping must be replaced.

Work at the Edwards Test Facility includes the reevacuation of the existing vacuum jacketed LOX transfer line and the replacement of LOX line expansion joints to insure that the system is maintained in an operational condition.

Similar work is required at Lewis Research Center, and Langley Research Center.

Environmental Control Systems - Replace small marginal, inadequate, and expensive to maintain heating and cooling systems with improved central systems and additional ducts to provide for more efficient and reliable operation. Replace or rehabilitate cooling tower cells, pumps and supporting structures. Examples of work required at specific locations are as follows:

At Goddard Space Flight Center improvements are needed in the chilled water system to maintain the normal operating pressure of 100 pounds-per-square inch (psi) under varying load conditions. The present system operates from 65 to 130 psi due to inadequate controls. Improvements will consist of the installation of chilled water regulating valves and booster pumps in twenty buildings. Increased fan capacity and larger drive motors are required to supply additional cooling capacity in equipment and test laboratories. Four existing boilers require replacement of casings, new fire brick liners, reinforced target walls, and nozzle openings.

At Ames Research Center the heating system in eleven buildings is over twenty years old and major modifications are needed to the natural gas supply system and boilers to provide additional heat.

The buildings at Langley Research Center are over thirty years old and major modifications to the air conditioning systems are needed to support the test programs.

The lines to the air conditioning cooling towers at the Jet Propulsion Laboratory were installed in 1953 and have corroded to the point where circulation is inadequate and 2,500 feet need to be replaced. The insulation on 1,600 feet of chilled water lines which was installed in the early part of 1950 has failed and must be replaced.

Significant reconditioning and replacement of cooling systems and expansion of environmental control systems is required at the Michoud Assembly Facility, such as the main cooling tower. Many of the wooden louvers and supports are showing increasing signs of deterioration and replacement of all cells is necessary. Ames Research Center, Downey Industrial Facility, Lewis Research Center at Plum Brook, and Goddard Space Flight Center will also require work of this nature.

Fire Protection Systems - Rehabilitate and improve existing fire detection, alarm, and water sprinkler systems to provide for improved coverage of critical areas. Install additional fire detectors and water sprinkler systems to provide for improved protection of computers and high value equipment. Modify existing central fire alarm systems to improve fire protection response capability.

Typical of the work required is at the Goldstone Tracking Complex where the main base and six outlying sites require modifications and improvements which include additions to the fire water mains and hydrants, the installation of water sprinkler systems and detection devices in the control and computer rooms, and alterations to individual buildings to improve fire safety capabilities.

Electrical Systems - Rehabilitate inadequate, overloaded electrical power systems by installing larger transformers, additional cable systems, improved switches and breakers, and additional grounding. Install devices to improve the efficiency of existing power systems. Replace inadequate lighting systems with improved fixtures and equipment.

The Ames Research Center is a prime example of requirements in this area. There is a need to increase the capability of the electrical power system to supply increased research demand loads, by replacing the substation grounds, and adding additional cables and transformers.

Utility Systems, Roads and Grounds - Recondition, modify, and improve storm sewer systems. Provide corrosion protection for utility lines and install additional lighting systems. Recondition roads and other paved areas. Examples of work required at specific locations are as follows:

At Goddard Space Flight Center 30,000 yards of existing paved roads are cracking and failing, requiring additional paving to protect the base. Existing unpaved roads have deteriorated and approximately 70,000 yards require regrading, surface treatment, and additional erosion control.

At Wallops Station the airstrip and roads were built in 1943 and are experiencing major pavement failures. There is a need to repair deteriorated sections of the 8,000 foot airstrip and provide a protective surface treatment. Approximately 3,000 yards of paved roads require similar treatment.

At the Jet Propulsion Laboratory, the sewer lines to buildings installed prior to 1953 are now inadequate and must be replaced. The roads were built before 1943, therefore 12,000 yards of repaving is required, 4,500 yards need rehabilitation with two inch overlay and repaving, and 3,400 yards require protective surfacing. Additional grading and planting is required over ten acres of hillside to protect from erosion.

PROJECT JUSTIFICATION:

The NASA facilities plant, with an initial acquisition value in excess of \$4 billion, requires the significant annual expenditure of resources in order to overcome the cumulative effects of wear, deterioration, and obsolescence. The problems of age, and severe operating conditions that demand the optimum in performance characteristics, require the development and implementation of a planned program of rehabilitation, reconditioning, and replacement of major facilities subsystems and units. These are the types of problems that cannot be corrected by day-to-day maintenance, or by minor repair efforts, and contribute to the increased cost of such programs if not undertaken on an orderly and substantial basis.

NASA has identified approximately \$20 million of requirements which require the type of corrective work called for by this project. However, only the top priority items are planned for execution under this project while the remainder will be placed in a deferred category for inclusion in future years' programs.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: It is estimated that between \$10,000,000 and \$15,000,000 per year will be required for this project in future years.

FISCAL YEAR 1970 ESTIMATES

AUTHORIZATION LINE ITEM: Various Locations

PROGRAM OFFICE FOR THE PROJECT: Office of Space Science and Applications

COGNIZANT NASA INSTALLATION: John F. Kennedy Space Center, NASA

TYPE OF CONSTRUCTION PROJECT: Alteration

FY 1969 and Prior Years	\$1,029,000
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FY 1970 Estimate	425,000
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Total Funding Through FY 1970	<u>\$1,454,000</u>
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	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>				<u>\$425,000</u>
Service structure under carriage	LS	---	\$57,000	57,000
Foundations and rails	LS	---	215,000	215,000
Electrical modifications	LS	---	78,000	78,000
Emergency egress stairway	LS	---	75,000	75,000
<u>Equipment</u>	---	---	---	---
<u>Design</u>	---	---	---	---
<u>Fallout Shelter</u> (Not feasible)	---	---	---	<u>None</u>
			TOTAL	<u>\$425,000</u>

CF7-7

PROJECT PURPOSE:

To improve the safety and reliability of launch control systems necessary for the support of polar orbit missions launched from the Western Test Range by the Delta and Thor/Agena type launch vehicles.

PROJECT DESCRIPTION:

This project provides for the following modifications and additions to Space Launch Complex 2, East Pad:

Replacement of the existing pneumatic rubber tire assembly and associated drive system with a steel wheel and electric drive system which is surplus to the Cape Kennedy Launch Complex 17 service structure. The new system will require the installation of steel rails to be supported by a reinforced concrete structure. The service structure base will be strengthened, and the electrical supply system will be modified to provide for increased power requirements.

An emergency egress stairway will be installed out board of, but attached to the service structure. The stairway will extend from ground level to the fourth level with fire walls to be installed on the column structure where necessary.

PROJECT JUSTIFICATION:

Space Launch Complex 2 comprises the entire west coast capability for Delta and Thor/Agena polar orbit launches for NASA and ESSA scientific and weather satellite missions. It is, therefore, essential that the maximum capability, reliability, and safety be built into this complex.

As presently configured, the launch complex cannot operate safely within a reasonable range of weather conditions. A key problem is the service structure which, as presently constituted, cannot be moved away from the launch vehicle during wind velocities in excess of 13.5 to 22 knots, depending upon direction. A wind from the rear of 23 knots or more, will deflect the pneumatic tires of the structure, which will in turn result in a magnified lateral movement at the fourth level, which is of sufficient magnitude to cause a dangerous bumping of the service structure against the launch vehicle. In addition, lateral winds in excess of 13.5 knots can cause excessive stresses in the walking beams which connect the structure to the pneumatic tires, when the weight of the service structure is in the process of transfer from jacks to wheels.

Since winds exceeding these limitations are common in the vicinity of the launch pad, costly launch delays can be the net result. As an example, with Delta 56, the service structure could not be removed for several hours because of limitations imposed by wind conditions. This resulted in the loss of many manhours by stage contractors and Air Force Western Test Range personnel.

In order to permit movement of the service structure during winds up to 30 knots, a new rail system and structural strengthening are essential. The rails will also provide a positive guided movement of the service structure while it is in close proximity to the launch vehicle, which is not possible with a pneumatic tire system.

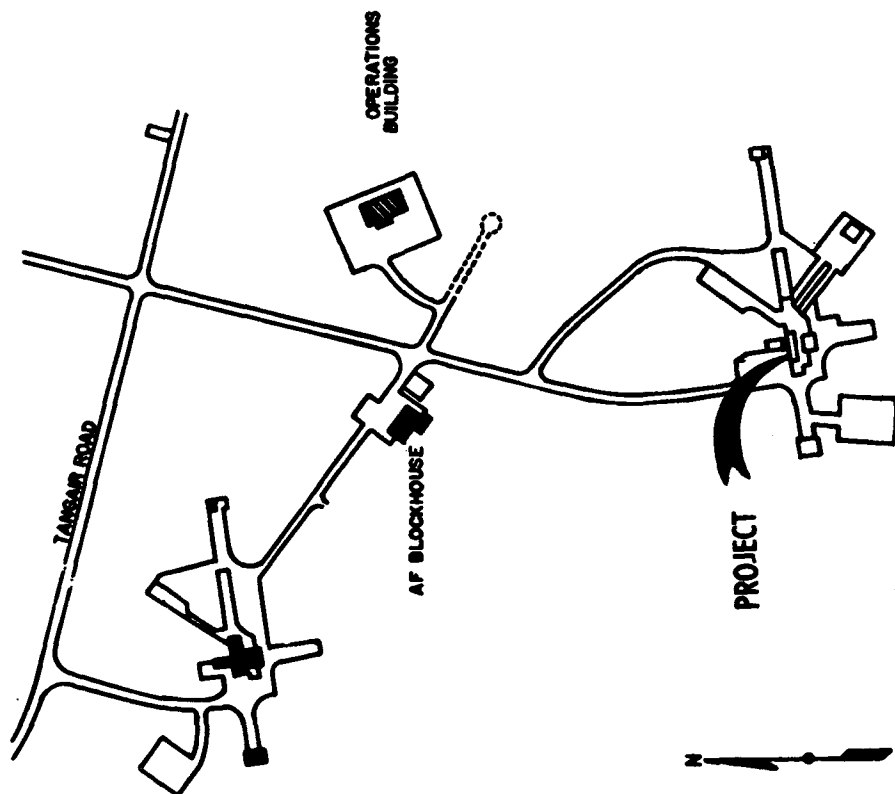
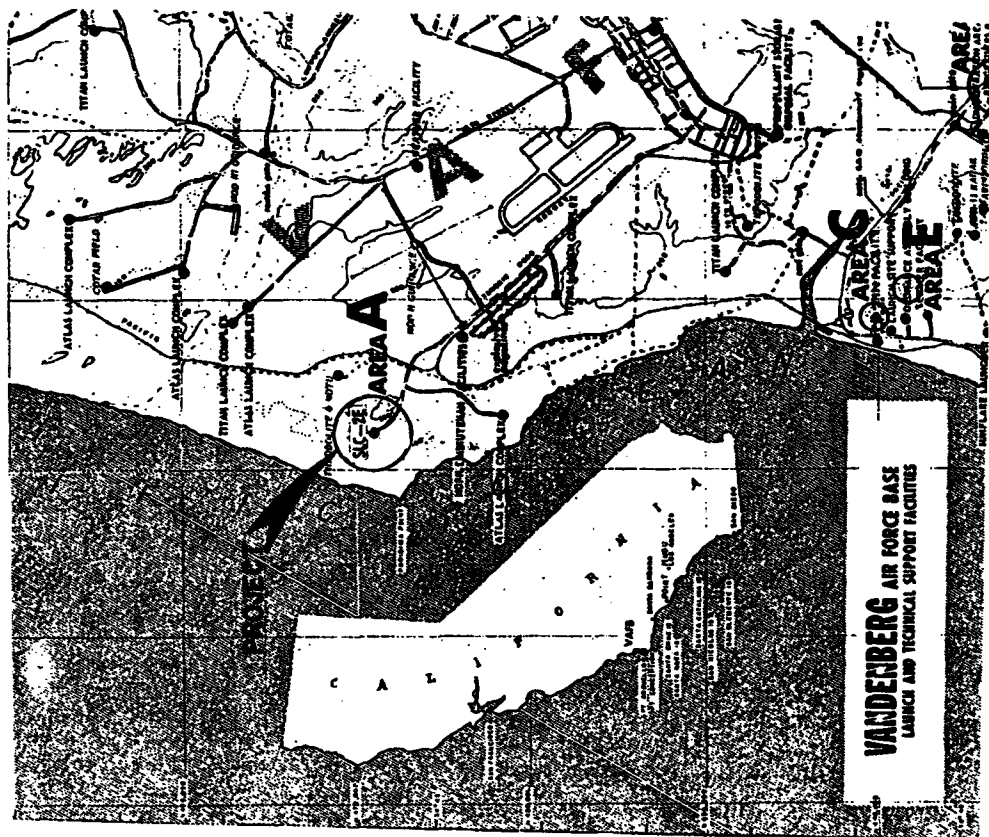
An emergency egress system, to supplement existing stairways and elevator systems, is also required for the service structure. Studies have been made of various egress systems and a conventional stairway has been found satisfactory to provide an adequately safe means of egress for this type of service structure.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: Future year funding for this facility will be dependent upon follow-on and future years' flight programs.

JOHN F. KENNEDY SPACE CENTER, NASA

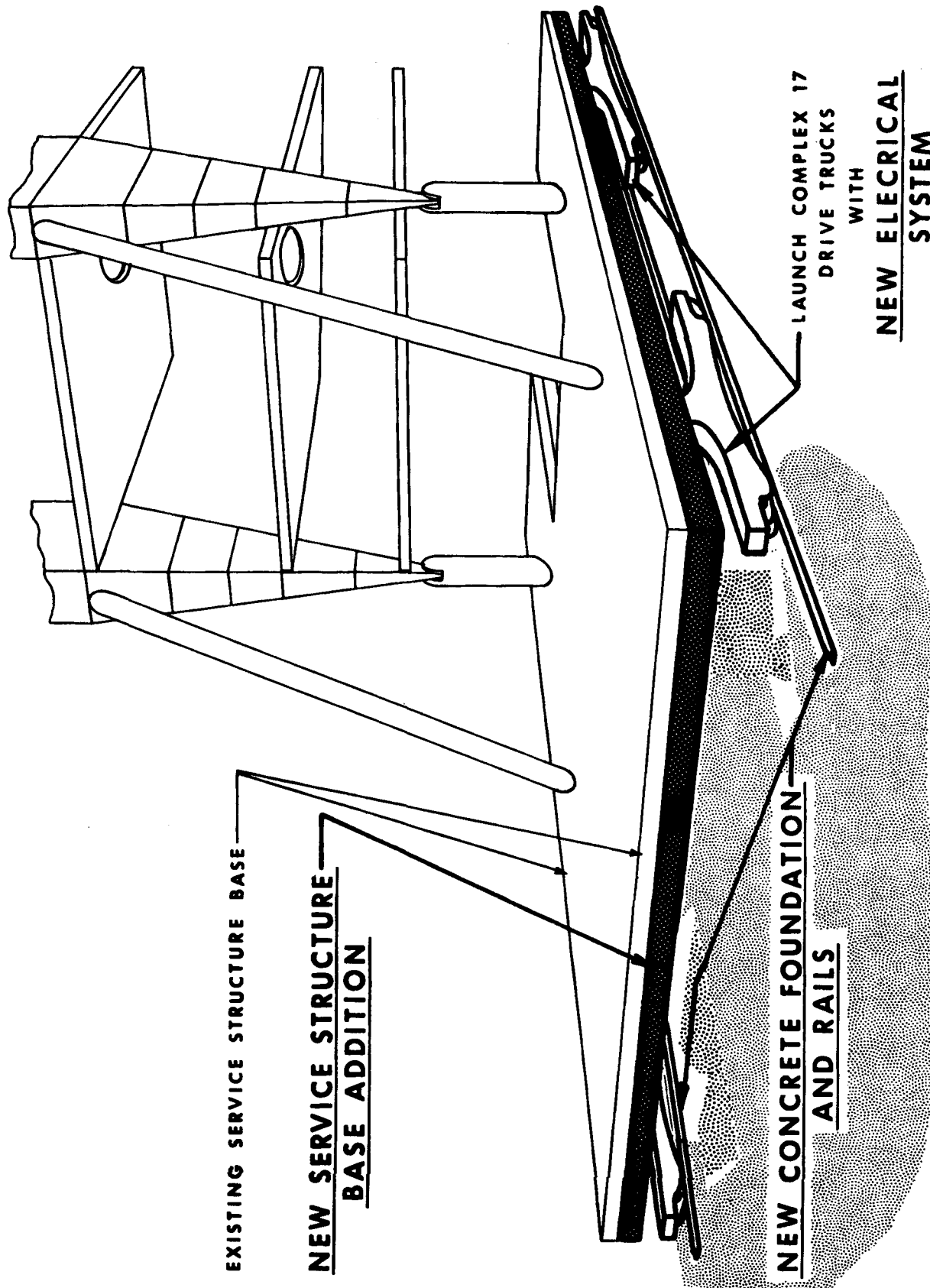
FISCAL YEAR 1970 ESTIMATE

MODIFICATIONS TO SPACE LAUNCH COMPLEX 2E

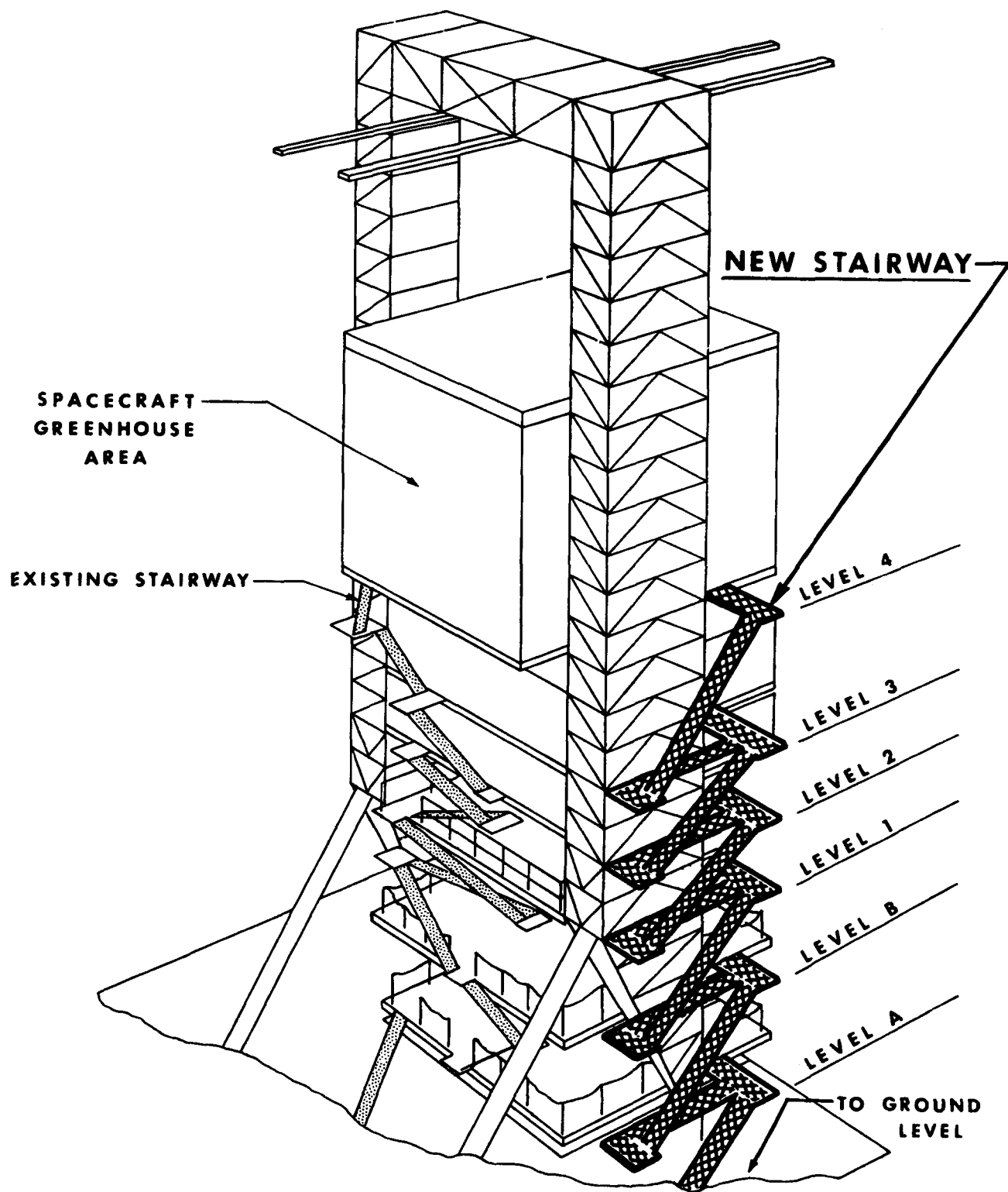


SITE PLAN
0 500 1000
SCALE IN FEET

SLC-2E SERVICE STRUCTURE
NEW SERVICE STRUCTURE DRIVE SYSTEM



SLC-2E SERVICE STRUCTURE
NEW STAIRWAY ADDITION



CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

DEEP SPACE ANTENNA (210 FOOT) FACILITIES

AUTHORIZATION LINE ITEM: Various Locations

PROGRAM OFFICE FOR THE PROJECT: Office of Tracking and Data Acquisition

LOCATION OF PROJECT: Canberra Complex, Australia
Madrid Complex, Spain

COGNIZANT NASA INSTALLATION: Jet Propulsion Laboratory

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1968 and Prior Years Design	\$540,000
FY 1969 Construction	17,000,000
FY 1970 Estimate	<u>17,000,000</u>
Total Funding Through FY 1970	<u>\$34,540,000</u>

PROJECT COST ESTIMATE: Canberra, Australia

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Total Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>				<u>\$14,761,000</u>
Operations building addition	Sq. Ft.	15,000	\$39.47	592,000
Power plant addition	KW	1,500	456.67	685,000
Microwave laboratory building	Sq. Ft.	3,750	46.13	173,000
Antenna system	Each	1	13,202,000	13,202,000
Supporting features	LS	---	109,000	109,000
<u>Equipment</u>				<u>\$2,286,000</u>
Antenna electronic equipment	LS	---	1,936,000	1,936,000
Communications equipment	LS	---	67,000	67,000
Installation, integration and evaluation	LS	---	283,000	283,000

	Unit of Measure	Quantity	Unit Cost	Total Cost
<u>Design</u>	---	---	---	---
<u>Fallout Shelter</u>	---	---	---	-0-

TOTAL, Canberra \$17,047,000

PROJECT COST ESTIMATE: Madrid, Spain

<u>Land Acquisition</u>	---	---	---	---
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<u>Construction</u>				<u>\$14,663,000</u>
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Operations building addition	Sq. Ft.	15,000	\$37.60	564,000
Power plant addition	KW	1,500	454.00	681,000
Microwave laboratory building	Sq. Ft.	3,750	43.73	164,000
Antenna system	Each	1	13,128,000	13,128,000
Supporting features	LS	---	126,000	126,000

<u>Equipment</u>				<u>\$2,290,000</u>
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Antenna electronic equipment	LS	---	1,936,000	1,936,000
Communications equipment	LS	---	67,000	67,000
Installation, integration, and evaluation	LS	---	287,000	287,000

<u>Design</u>	---	---	---	---
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<u>Fallout Shelter</u>	---	---	---	-0-
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TOTAL, Madrid \$16,953,000

GRAND TOTAL \$34,000,000

Less FY 1969 Funding -17,000,000

FY 1970 Request \$17,000,000

PROJECT PURPOSE:

To provide a required increase in the deep space ground antenna capability by completing, in a timely and economical manner, a three station network of deep space (210 foot) antenna facilities appropriately spaced around the earth.

PROJECT DESCRIPTION:

This project provides the funding for the completion of construction of two 210 foot diameter antenna systems for the Deep Space Network authorized in the FY 1969 budget. Prior year funding provided for the design, incremental costs of construction of concrete pedestals for the antennas, and initiation of procurement of the antennas.

These antennas, to be located at Madrid, Spain, and Canberra, Australia, together with the operational 210 foot antenna at Goldstone, California, will provide a three station network with the increased performance required for planetary spacecraft projects in the post 1970 time period. The three station network will be capable of continuous communication with deep space vehicles in the declination range 28.5°N to 28.5°S.

The antenna system facilities included under this project will consist of augmentation of the existing Deep Space Network facilities located at Canberra, Australia, and Madrid, Spain. This project will provide for: (1) the construction of a 15,000 square foot addition to the existing operations building; (2) increasing the output of the existing power plant to meet the requirements of the antenna system; (3) fully steerable 210 foot diameter, paraboloid reflector-type antenna complete with concrete pedestal, control room, machinery, and equipment rooms; and (4) 3,750 square foot microwave laboratory buildings. The project will also provide for all necessary supporting features, including utilities, outside communications, roads, water storage, fuel storage, and site development. The project will further provide for the essential electronic equipment associated with the antenna system.

PROJECT JUSTIFICATION:

This project will continue the work started in prior years to complete the installation of two overseas antenna (210 foot) facilities. These antennas, together with the Goldstone facility, are necessary to support planetary spacecraft projects planned in the early 1970's.

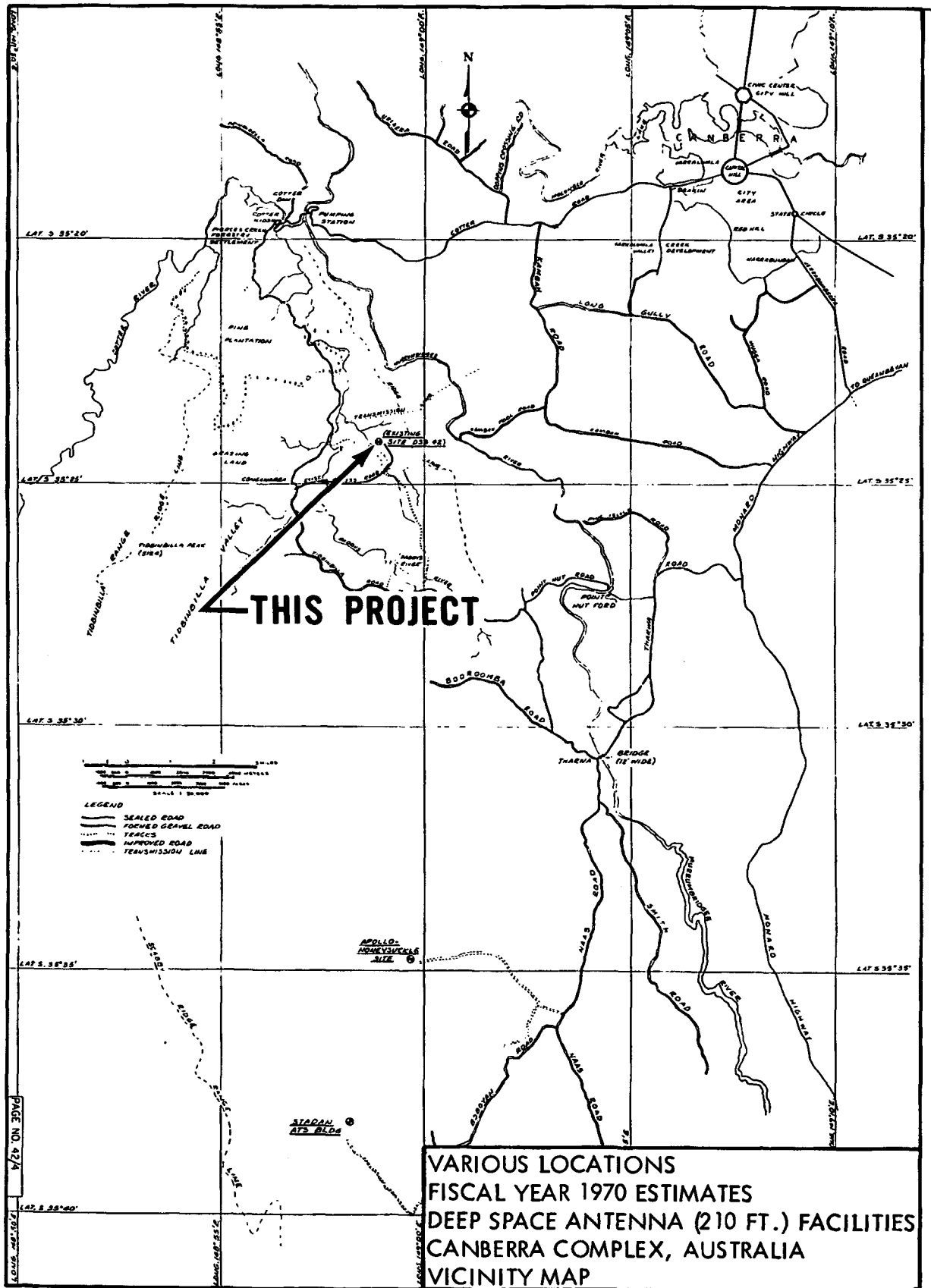
This network is required for the continuous surveillance of the spacecraft during the complex planetary reconnoitering and atmospheric probe missions which are evolving from past successful early missions in the vicinity of the Moon, Mars, and Venus. These missions, initiated by Ranger, Surveyor, Mariner/Venus, Mariner/Mars, and Lunar Orbiter all have demonstrated the important balanced performance required between the spacecraft and ground communications systems to obtain meaningful and sufficient amounts of data. Increased emphasis on visual imaging experiments by future missions, particularly the long-lived reconnoitering or orbital types, will be conducted over longer periods of time and over much greater distances from the earth and will result in even more significant increases in the quantity of data to be transferred to the ground stations.

Future planetary orbital missions, as compared to past short-time observation and long-time data transfer flyby-type missions, will require extensive time sharing between the flight observational and the data transfer activity at much higher data bit rates. As an example, even a partial planetary survey of the Martian surface similar to that conducted by a single Lunar Orbiter mission acquires more than 1,000 times more data bits than that planned for even Mariner 1969--a task which becomes virtually impossible to accomplish by an 85 foot antenna network. The total support period afforded by a complete high performance 210 foot antenna communications network, however, influences directly the ability to receive these quantities of data in a reasonable period; thus, the complete network availability becomes one of the pacing factors in orbital mission effectiveness.

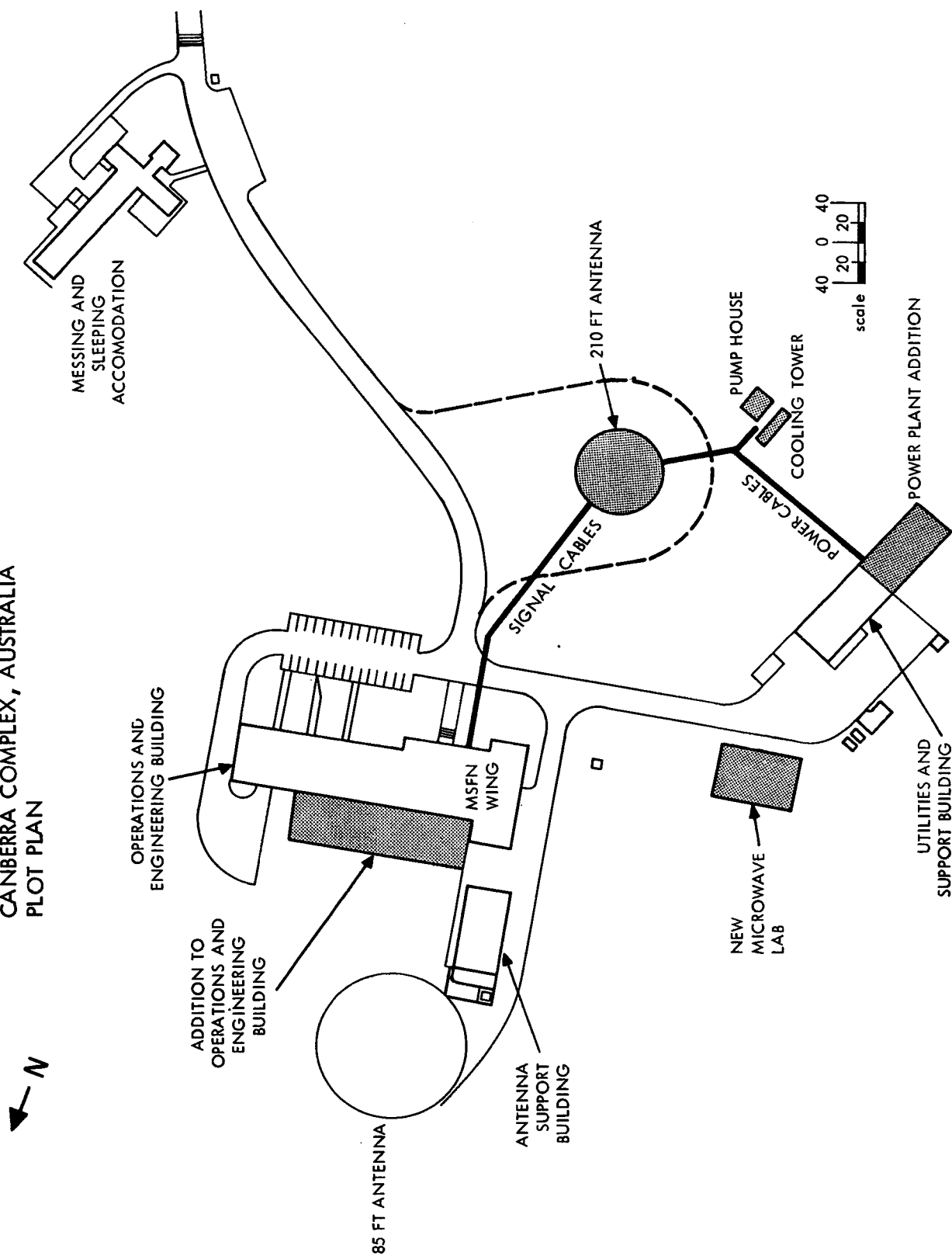
Secondly, but equally important, the antenna system provides the required continuous and reliable high power positive command control for distant planetary spacecraft under all attitude conditions. This continuous coverage capability is vital to mission success when adverse spacecraft maneuvers or anomalies result in poor on-board command reception.

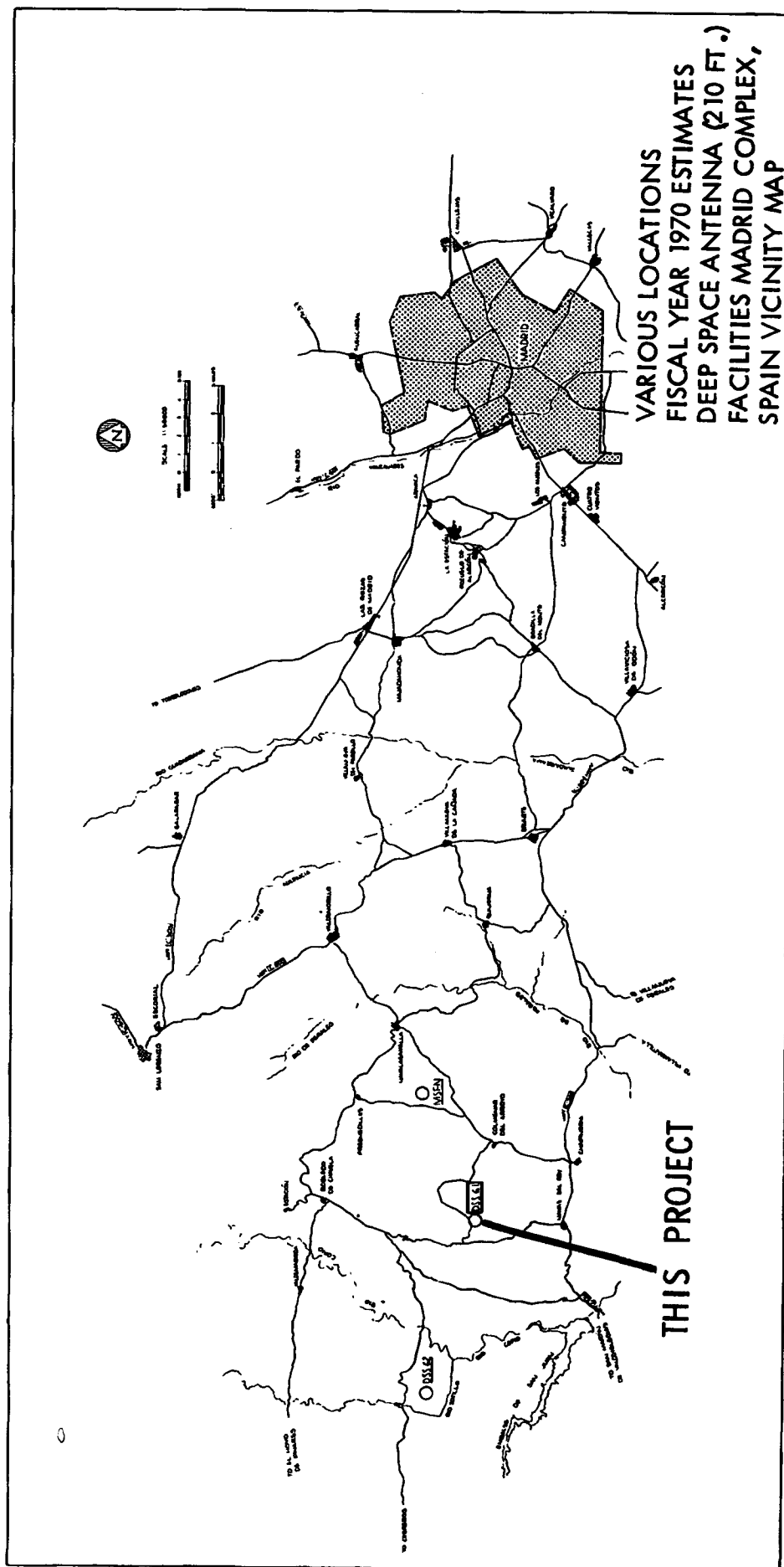
Further, as demonstrated by the recent support by the Goldstone 210 foot antenna, the sixfold communication advantage over the 85 foot standard antenna permits an important extension to the usable life of such valuable spacecraft as Pioneer and Mariner which have passed beyond the communication range of the 85 foot antenna. Based on the performance of the on-going Pioneer spacecraft, support to these and future extended mission phases will utilize a large part of the 210 foot antenna network available time in the post 1971 period.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

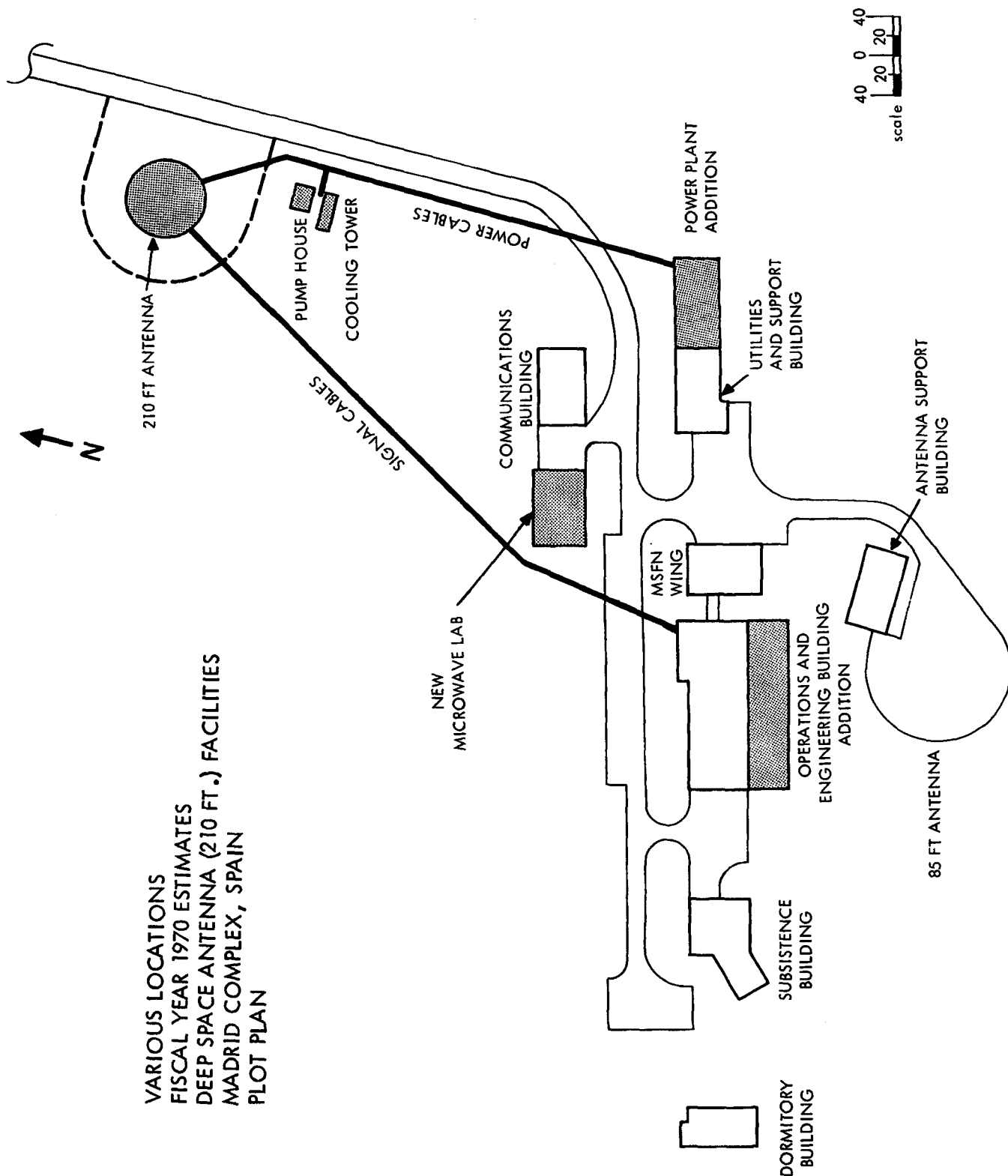


VARIOUS LOCATIONS
FISCAL YEAR 1970 ESTIMATES
DEEP SPACE ANTENNA (210 FT.) FACILITIES
CANBERRA COMPLEX, AUSTRALIA
PLOT PLAN





VARIOUS LOCATIONS
FISCAL YEAR 1970 ESTIMATES
DEEP SPACE ANTENNA (210 FT.) FACILITIES
MADRID COMPLEX, SPAIN
PLOT PLAN



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

FACILITY PLANNING AND DESIGN

Page No.

Summary.....	CF 8-1
Office of Organization and Management (NASA General)	
Facility planning and design.....	CF 8-2

(Dollars in thousands)

NASA INSTALLATION All		COGNIZANT PROGRAM OFFICE FOR INSTALLATION Office of Organization and Management	
LOCATION OF INSTALLATION ---	COUNTY ---	NEAREST CITY ---	
INSTALLATION MISSION			

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 19 ⁵⁹ THRU CURRENT YR	FY 19 ⁷⁰ (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Facility Planning and Design	O&M	53,865	3,500		Not Applicable
TOTAL			3,500		

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1970 ESTIMATES

FACILITY PLANNING AND DESIGN

Facility planning and design funds include the cost of preparing preliminary engineering reports, preliminary plans and specifications as well as final construction contract plans and specifications related to facilities projects. Included are the preparation of necessary site investigations, conceptual studies, cost estimates, and design and construction schedules.

Facility planning and design also encompasses necessary field installation development and master planning costs as well as the costs related to special facilities investigations, studies and reports.

The \$3.5 million request for FY 1970 includes the following major activities:

- a. \$2.3 million for the completion of final contract plans, specifications and cost estimates for projects to be included in the subsequent FY 1971 construction program.
- b. \$800,000 for the preparation of preliminary engineering reports, investigations and studies related to proposed facilities projects to be included in the subsequent FY 1972 construction program.
- c. \$400,000 for the essential updating of field installation master and development plans as well as special facilities investigations, studies and reports.

All of the above work is sequential and follow-on to NASA prior years planning and design efforts. These efforts are basic to providing sound engineering data and cost estimates as well as the timely preparation of plans and specifications so the facility construction projects ultimately may be placed under construction contract under the best possible conditions in terms of plans and specifications as well as construction time phasing. This \$3.5 million is the minimum essential to achieve this basic objective.