COPY #45

National Aeronautics and Space Administration

BUDGET ESTIMATES

BUREAU OF THE BUDGET SUBMISSION

ARCHIVES
NO.

FISCAL YEAR 1966

Volume II

CONSTRUCTION OF FACILITIES
ADMINISTRATIVE OPERATIONS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

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FISCAL YEAR 1966 ESTIMATES

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CONSTRUCTION OF FACILITIES

APPROPRIATION LANGUAGE

(To be provided later)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

CONSTRUCTION OF FACILITIES

Program and Financing (in thousands of dollars)

	Budget Plan			Obligations		
	1964	1965	1966	1964	1965	1966
Program by activities:						
1. Manned space flight.....	495,093	222,664	43,121	384,120	430,300	148,200
2. Scientific investigations in space.....	18,364	5,692	15,464	32,831	38,000	12,000
3. Space applications.....	3,933	-	-	3,697	200	200
4. Space technology.....	60,945	23,401	41,772	68,174	71,700	35,500
5. Aircraft technology.....	2,589	3,779	15,525	100	6,200	8,900
6. Supporting operations.....	134,526	7,344	17,118	57,637	111,000	14,200
Total obligations.....	715,450	262,880	133,000	546,559	657,400	219,000
Financing:						
Unobligated balance available, start of year:						
For completion of prior year budget plans (-).....	-	-	-	-375,082	-542,194	-149,453
Available to finance new budget plans (-).....	-15,797	-	-	-15,797	-	-
Unobligated balance transferred from "Research and development" (77 Stat. 439) (-).....	-1,779	-	-	-	-1,779	-
Unobligated balance transferred to "Research and development" (76 Stat. 731) and (75 Stat. 355).....	15,472	-	-	15,472	-	-
Unobligated balance available, end of year.....	-	-	-	542,194	149,453	63,453
New obligational authority..	713,346	262,880	133,000	713,346	262,880	133,000

Program and Financing (in thousands of dollars)--Continued

	Budget plan			Obligations		
	1964	1965	1966	1964	1965	1966
New obligational authority:						
Current authorization:						
Appropriation.....	680,000	262,880	133,000	680,000	262,880	133,000
Transferred from:						
"Research and development" (77 Stat. 439).....	20,046	-	-	20,046	-	-
"Administrative operations" (77 Stat. 439).....	13,300	-	-	13,300	-	-
Appropriation (adjusted)	713,346	262,880	133,000	713,346	262,880	133,000

Note.—Reconciliation of budget plan to obligations:

Total budget plan.....	715,450	262,880	133,000
Deduct portion of budget plan to be obligated in subsequent years.....	430,323	74,657	60,000
Add obligations of prior year budget plans.....	261,432	469,177	146,000
Total obligations.....	546,559	657,400	219,000

Type size: 8 point, 22 picas Case 180. Red underscore Case 210

STANDARD FORM 301
Short form
July 1964, Bureau of the Budget Circular No. A-11, Revised.
301-101

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES

FINANCING AND EXPENDITURES (in thousands of dollars)

Identification code 27-00-0107-0-1-251	1964 actual	1965 estimate	1966 estimate
~~10 Total obligations (from program schedule)~~			
~~Financing:~~			
~~Receipts and reimbursements from:~~			
~~11 Administrative budget accounts (—)~~			
~~13 Trust fund accounts (—)~~			
~~14 Non Federal sources (—)~~			
~~16 Comparative transfers to/from (—) other accounts~~			
~~17 Recovery of prior year obligations (—)~~			
~~21 Unobligated balance available, start of year (—)~~			
~~24 Unobligated balance available, end of year~~			
~~25 Unobligated balance lapsing~~			
~~26 Unobligated balance rescinded ( )~~			
~~New obligational authority~~			
Relation of obligations to expenditures:			
10 Total obligations	546,559	657,400	219,000
~~70 Receipts and other offsets (items 11-17)~~			
71 Obligations affecting expenditures	546,559	657,400	219,000
72 Obligated balance, start of year	522,288	632,185	763,062
74 Obligated balance, end of year (—)	-632,185	-763,062	-528,062
~~77 Adjustments in expired accounts~~			
90 Expenditures	436,662	526,523	454,000

Use instead of Forms 302 and 303 when possible

☆ GPO:1964—O-732-469

(Mono cast: 21.5) (Mono cast: 5) (Mono cast: 5) (Mono cast: 4.9)

Type size: 8 point 22 picas Case 180. Red underscore Case 210

STANDARD FORM 300
July 1964, Bureau of the Budget Circular No. A-11, Revised.
300-101

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES

OBJECT CLASSIFICATION (in thousands of dollars)

Identification code 27-00-0107-0-1-251	1964 actual	1965 estimate	1966 estimate
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION			
31.0 Equipment	185,496	313,766	128,772
32.0 Lands and structures	361,063	343,634	90,228
Total obligations, National Aeronautics and Space Administration	546,559	657,400	219,000
ALLOCATION ACCOUNTS			
31.0 Equipment	45	110	....
32.0 Lands and structures	7,821	4,232	....
Total obligations, allocation accounts	7,866	4,342	....
99.0 Total obligations	554,425	661,742	219,000
Obligations are distributed as follows:			
National Aeronautics and Space Administration	546,559	657,400	219,000
Department of Commerce, Bureau of Public Roads	3,981	1,843	....
U. S. Atomic Energy Commission	3,885	2,499	....
	(Mono cast: 5)	(Mono cast: 5)	(Mono cast: 4.9)

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☆ GPO:1964—O-732-469

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

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

INSTALLATION MISSION

To conduct overall planning and supervision of the integration, test, checkout and launch of NASA space vehicle systems at the Atlantic Missile Range (AMR) and Merritt Island, and to provide support services for all NASA elements located in the area.

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL *(End of Year)*	1,625	2,164	2,164
CONTRACTOR & OTHER PERSONNEL	5,797	8,309	9,729
TOTAL ALL PERSONNEL	7,422	10,473	11,893

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	88,743	
LAND *(Lease or Permit)*	3,340	
PLANT VALUE *(as of June 30, 1964)*		298,069
TOTAL	92,083	298,069

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1964 AND PRIOR YEARS	FY 1965 *(Estimated)*	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Utility Installations - New Area	MSF	80.3	154.2	4,168.7	-	4,403.2
Flight Crew Training Building Addition	MSF	17.5	2,431.0	1,340.7	-	3,789.2
RF Systems Test Facility	MSF	-	69.0	1,374.5	-	1,443.5
Addition to Dispensary	MSF	371.0	19.4	608.0	-	998.4
Modifications to Launch Complex No. 17	SSA	55.0	465.0	1,300.0	-	1,820.0
TOTAL FOR PROJECTS IN FY 1966 ESTIMATE				8,791.9		

NASA FORM 1029 DEC 63

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center, NASA	Construction of Facilities	Utility Installations - New Area

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

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

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

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

TYPE OF CONSTRUCTION PROJECT: Extensions

FUNDING:

FY 1964 and Prior Years	$ 80,300
FY 1965 Estimate	154,200
FY 1966 Estimate	4,168,700
Total Funding Thru FY 1966	$4,403,200

PROJECT COST ESTIMATE:	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	-	-	-	-
Construction	-	-	-	$ 649,700
Addition to Central Telephone Office	SF	5,500	$37.95	208,700

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center, NASA	Construction of Facilities	Utility Installations - New Area

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Wilson Repeater Building	SF	2,750	$35.02	$ 96,300
Utilities	LS	-	-	50,200
Site Development	LS	-	-	29,200
Road	Sq Yd	8,300	5.30	44,000
Primary Substation Transformer	LS	-	-	165,100
Electric Power Line	Ln Ft	5,500	-	56,200
Equipment				3,519,000
Wideband Transmission Equipment -	-	-	-	653,000
Technical Control Audio Equipment	-	-	-	913,000
Technical Control Wideband	-	-	-	327,000
Technical Control Support Equipment	-	-	-	116,000
Cable	-	-	-	1,510,000
Design	-	-	-	-
Fallout Shelter	-	-	-	-
			TOTAL	$4,168,700

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center	Construction of Facilities	Utility Installations - New Area

SUPPORTING DATA:

PROJECT DESCRIPTION:

This project provides for the expansion of the existing, electrical distribution, communications, and road systems serving the Merritt Island Launch Area. Electric power consists of the installation of approximately 5,700 feet of three conductor aerial cable from the intersection of Orsino Road and Banana River Road, paralleling the Fluid Test Safety road to the oil switch adjacent to the Ordnance Storage Building. Electric power also includes the installation of a 10,000 KVA transformer with the necessary protection devices in the main substation. Communications includes an addition to the Central Telephone Office. This 5,500 square foot masonry addition extends the full length of the north and west sides of the present building. Additional parking will be provided to the west of the building. Communications also includes the Wilson Repeater Building, which will be of masonry construction, one story high with an area of 2,750 square feet. The structure is sited on Merritt Island Road approximately four miles north of the Launch Complex 39 Repeater Building. Necessary paving, utilities and equipment to make this a usable facility are included. Outside cable plant is provided for all facilities being completed in this time frame. The work includes the design, procurement, and installation of equipment and cable. Major equipment components are technical control and wide band transmission. Roads include the construction of approximately 4,000 linear feet of 24 foot wide roadway in the MILA Industrial Area which will complete the four laning of "C" Avenue from Second Street south to Fifth Street and of Fifth Street from "B" Avenue east to "C" Street.

PROJECT JUSTIFICATION:

The expansion of the utility and road systems is required to provide an increase in the service capability to meet the demands of the orderly development of the Merritt Island Launch Area in this time frame. Detailed justifications of items follow:

(1) Electric Power - Installation of aerial cable is required along Fluid Test Safety Road to provide a loop feed to the Fluid Test Complex which will eliminate power outage delays in vital test and checkout operations that are to be performed in this area. Installation of a transformer is required since the FY 1965 addition to the Operations and Checkout Building increases the demand on the existing main substation by approximately 7,000 KVA.

SUPPORTING DATA:

(2) Addition to Central Telephone Office - This expansion is necessary to provide space for the following activities:

Switchboard Room - It will be necessary to expand the switchboard positions from 10 to 18 during FY 1967 and subsequent years. Currently, all present 10 positions have been placed into operation to support the local and long-distance telephone communications needs. The next increment of positions will be one module consisting of three operating positions which will be required in the beginning of FY 1967.

Switching Equipment - The present area allocated to switching equipment is completely utilized with no room for expansion of service. Switching requirements will continue to expand with the increase in population from 1966 on.

Frame Room - The main distribution frame will require augmentation concurrently with the expansion of the switching facility.

Central Paging Facility - This is a new function which is not presently being operated in this location. By centralizing all of the paging operations, economies in manpower, equipment, and building space will result. This function must be located in the central telephone office.

Service Section - This section is responsible for receiving work request from the customers and processing these requests to the particular activity responsible for performing the installation work. This service must expand concurrently with the population of MILA to insure that the service can maintain its workload.

Communications Center Room and Crypto Vault - The concept of operation of the KSC Communications System requires the establishment of the Communications Center and Crypto Room within the Central Telephone Office. This is a newly assigned function to this building.

Expansion of Wideband and Video Circuit Equipment Area - As the NASA operational activities on MILA increase, additional space will be required to support wideband terminal and repeater equipment. This space must be provided at this time.

Systems Control - The operational concept established for MILA communications includes a means of patching local and long-distance circuits through a systems control which is capable of monitoring the quality of these circuits, detecting and reporting trouble, and providing a display of the status of circuits. This is a new function and requires space within the Central Telephone Office. It is planned to activate this facility in early FY 1967, thus, requiring building construction support in FY 1966.

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SUPPORTING DATA:

(3) Wilson Repeater Building - This structure is needed to provide operating space for the following:

Switching Equipment - To provide telephone communications support to the extreme north areas of MILA and to those Defense Department sites located in the immediate vicinity of the Repeater Building, will require installation switching equipment having a 300 line capacity.

Carrier Equipment - This equipment will be installed to provide carrier circuits between the Wilson Repeater Station, the Central Telephone Office back to the Wilson Repeater Station, and thence to Cape Kennedy. Wideband repeater equipment will be installed to support this type of circuitry between the Central Telephone Office and the north MILA area.

Staging Area for Cable System Maintenance - The excessive distances required to be traveled from the MILA Central Telephone Office area to the extreme north MILA area for maintenance people dictate that an intermediate point be established from which these people and equipment can be staged.

(4) Roads - Completion of the four laning of Fifth Street and "C" Avenue is required to support the vehicle traffic resulting from personnel buildup in the MILA Industrial Area. The two roadways are the major entrances and exits for the Industrial Area. This traffic also has a large percentage of left turning movements.

ESTIMATED FUTURE YEAR FUNDING: None

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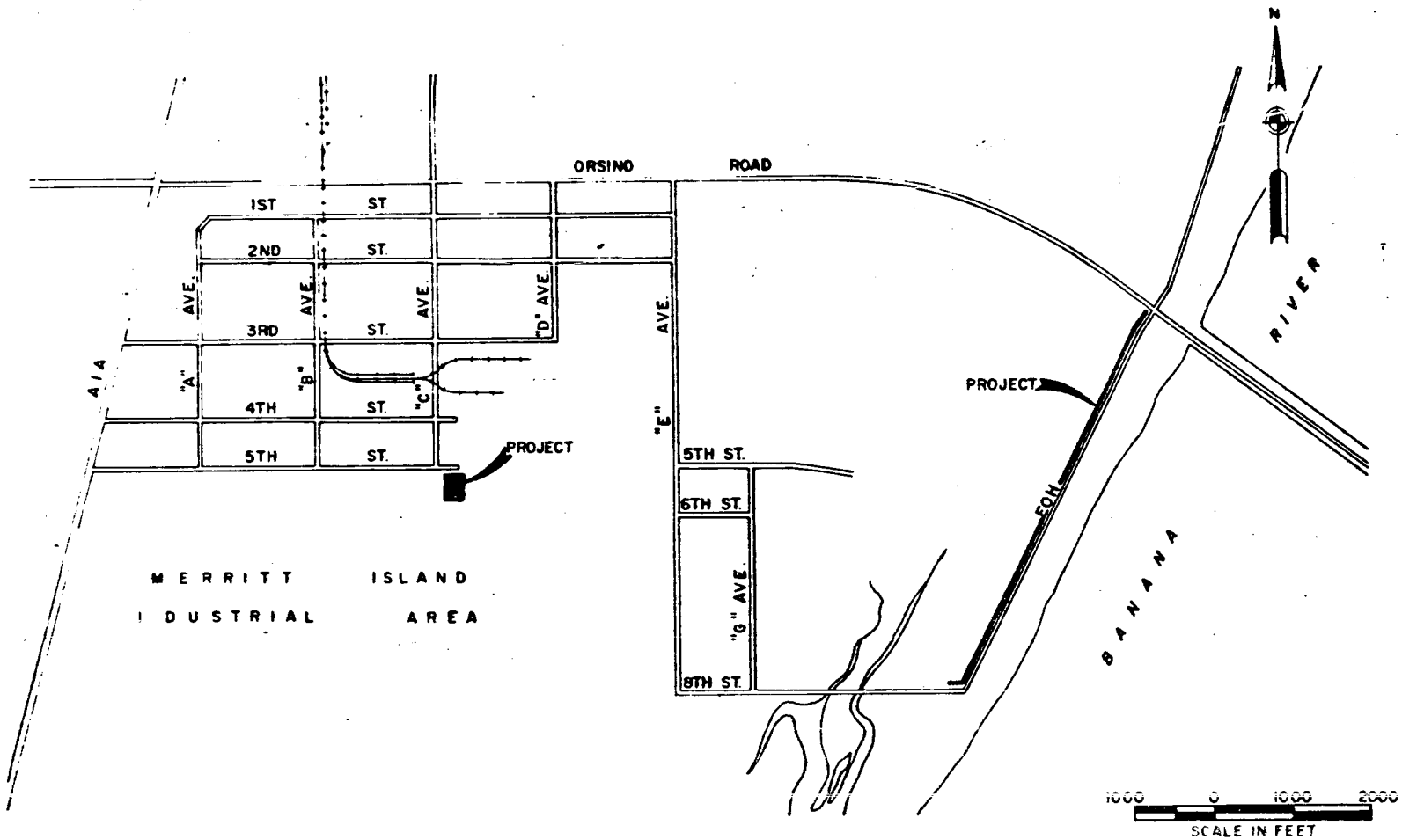
JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1966 ESTIMATES

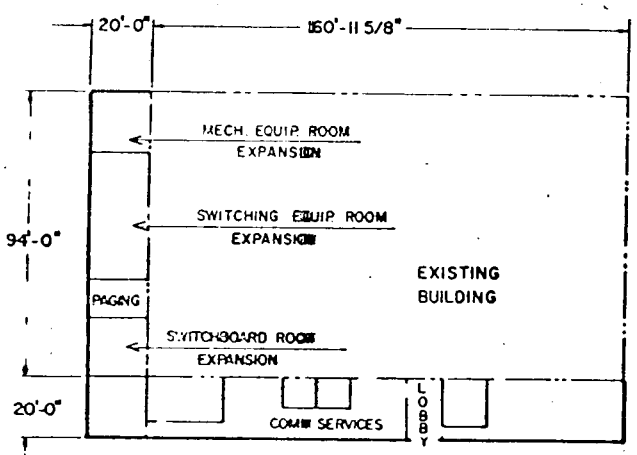
UTILITY INSTALLATIONS-NEW AREA



ELECTRIC SUB-STATION & 13.2 K.V. POWER LINE

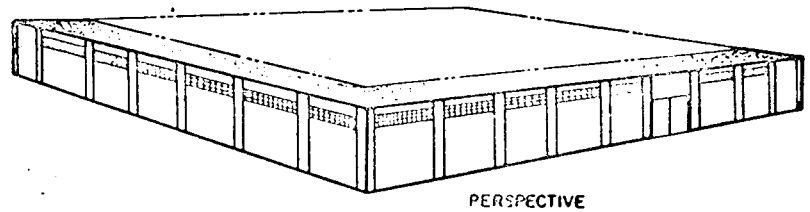
JOHN F KENNEDY SPACE CENTER, NASA
FISCAL YEAR 1966 ESTIMATES

UTILITY INSTALLATIONS-NEW AREA



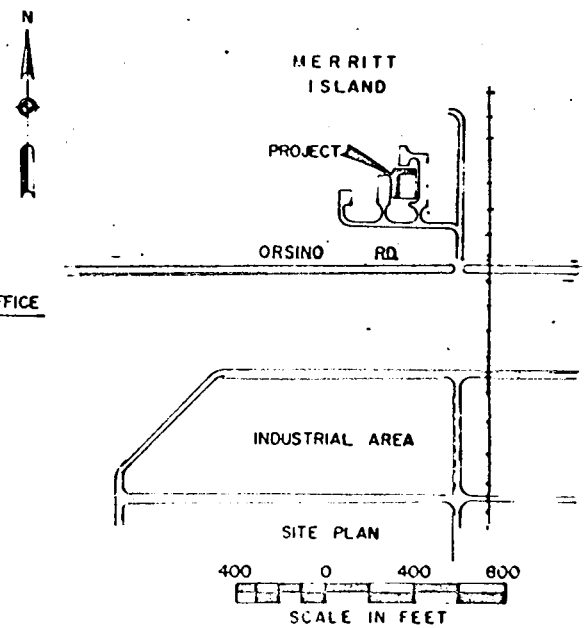
PLAN

20 10 0 20 40
SCALE IN FEET



PERSPECTIVE

ADDITION TO CENTRAL TELEPHONE OFFICE



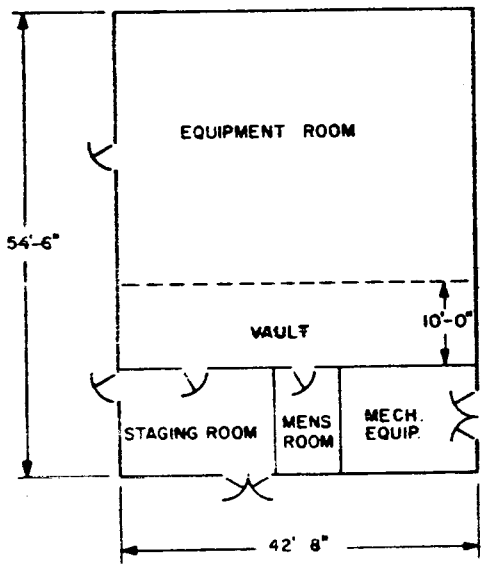
SITE PLAN

400 0 400 800
SCALE IN FEET

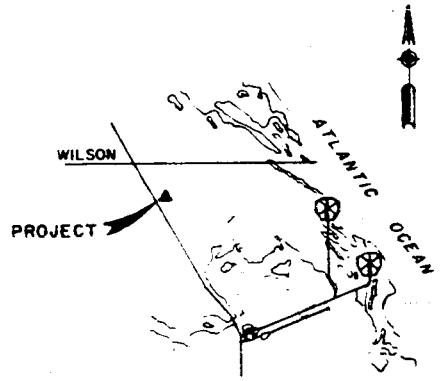
JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1966 ESTIMATES

UTILITY INSTALLATIONS - NEW AREA

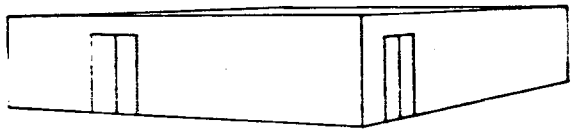


FLOOR PLAN



SITE PLAN

5000 0 5000 10000
SCALE IN FEET



PERSPECTIVE

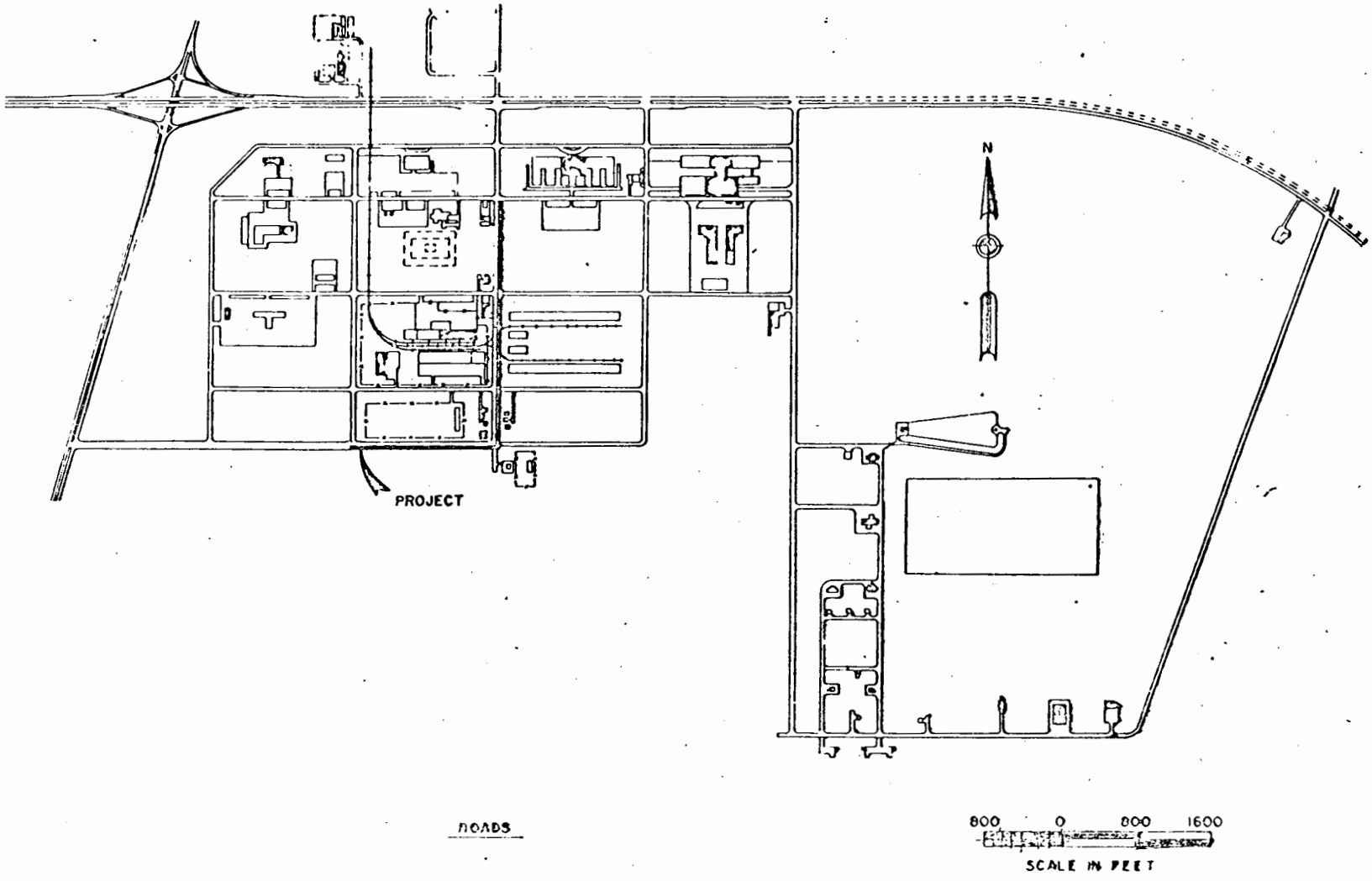
WILSON REPEATER BUILDING

8 0 8 16 24
SCALE IN FEET

JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1966 ESTIMATES

UTILITY INSTALLATIONS-NEW AREA



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center, NASA	Construction of Facilities	Flight Crew Training Building Addition

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

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

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

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

TYPE OF CONSTRUCTION PROJECT: Addition

FUNDING:

FY 1964 and Prior Years	$ 17,500
FY 1965 Estimate	2,431,000
FY 1966 Estimate	1,340,700
Total Funding Through FY 1966	$3,789,200

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--
Construction	--	--	--	$905,000
Building	SF	17,640	47.03	829,600

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center, NASA	Construction of Facilities	Flight Crew Training Building Addition

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Site Development	LS	--	1,700	1,700
Utilities	LS	--	73,700	73,700
pment	--	--	--	435,700
Intercommunication Systems	LS	--	49,000	49,000
Operational Television System	LS	--	13,000	13,000
Cabling	LS	--	13,000	13,000
Office, Shop & Lab Equip.	LS	--	45,700	45,700
Systems to Connect Power Supplies, Air Conditioning and Cooling System for G.S.E.	LS	--	315,000	315,000
Design	--	--	--	--
Fallout Shelter	--	--	--	--
			Total	$1,340,700

PROJECT DESCRIPTION:

This project provides for the design and construction of 16,840 square foot addition to the existing Flight Crew Training Building. The addition will consist of (1) approximately 5,500 square feet of 30 foot high-bay area to house two mission simulators; (2) approximately 3,300 square feet for computers, peripheral equipment, and consoles in support of the simulators; (3) approximately 7,050 square feet for computer programming, shop, offices, balcony in high bay area, and building service areas; (4) approximately 990 square feet of second floor air conditioning fan room adjacent to the high bay.

This addition will be of reinforced concrete frame with masonry exterior walls to match the original building. The necessary site development and utilities to make this a useable facility are included.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center, NASA	Construction of Facilities	Flight Crew Training Building Addition

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Site Development	LS	--	1,700	1,700
Utilities	LS	--	73,700	73,700
Equipment	--	--	--	435,700
Intercommunication Systems	LS	--	49,000	49,000
Operational Television System	LS	--	13,000	13,000
Cabling	LS	--	13,000	13,000
Office, Shop & Lab Equip.	LS	--	45,700	45,700
Systems to Connect Power Supplies, Air Conditioning and Cooling System for G.S.E.	LS	--	315,000	315,000
Design	--	--	--	--
Fallout Shelter	--	--	--	--
			Total	$1,340,700

PROJECT DESCRIPTION:

This project provides for the design and construction of 16,840 square foot addition to the existing Flight Crew Training Building. The addition will consist of (1) approximately 5,500 square feet of 30 foot high-bay area to house two mission simulators; (2) approximately 3,300 square feet for computers, peripheral equipment, and consoles in support of the simulators; (3) approximately 7,050 square feet for computer programming, shop, offices, balcony in high bay area, and building service areas; (4) approximately 990 square feet of second floor air conditioning fan room adjacent to the high bay.

This addition will be of reinforced concrete frame with masonry exterior walls to match the original building. The necessary site development and utilities to make this a useable facility are included.

SUPPORTING DATA:

In addition, an approximately 800 square foot extension to the Equipment Building will be made. This structure will house the air conditioning refrigeration equipment required for the addition to the training facility.

PROJECT JUSTIFICATION:

The existing Flight Crew Training Building will house an Apollo part task trainer and mission simulator, Lunar Excursion Module part task trainer and mission simulator, and the related computers and support areas. The original facility was sized to accommodate training flight crews in support of a launch rate of four spacecraft per year. This addition will house an Apollo mission simulator, Lunar Excursion Module mission simulator, and their computers and support areas. This will supplement the facilities provided in the original building to furnish adequate training space for flight crews to support a launch rate of six spacecraft per year.

These training schedules are based on the fact that flight crews will arrive in the launch area to begin their preflight operations at approximately the same time the spacecraft arrives for checkout. During this pre-flight period of approximately three months, flight crew training must continue.

The first month of this period is required for fabrication and modification to configure the simulators to the specific spacecraft to be launched. During this period the flight crew's training will be continued by using the two part task trainers provided in the original facility. The second month the flight crew is trained in the configured simulators. During the final month of training, integrated training exercises with the configured simulators are held, involving flight crews, flight controllers at the Integrated Mission Control Center, and the world-wide tracking network.

Space is not available in the previously funded training facility for the two additional simulators necessary to train flight crews required for six spacecraft launches per year. This addition is required to maintain flight crew training in a unified facility, maintain an adequate training schedule, and provide the space required for the two simulators.

ESTIMATED FUTURE YEAR FUNDING: None

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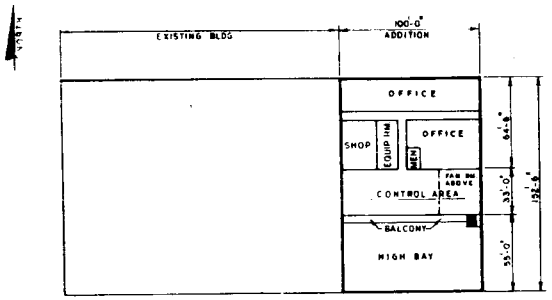
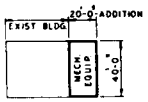
JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1966 ESTIMATES

ADDITION TO

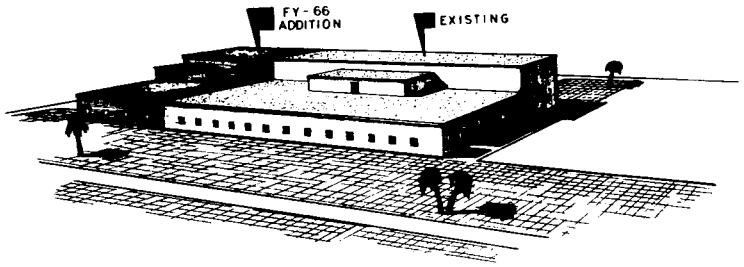
MANNED SPACECRAFT FLIGHT CREW TRAINING BUILDING



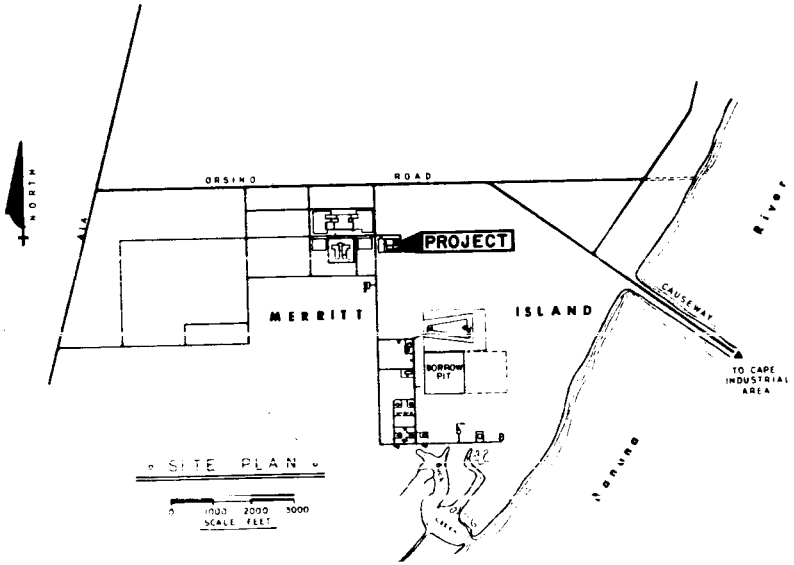


FLOOR PLANS

30 15 0 30 60
SCALE-FEET



PERSPECTIVE



SITE PLAN

0 1000 2000 3000
SCALE FEET

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center	Construction of Facilities	RF Systems Test Facility

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

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

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

COGNIZANT NASA INSTALLATION: John F. Kennedy Space Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	-
FY 1965 Estimate	69,000
FY 1966 Estimate	1,374,500
Total Funding Through FY 1966	$1,443,500

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--
Construction	--			$1,216,500
Building	SF	2000	85.30	170,600
Site Development	LS	--	875,500.00	875,500
Utilities	LS	--	170,400.00	170,400

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center	Construction of Facilities	RF Systems Test Facility

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment				$ 158,000
Positioning Equipment	LS	--	100,000	100,000
Intercommunication Systems	LS	--	38,000	38,000
Cable	LS	--	20,000	20,000
Design	--	--	--	--
Fallout Shelter	--	--	--	--
		TOTAL		$1,374,500

PROJECT DESCRIPTION:

This project provides for design and construction of a Manned Spacecraft RF Systems Test Facility, which will consist of a fixed tower and an addition to the existing Radar Boresight Range Control Building.

A flat, level area between the Control Building and fixed tower will be approximately 3,000 feet long, 500 feet wide at the Control Building, 150 feet wide at the fixed tower, and will have surface levelness not varying by more than ½ inch.

The fixed tower will be 50 feet high, 8 feet square, constructed of timber, and will accommodate positioning equipment for pointing the spacecraft (and radar) in any direction.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center	Construction of Facilities	RF Systems Test Facility

SUPPORTING DATA:

The addition to the Control Building will house the control and readout equipment required for the tests. The L-shaped addition will be of masonry construction, with a special rubberoid outer covering to provide proper reflective and absorbant qualities. The two-story facility will have a total gross area of approximately 2,000 square feet. The first floor will house a toilet, equipment room, and the air conditioning equipment. The second floor will house the control room.

The necessary site preparation, utilities and equipment to make this a usable facility are a part of this project.

PROJECT JUSTIFICATION:

The Apollo Command and Service Modules and Lunar Excursion Module (LEM) are equipped with a rendezvous radar (X-band) system which will guide the LEM to rendezvous with the Command Module.

It is required that the radar system antennae be precisely calibrated (boresighted) with the spacecraft. The boresight accuracy is required to be within $\pm$ 2 mils. To achieve this accuracy, calculations have determined that a boresight range of 3,000 feet is required for proper calibration of the X-band systems. The grassed surface between the control room and the tower cannot vary more than $\pm\frac{1}{2}$ inch for proper measurement of the antenna performance.

One other boresight range exists at Cape Kennedy for use in boresighting the Gemini spacecraft rendezvous radar. Because this radar operates in the L-band frequency region, the boresight range is 1,000 feet in length and, therefore, will not be suitable for the Apollo radar. Due to its orientation, buildings and main roads prevent its extension into a longer range. Consequently, the new range is planned in the area opposite the existing range.

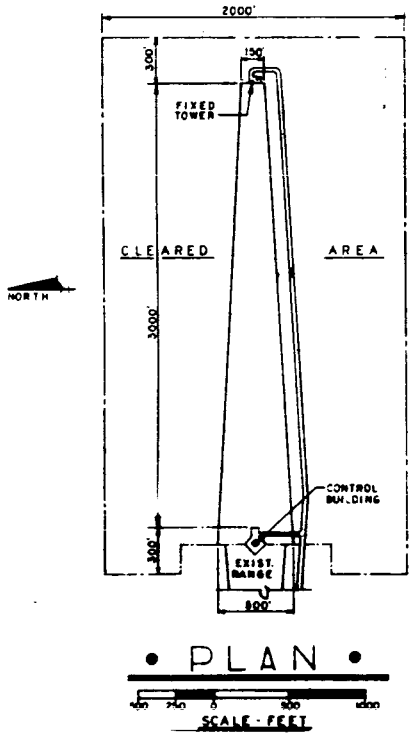
The boresighting of the radar system must be performed at Cape Kennedy and must be a part of the preflight checkout operations to prevent mis-alignment prior to flight.

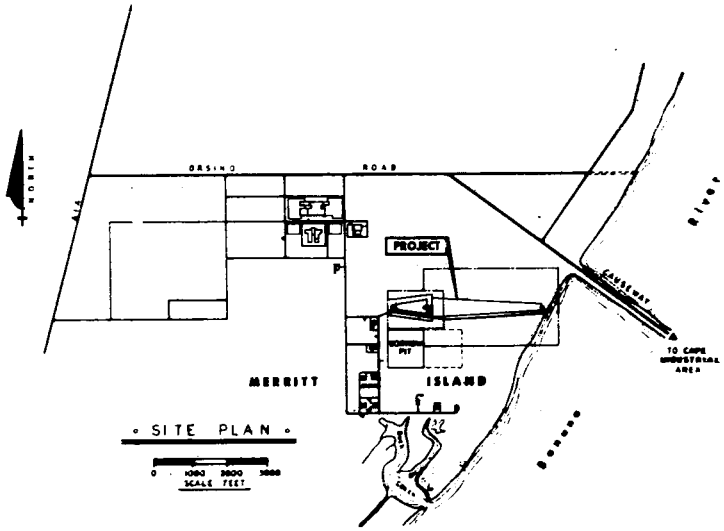
ESTIMATED FUTURE YEAR FUNDING: None

JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1966 ESTIMATES

MANNED SPACECRAFT RF SYSTEMS TEST FACILITY

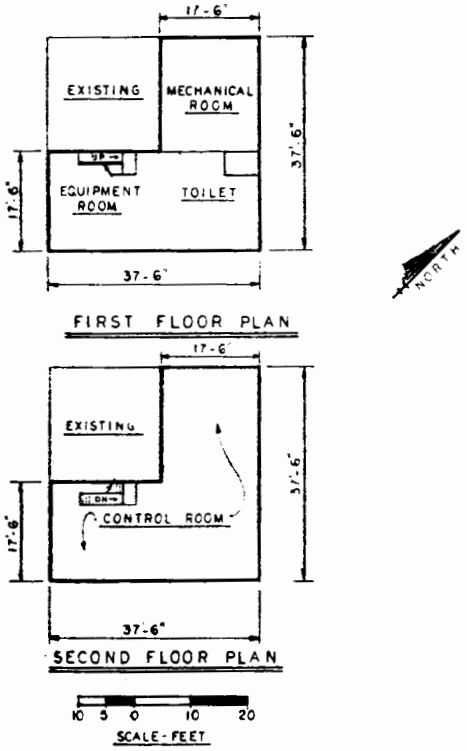


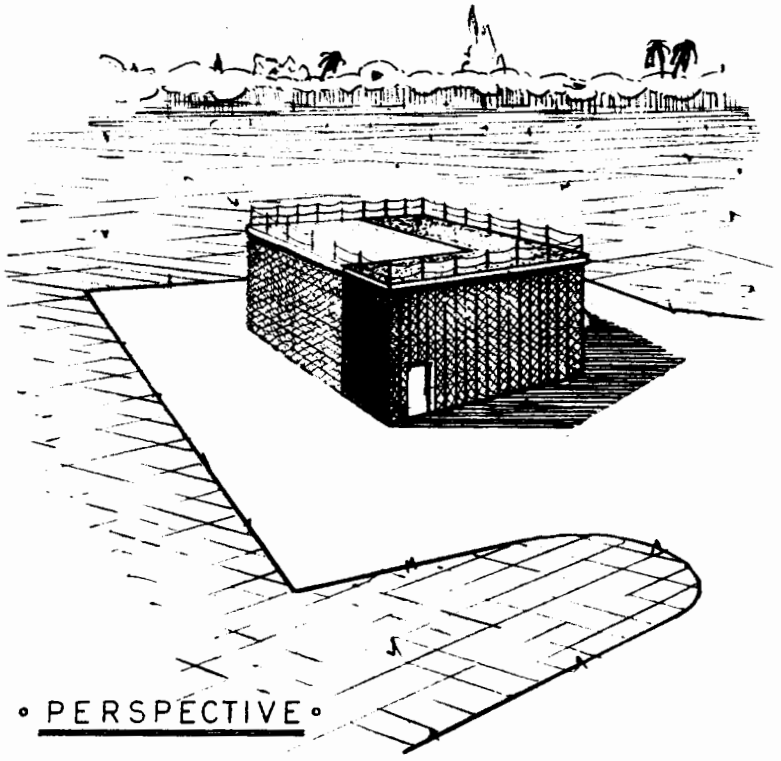


JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1966 ESTIMATES

MANNED SPACECRAFT RF SYSTEMS TEST FACILITY





NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center, NASA	Construction of Facilities	Addition to Dispensary

UPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

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

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

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

TYPE OF CONSTRUCTION PROJECT: Addition

FUNDING:

FY 1964 and Prior Years	$371,000
FY 1965 Estimate	19,400
FY 1966 Estimate	608,000
Total Funding Through FY 1966	$998,400

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$336,000
Building Addition	SF	8,650	33.65	291,000
Site Development	LS	---	---	27,000
Utilities	LS	---	---	18,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center, NASA	Construction of Facilities	Addition to Dispensary

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment				$272,000
Medical equipment	LS	---	---	262,000
Communications cabling	LS	---	---	10,000
Design	---	---	---	---
Fallout Shelter	---	---	---	---
		TOTAL		$608,000

PROJECT DESCRIPTION:

This project provides for an extension to the existing Merritt Island Dispensary, to house the essential facilities required for an occupational health center. The project will consist of minor modifications to the existing building and the construction of 8,650 square feet of additional office, laboratory and medical support space. The extension will be a one story masonry building. Additional utility connections and parking space for 30 cars will be provided.

PROJECT JUSTIFICATION:

An occupational health program represents management's recognition of its obligation to provide a safe working environment and optimum treatment of all job-related injuries and illnesses. The primary objective of the occupational health program is to monitor the overall work environment. This is accomplished through field analysis of physical, chemical, radiological, and bacteriological hazards. The hazards must be identified and controlled through surveillance, analysis, and education. This facility will provide the space and resources required to achieve this objective.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center, NASA	Construction of Facilities	Addition to Dispensary

SUPPORTING DATA:

Four basic activities must be accommodated - Industrial Hygiene Engineering, Radiation Control, Sanitary Engineering and Laboratory Support. Industrial Hygiene Engineering means surveillance of the work area. Such factors as noise, humidity, temperature, illumination and ventilation will be measured. Criteria for hazard acceptance will be prepared, and samples (vapor fumes, gases, dust) will be collected to identify and predict contamination. Radiation control pertains primarily to electromagnetic radiation. Specialized equipment will be provided to survey, monitor, analyze and predict radioactive hazards. Sanitary engineering provides for the surveillance of all water sources, purification methods, sanitary sewage processes and standards, evaluation of water requirements, and control of pollution, corrosion, and scale. All food service facilities must be inspected on a continuing basis.

Currently, there are no physical resources available to determine acceptable physiological tolerances for personnel working in hazardous environments. There are no facilities available to permit the development of medical standards required to achieve an effective evaluation of the overall working environment. There are no means available to gather the quantitative information necessary to make diagnoses, treat exposures, and develop health standards. Thus, an acceptable occupational health program cannot be undertaken without this facility.

ESTIMATED FUTURE YEAR FUNDING: None

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES
FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center, NASA	Construction of Facilities	Modifications to Launch Complex 17

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

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

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

LOCATION OF PROJECT: Cape Kennedy Air Force Station

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

TYPE OF CONSTRUCTION PROJECT: Alterations

FUNDING:

FY 1964 and Prior Years	$ 20,000
FY 1965 Estimate	57,000
FY 1966 Estimate	1,300,000
Total Funding Thru FY 1966	$1,377,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	-	-	-	-
Construction	-	-	-	-
Equipment	-	-	-	$1,300,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
John F. Kennedy Space Center, NASA	Construction of Facilities	Modifications to Launch Complex 17

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Operational Television Syst.	LS	-	233,000	$ 233,000
Second Stage Propellant Loading System	LS	-	1,026,000	1,026,000
Air-Conditioning for Environmental Encl.	LS	-	41,000	41,000
Design	-	-	-	-
Fallout Shelter	-	-	-	-
			TOTAL	$1,300,000

DESCRIPTION:

This project consists of the following additions and modifications:

a. Second-Stage propellant loading system.
b. Operational Television System on the gantry of pads 17A and 17B.
c. Air-Conditioning unit for environmental enclosures.

The second stage propellant loading system consists of two 1000 gallon storage tanks, one for the oxidizer (inhibited Red Fuming Nitric Acid) and one for the fuel (Unsymetrical Diemethyl Hydrazine) together with supply lines, valving, a remote console and flow measuring system.

The operational television system consists of:

a. Six 21" TV monitors
b. Two [illegible]" TV monitors
c. Twelve TV cameras with weather proof enclosures
d. Eight pan tilt systems
e. Eight zoomar systems
f. One central control console

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SUPPORTING DATA:

g. Interconnecting cables and fixtures, remote camera selector controls, and video transmission equipment required for a usable system.

The operational TV system will provide remote control from a central console located within the blockhouse with monitors within easy view of the Propulsion Console operator, the Test Conductor, the Launch Director, and Telemetry Tracker. Weather proof TV cameras located at each launcher will scan propellant servicing system lines and operations, view all vehicle and spacecraft umbilicals, and observe spacecraft third stage and TAD solid motor installation and operations. Two TV cameras having wide angle lens and explosion proof enclosures shall be mounted on existing mounts on each launch deck. Four TV cameras, having pan, tilt, and zoom lens features will be mounted on ground level near the corners of the apron of each launcher. Pictures from the launch deck and launcher apron cameras will be displayed on six 21" monitors located in the blockhouse. A selector switch will be provided to switch from the six TV cameras of Pad A or Pad B. Also, two stepping switches (remote controlled from Hangar AE) will be provided to step thru three TV cameras on each launcher for remote viewing on existing monitors in Hangar AE, Mission Control Center.

The environmental enclosure air-conditioning provides a 40 ton air-conditioning unit and connections to existing ducts to supply conditioned air to the environmental enclosure surrounding the second stage and spacecraft levels of each gantry. Air-conditioned environmental enclosures provide contamination protection for the Delta space launch vehicle guidance and control area and to the spacecraft area.

JUSTIFICATION:

The second stage propellant loading system is required to replace the present system of trailer supply which is manual and of insufficient capacity (600 gallons) for the Improved Delta. This system will provide accurate remote controlled propellant transfer in a safe efficient manner.

The operational television system will supplement the present system installed in 1956 to support the single stage Thor missile tests and is presently inadequate for multistage vehicle and spacecraft operations. This system provides a means of visual monitoring for overall flight readiness and is the only means of viewing strategic areas of the vehicle and launcher during fueling and terminal countdown. This system will permit interested personnel to view the

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SUPPORTING DATA:

operations from a safe distance, alieving congestion on the launch pad and decreasing the number of people exposed during hazardous operations.

The air-conditioning unit for environmental enclosures is required to provide a controlled environment for the upper levels of the gantries where spacecraft and vehicle guidance checkout are performed. Sensitive GSE for spacecraft are located on these levels and need protection. This equipment must be operational ready by June 1966. This environmental control is now being provided on a limited non-interference basis by borrowed AFETR equipment. AFETR will not commit continued support.

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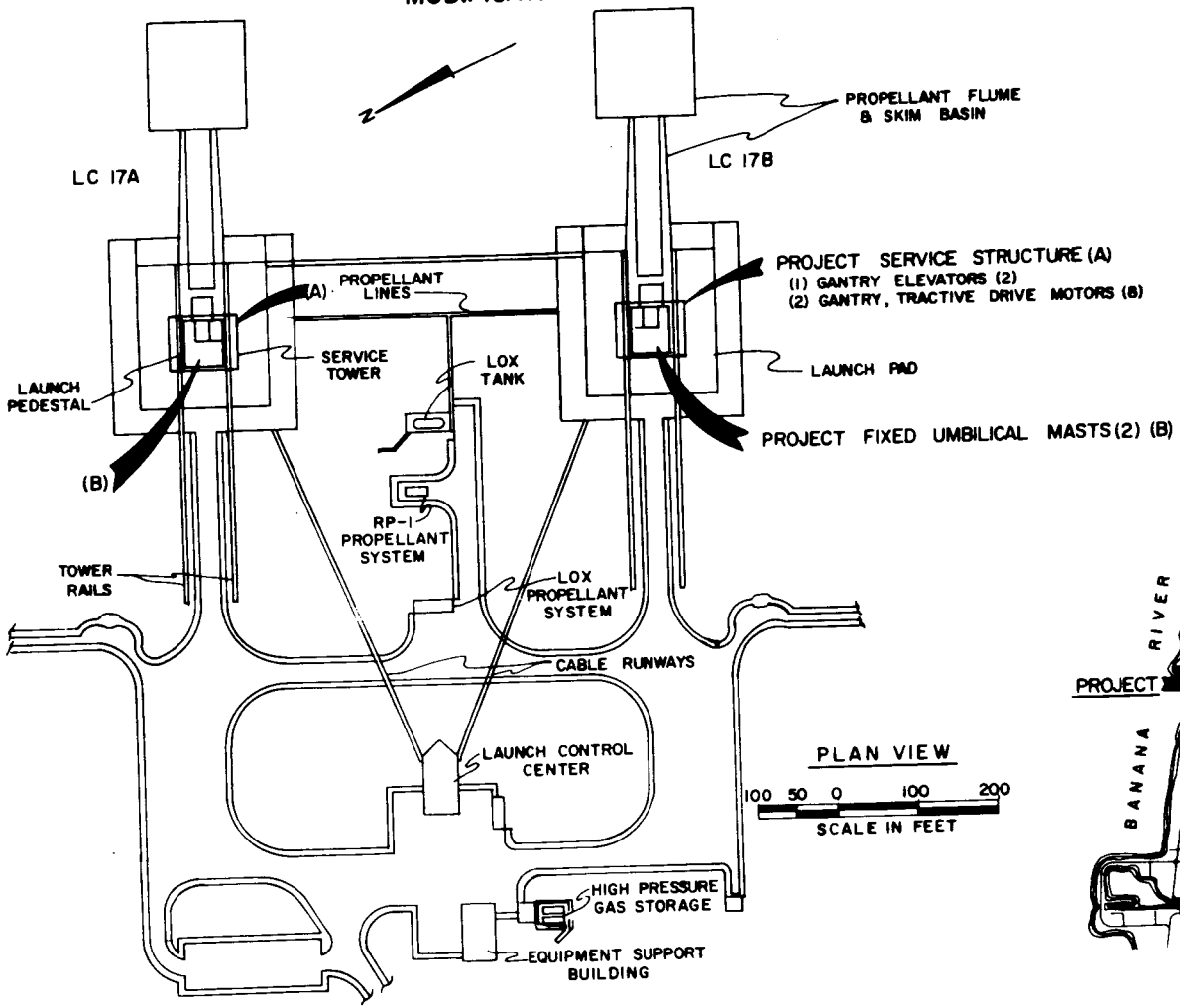
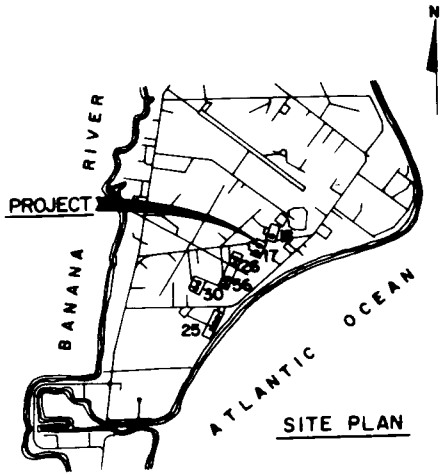
JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1965 ESTIMATES

MODIFICATIONS TO LAUNCH COMPLEX NO. 17





NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

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

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 and conduct of astronaut training.

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL *(End of Year)*	4,272	4,811	5,796
CONTRACTOR & OTHER PERSONNEL	1,519	2,907	3,544
TOTAL ALL PERSONNEL	5,791	7,718	9,340

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	1,600	
LAND *(Lease or Permit)*	477	
PLANT VALUE *(as of June 30, 1964)*		131,045
TOTAL	2,077	131,045

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1964 AND PRIOR YEARS	FY 1965 *(Estimated)*	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Center Support Facilities	MSF	5,557.0	1,843.0	3,489.2	0	10,889.2
Modifications to the Environmental Testing Laboratory	MSF	30,372.0	8,938.0	3,115.9	0	42,425.9
Spacecraft Instrumentation Evaluation Facility	MSF	37.5	96.5	2,611.5	0	2,745.5
Anechoic Chamber Test Facility	MSF	3,592.6	41.0	742.2	0	4,375.8
TOTAL FOR PROJECTS IN FY 1966 ESTIMATE				9,958.8		

NASA FORM 1029 DEC 63

GPO 870-099

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Center Support Facilities

SUPPORTING DATA:

PROGRAM DIRECTOR FOR THE INSTALLATION: Office of Manned Space Flight.

PROGRAM DIRECTOR FOR THE PROJECT: Office of Manned Space Flight.

AUTHORIZATION LINE ITEM: Manned Spacecraft Center.

LOCATION OF PROJECT: Clear Lake, Harris County, Texas.

COGNIZANT NASA INSTALLATION: Manned Spacecraft Center.

TYPE OF CONSTRUCTION PROJECT: New.

FUNDING:

FY 1964 and Prior Years	$ 5,557,000
FY 1965 Estimate	1,843,000
FY 1966 Estimate	3,489,200
Total Funding Through FY 1966	$10,889,200

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--		--	

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Center Support Facilities

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Construction				$2,575,400
Maintenance Office Building	SF	16,905	25.87	437,300
Warehouse	SF	60,876	16.10	980,100
Central Heating and Cooling	SF	4,100	22.63	92,800
Utilities	LS	--	225,000	225,000
Site Preparation	LS	--	840,200	840,200
Equipment				913,800
Central Heating and Cooling Plant Equipment	LS	--	913,800	913,800
Design	--	--	--	--
Fallout Shelter	--	--	--	--
		TOTAL		$3,489,200

PROJECT DESCRIPTION:

This project will provide for the required supporting facilities for the planned Fiscal Year 1966 Construction of Facilities Program.

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NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJEC
Manned Spacecraft Center	Construction of Facilities	Center Support Facilities

SUPPORTING DATA:

Central Heating and Cooling Plant Extension - This extension will include expansion of the central heating and cooling plant structure, incorporation of one 60,000 pound/hour steam boiler and one 2,000 ton centrifugal refrigeration unit, including all related equipment such as cooling towers, operating and safety controls and piping. Also, the existing central mechanical control system will be expanded. This facility will provide an additional gross area of approximately 4,100 square feet.

Warehouse - This facility will provide for the construction of 60,876 square feet of warehouse space. The building will be a single story high-bay structure 20 feet high, constructed of steel frame and precast concrete wall panels. Included in the facility will be a 32,000 square foot humidity-controlled area which will be supplied with heating and air-conditioning from a self-contained unit. The remainder of the building will be provided with ceiling mounted heating and ventilating units.

Maintenance Office - This facility will provide office space for maintenance and operations contractor personnel. The building will be a single story steel frame structure with dimensions of 105 feet by 161 feet and an area of 16,905 square feet. Heating and air-conditioning will be supplied by a central self contained unit. A parking area for 45 vehicles will also be provided.

Secondary Roads and Parking Areas - These facilities will include 4.5 miles of secondary road and parking areas for 297 vehicles. The roads to be constructed are Avenues A, C and E and First Street, as shown on the attached site plan. The roads and parking areas will be constructed of asphaltic concrete except Avenue A which will be gravel surfaced.

Electrical Substation Addition - This addition provides for the installation of two new electrical feeders and the extension of electrical ducts from Avenue B to the new sections being added to the switchgear complex.

PROJECT JUSTIFICATION:

Central Heating and Cooling Plant Extension - Evaluation of the Central Heating and Cooling Plant indicates that insufficient capacity exists to provide steam and chilled water to the planned Fiscal Year 1966 facilities. Existing facilities authorized by the Fiscal Years 1962, 1963, 1964 and 1965 programs included the installation

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of five 60,000 pounds per hour steam boilers and seven 2,000 ton centrifugal regrigeration compressors and chillers. An additional 60,000 pound per hour steam boiler and one additional 2,000 ton centrifugal refrigeration unit will be required to accommodate the additional loads introduced by the FY 66 CofF facilities.

Maintenance Office - The Fiscal Year 1962 CofF program provided a Support Office Building (No. 419) for housing the Logistics Division and the Maintenance and Operations Service contractor. This facility was provided to satisfy the initial service contractors housing requirement. It was planned that additional facilities would be provided as the MSC construction program progressed and the service contractors' personnel staffing neared its peak. The Logistics Division has now increased to 80 personnel and occupies the Buidling No. 419 in its entirety. The Maintenance and Operations Contractor, who now has an office staff of 35, is presently housed in temporary quarters (portable buildings). The Maintenance and Operations staff, which requires office space, will increase to 90 (10 NASA and 90 contractor) by June 1967. Therefore, since maintenance of the Clear Lake facilities will be a continuing requirement, it is in the best interests of the Government to provide permanent facilities for this activity. The use of trailers for 90 personnel is both uneconomical and inefficient.

Warehouse - FY 62 and FY 65 CofF programs provided a combined total of 52,098 square feet of warehouse space at the Clear Lake site. This space is not adequate for receiving, storing and issuing supplies required by the engineering and administrative activities of the Manned Spacecraft Center. The FY 66 CofF facility will provide an additional 60,876 square feet required to supplement existing space. The humidity controlled area is required for storage of delicately precisioned mission-oriented spares to assure proper maintenance and dependability. By June 1967, approximately 70,000 individual line items will be handled in support of the MSC testing program. These 70,000 items will require approximately 98,000 square feet of storage area. The balance of warehouse space is required for storage of items such as furniture and supplies.

Roads and Parking - This item represents the secondary road network required to provide better accessibility to the FY 66 facilities, as well as better ingress and egress to and from the Clear Lake site, in accordance with the approved Manned Spacecraft Center Master Plan. A gravel surfaced Avenue A is needed to permit surveillance and the unpopulated portion of the site. The present 3,245 parking spaces made available through the FY 65 CofF program must be expanded by 297 in order to accommodate the 7,200 NASA and Contractor personnel, and the more than 200 visitors per day projected to be on-site by June 1967. Based on an on-site requirement of

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

SUPPORTING DATA:

7,400 personnel and visitors, and by using a ratio of one space for every two people, the parking facilities must be increased by a minimum of 297 spaces.

Electrical Substation Addition - Electrical feeders now serving the central building complex are operating at maximum capacity. Therefore, an addition to the electrical substation must be completed by the second quarter of Calendar Year 1966 to accommodate construction of Building 17 in this Construction of Facilities Program.

ESTIMATED FUTURE YEAR FUNDING: None

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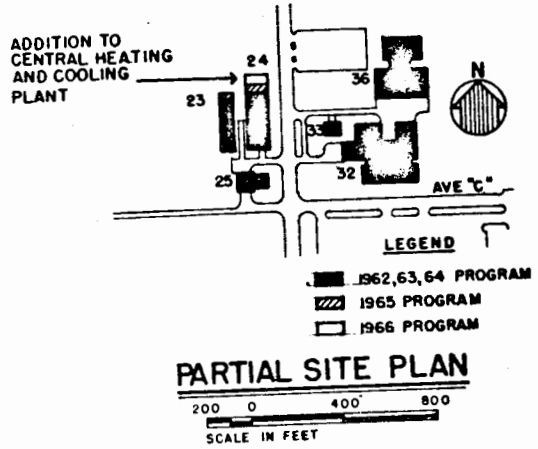
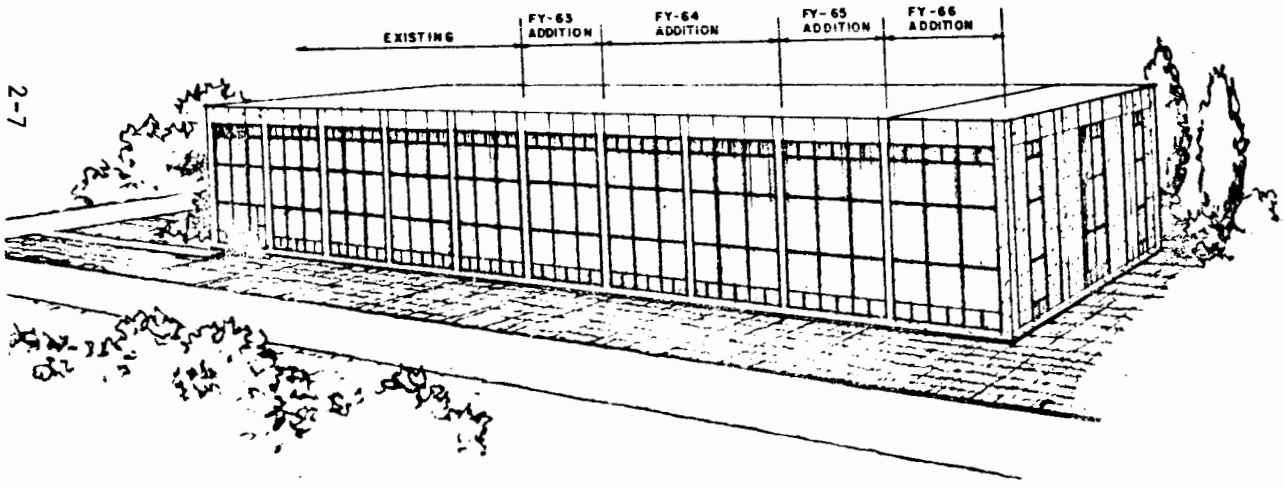
MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

CENTER SUPPORT FACILITIES



PARTIAL SITE PLAN

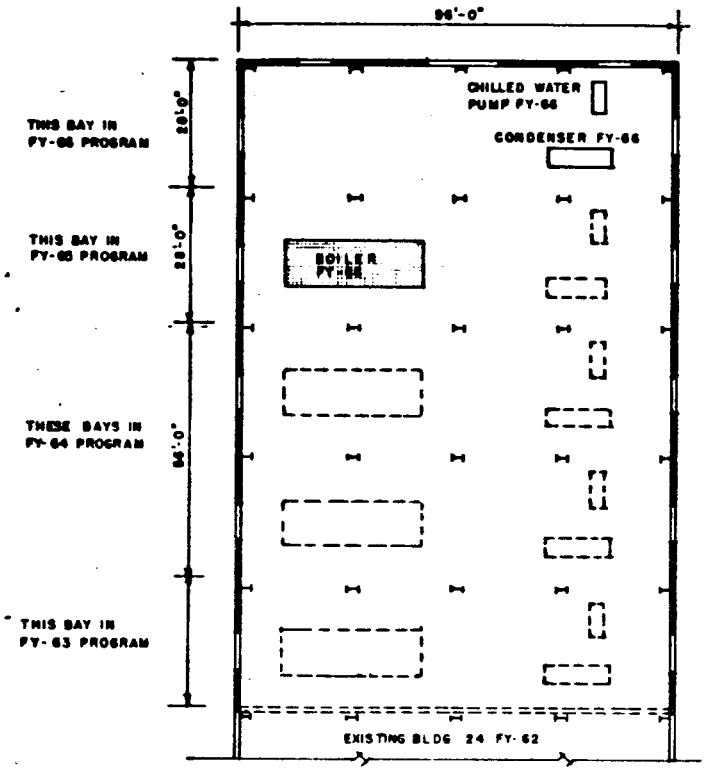


PERSPECTIVE

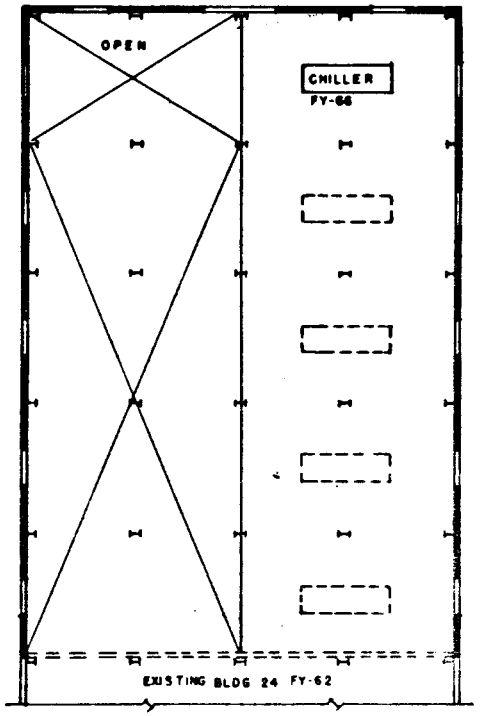
MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

CENTER SUPPORT FACILITIES



FIRST FLOOR PLAN



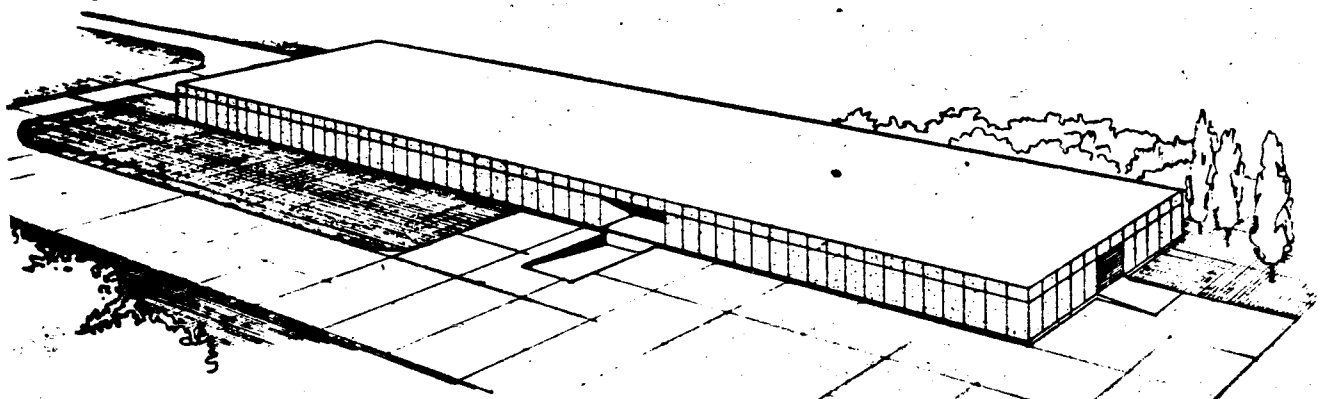
SECOND FLOOR PLAN

ADDITION TO CENTRAL HEATING AND COOLING PLANT- PLANS

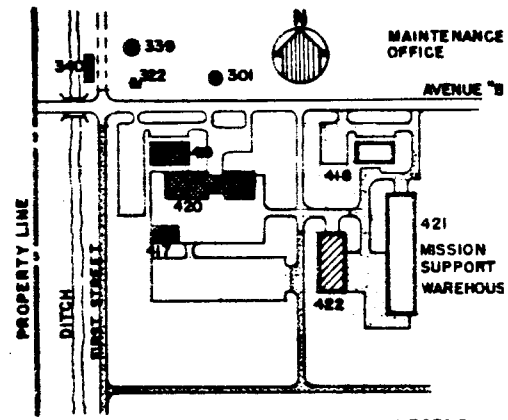
MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

CENTER SUPPORT FACILITIES



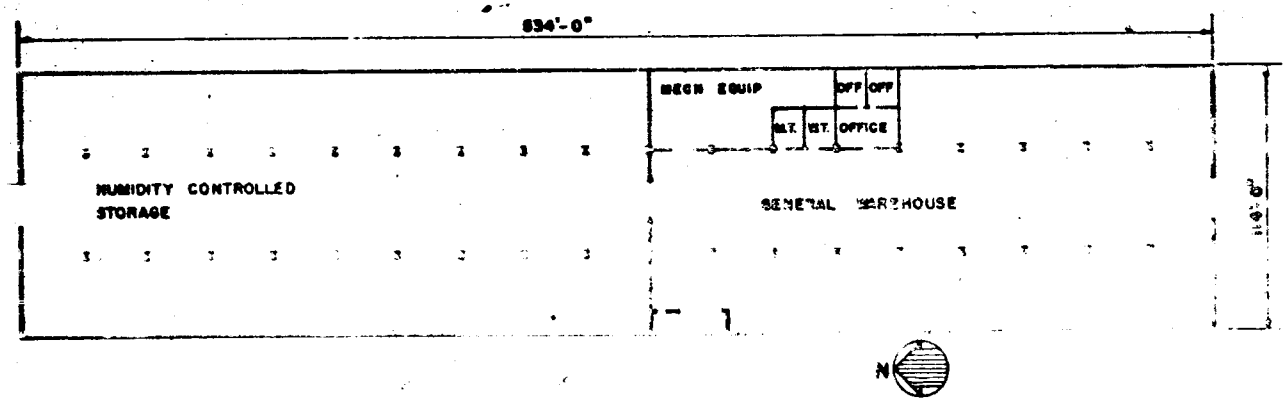
PERSPECTIVE



PARTIAL SITE PLAN

200 0 400 800
SCALE IN FEET

LEGEND
1962 PROGR
1965 PROGR
1966 PROGR

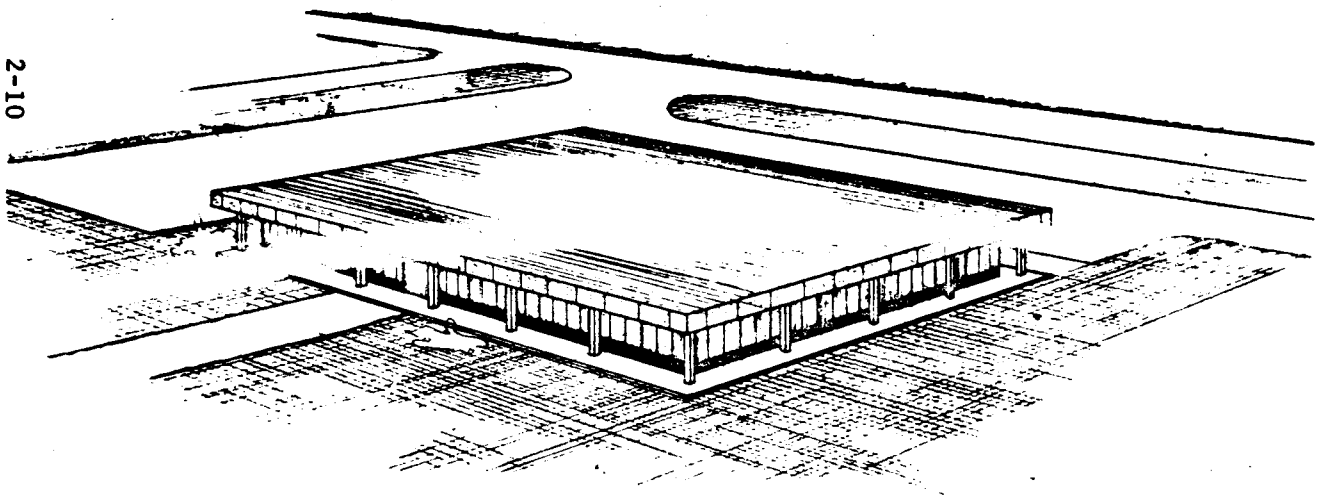


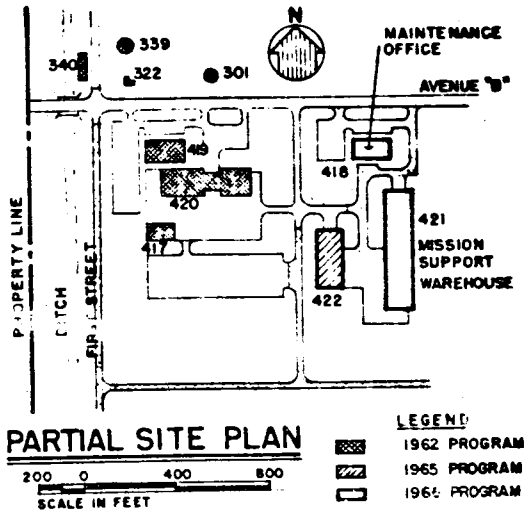
20 0 40 80
SCALE IN FEET

MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

CENTER SUPPORT. FACILITIES





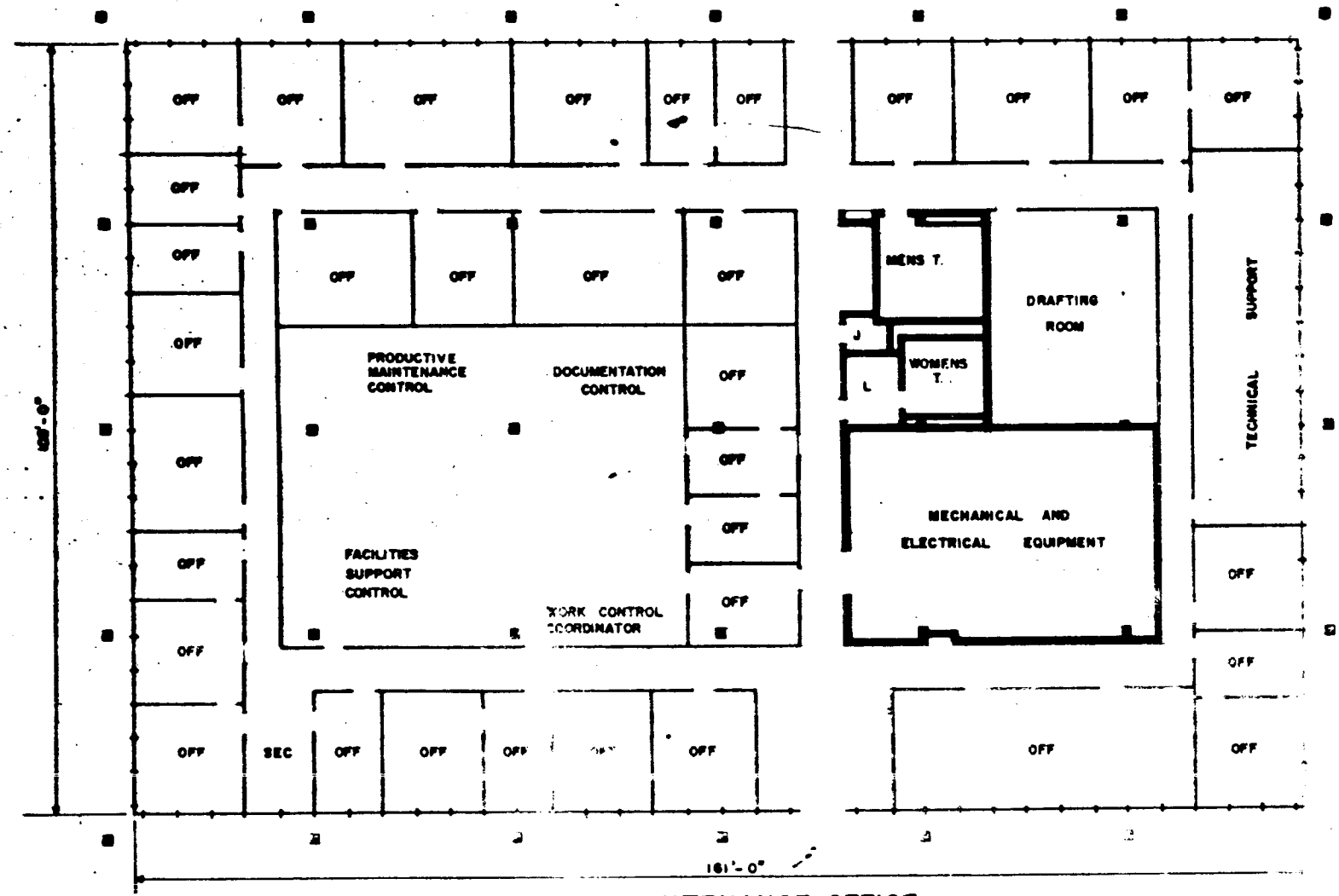
PARTIAL SITE PLAN

PERSPECTIVE
MAINTENANCE OFFICE

MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

CENTER SUPPORT FACILITIES



PLAN-MAINTENANCE OFFICE

5 0 10 20

SCALE IN FEET

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Alterations to the Environmental Testing Laboratory

SUPPORTING DATA:

PROGRAM DIRECTOR FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM DIRECTOR FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Manned Spacecraft Center

LOCATION OF PROJECT: Clear Lake, Harris County, Texas

COGNIZANT NASA INSTALLATION: Manned Spacecraft Center

TYPE OF CONSTRUCTION PROJECT: Alteration

FUNDING:

FY 1964 and Prior Years	$30,372,000
FY 1965 Estimate	8,938,000
FY 1966 Estimate	3,115,900
Total Funding Through FY 1966	$42,425,900

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$ 317,900
Building	SF	6,075	28.64	174,000
Site Preparation	LS	---	3,900	3,900
Additional air conditioning	LS	---	---	140,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Modifications to the Environmental Testing Laboratory

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment				$2,798,000
Data Acquisition Systems	LS	---	350,000	350,000
Vacuum Chamber Systems	LS	---	2,448,000	2,448,000
Design	---	---	---	---
Fallout Shelter	---	---	---	---
			TOTAL	$3,115,900

PROJECT DESCRIPTION:

This project will provide an increase in the test data acquisition and simulation capability and reliability of the two vacuum chambers in the Environmental Testing Laboratory, Building No. 32. A hard line data link system will be constructed from the Environmental Testing Laboratory to the IMCC, the Central Data Facility, and the Vibration and Acoustic Test Facility. A closed loop orbital simulator will be installed in the existing facility for computer programming the temperature intensities and positions of the solar simulation systems and the lunar plane. Also, to accommodate improvements to the vacuum pumping system, the area of the Pump Equipment Wing will be increased by approximately 2,790 square feet and the Refrigeration Equipment will be increased by approximately 3,285 square feet. These additions will be standard steel frame structures with aluminum panel siding. The combined area of the additions will be approximately 6,075 square feet.

Other modifications to the Environmental Testing Laboratory will include the addition of a gas leak detection system, a 40,000 foothold mode, a hot gaseous nitrogen recirculation system, expansion of the air conditioning and the cooling water system, and an increase in the number of chamber penetrations.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Modifications to the Environmental Testing Laboratory

SUPPORTING DATA:

PROJECT JUSTIFICATION:

It is required that data links be added between the Environmental Testing Laboratory and the IMCC. This will enable a complete mission simulation controlled by the flight controllers located in the IMCC. Real time data reduction for the simulated missions is required to enable on-the-spot decisions to be made during the simulated flight. The data link between the Environmental Testing Laboratory and the Central Data Facility will provide for real time data reduction. The Environmental Testing Laboratory has the only set of Automatic Checkout Equipment (ACE) at MSC. To fully utilize the ACE, it is proposed to link it with the Vibration and Acoustic Test Laboratory so that the tests being conducted in that facility can be programmed with the ACE equipment.

During a simulated mission, the intensity of the sun and the orientation of the spacecraft with respect to the sun are variables. The proposed close loop orbital simulator will enable the intensity of the solar simulators to be varied and the lunar plane to be automatically controlled to achieve the required variations simulating the sun and spacecraft orientation. If this is not provided, a very tedious and uncertain manual procedure will be required which will degrade the test results.

Additional vacuum pumping is required to decrease the vacuum pumpdown in the chamber from 12 hours to 4 hours. This is required because it is not possible at this time to have an astronaut enter the chamber just prior to commencement of the test due to lack of proper space suit systems. For this reason, the astronaut must be confined in the spacecraft from the start of vacuum pumping. A four-hour confinement in the spacecraft is considered to be tolerable but a 12-hour confinement prior to the actual test will degrade test results due to astronaut fatigue.

As presently designed, the vacuum pump down cycle is computer programmed and the instrumentation is such that the chamber simulates a flight from atmospheric pressure to space vacuum without a stop. It is now determined that to provide for the safety of the astronauts, the chamber vacuum pumping should be programmed to hold for a period of time at the 40,000 foot level. This will enable the integrity of the chamber, equipments, and all instrumentation to be checked prior to proceeding to the hard vacuum (10^{-6} mmHg) region.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Modifications to the Environmental Testing Laboratory

SUPPORTING DATA:

In the large vacuum chambers, one of the major problems encountered is that of vacuum leaks. The manual detection of these leaks, which is required at this time, will be time consuming and will present a great potential delay to the efficient utilization of the chambers. It is possible to detect these leaks by an automatic system, and it is proposed that this automatic leak detection equipment be provided.

Other modifications to the chambers are required to provide for greater safety of the astronauts during manned operations and for improving the operating efficiency of the chambers.

ESTIMATED FUTURE YEAR FUNDING: None

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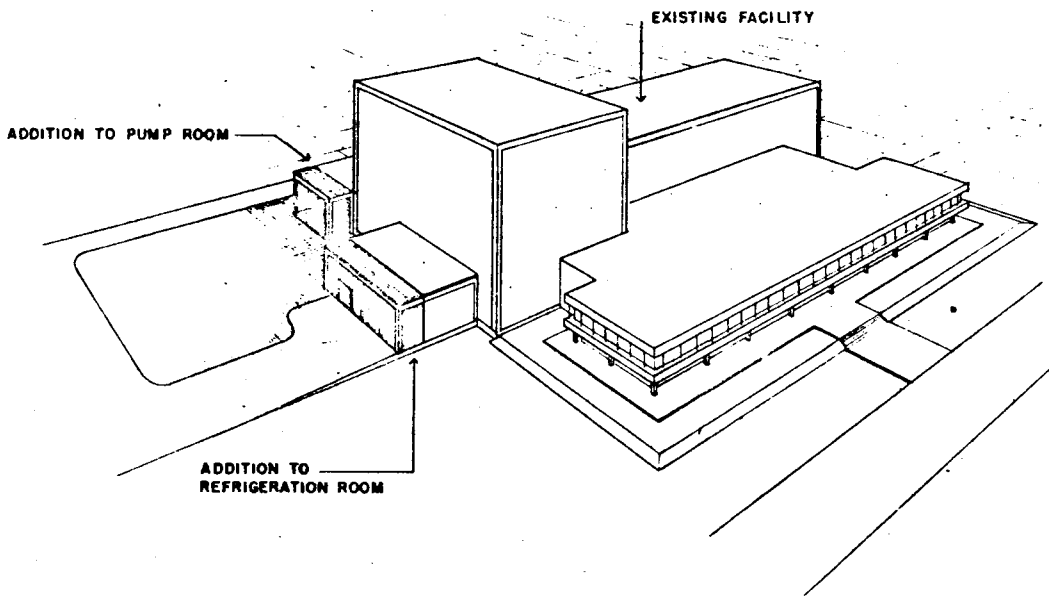
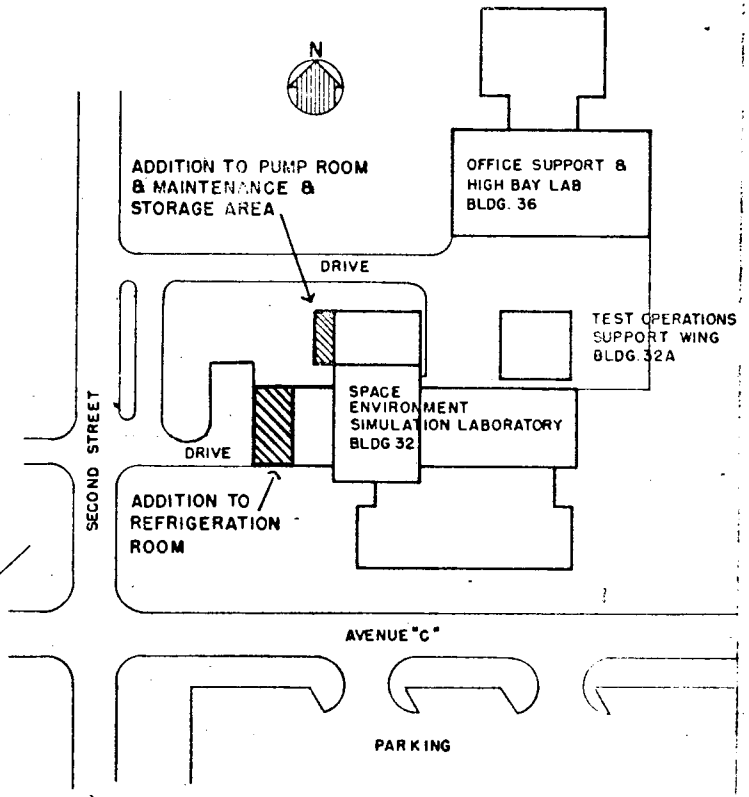
MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

MODIFICATIONS TO THE EVIRONMENTAL TESTING LABORATORY



PERSPECTIVE



PARTIAL SITE PLAN

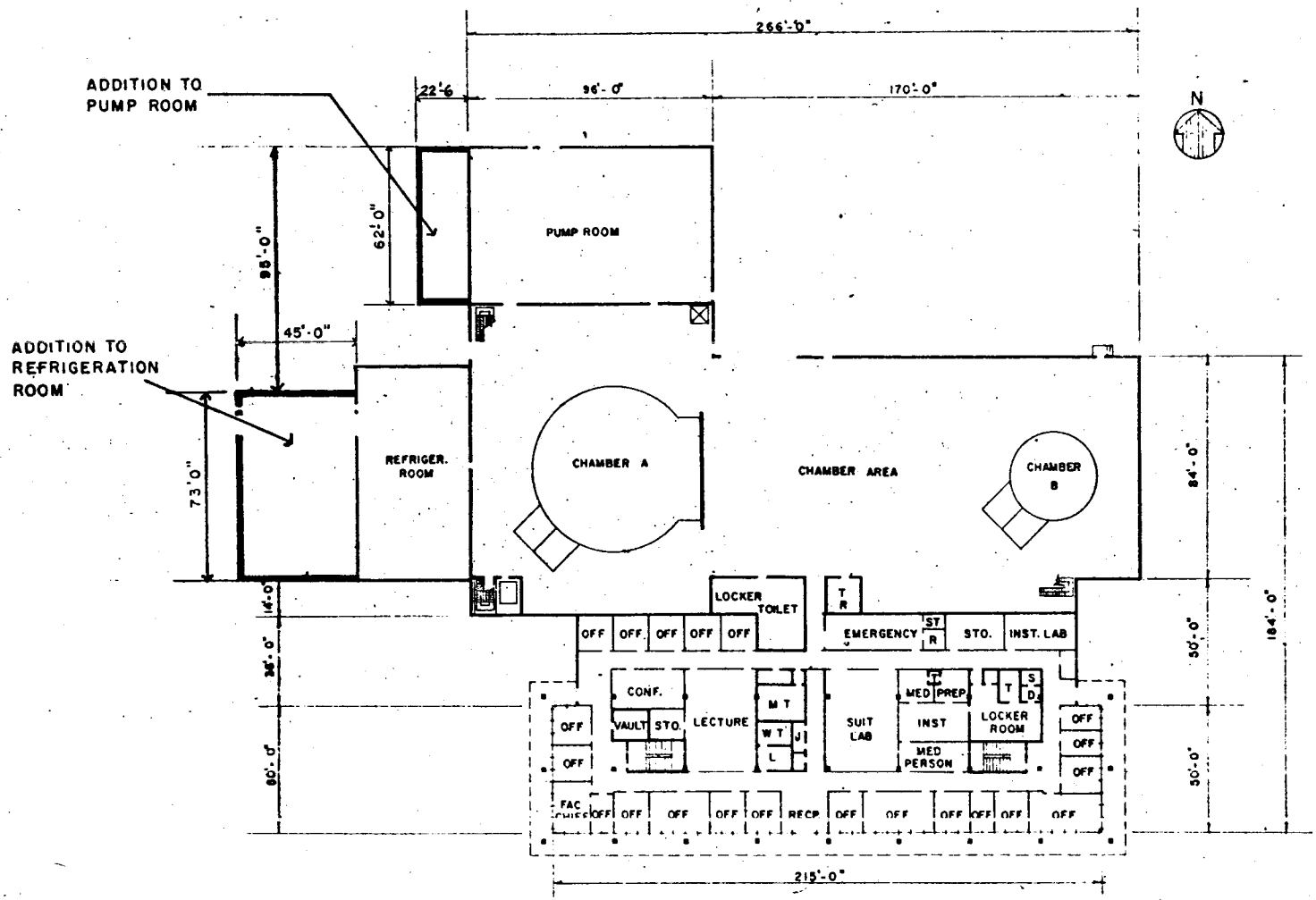
50 0 100 200

SCALE IN FEET

MANNED SPAC RAFT CENTER

FISCAL YEAR 1966 ESTIMATES

MODIFICATIONS TO THE ENVIRONMENTAL TESTING LABORATORY

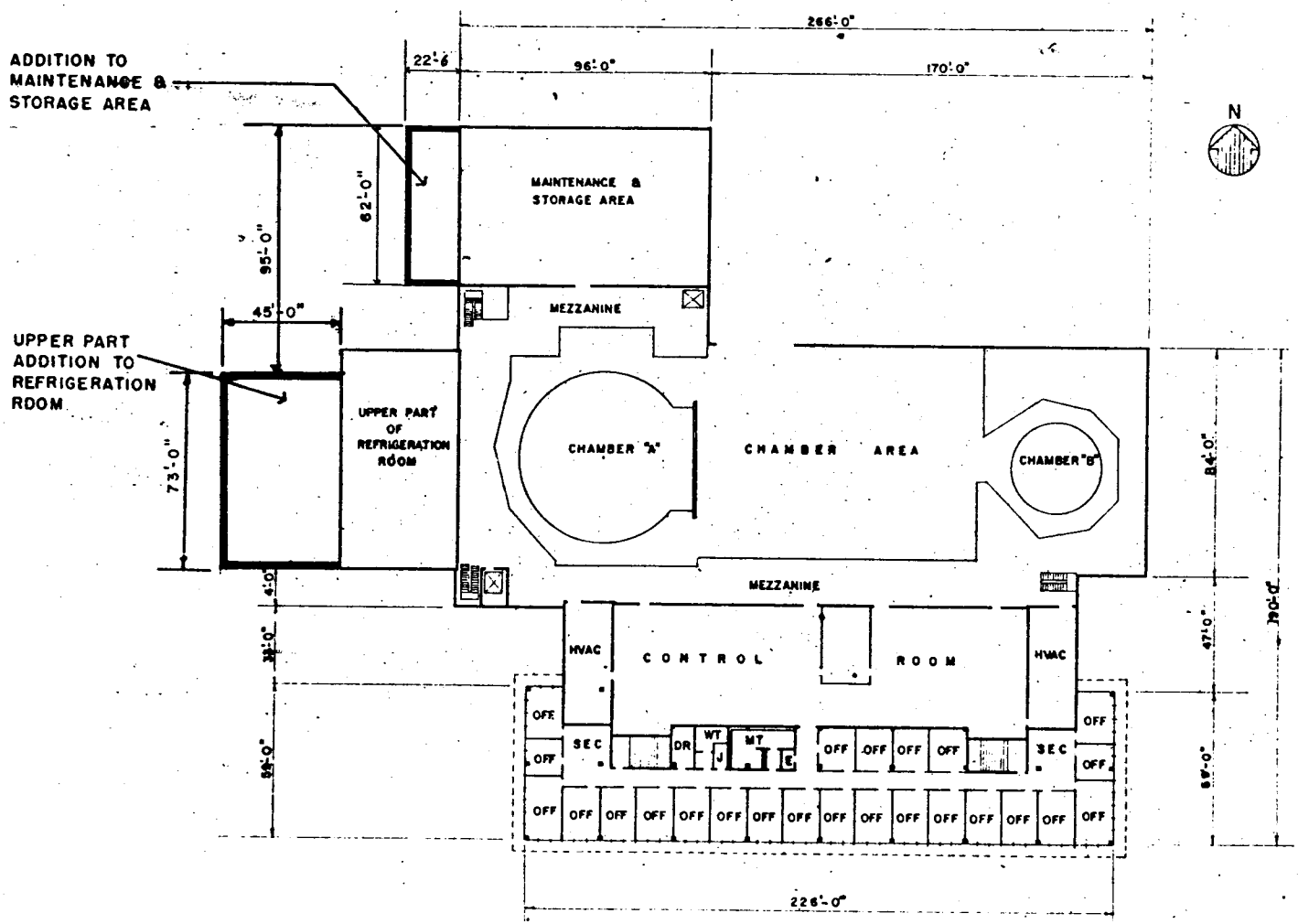


FIRST FLOOR PLAN

MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

MODIFICATIONS TO THE ENVIRONMENTAL TESTING LABORATORY



SECOND FLOOR PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Spacecraft Instrumentation Evaluation Facility

SUPPORTING DATA:

PROGRAM DIRECTOR FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM DIRECTOR FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Manned Spacecraft Center

LOCATION OF PROJECT: Clear Lake, Harris County, Texas

COGNIZANT NASA INSTALLATION: Manned Spacecraft Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ 37,500
FY 1965 Estimate	96,500
FY 1966 Estimate	2,611,500
Total Funding Through FY 1966	$2,745,500

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Spacecraft Instrumentation Evaluation Facility

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Construction				$1,786,500
Building	SF	53,470	31.48	1,683,000
Site Preparation	LS	--	44,600	44,600
Utilities	LS	--	58,900	58,900
Equipment	LS	--	825,000	825,000
Design	--	--	--	--
			TOTAL	$2,611,500

PROJECT DESCRIPTION:

This facility will be a two-story integrated office-laboratory building in which the design, development, testing, and evaluation of electronic and optical instrumentation components and instrumentation systems in support of the Apollo mission will be accomplished. It will provide office-laboratory area for a staff of approximately 200 people consisting of approximately 80 NASA and 120 contractor personnel. The building will be of standard steel frame construction with precast concrete panels. It will have first-floor dimensions of approximately 133 by 161 feet and second-floor dimensions of approximately 143 by 171 feet; a connecting wing with dimensions of approximately 28 by 58 feet and a 30-foot high-bay laboratory with dimensions of approximately 52 by 115 feet, with a gross area of approximately 53,470 square feet. The Central Heating and Cooling Plant will supply chilled and hot water for the air conditioning and heating system of the facility. Also included are parking facilities to accommodate 104 vehicles.

Development and validation testing will be conducted on spacecraft tracking transponders, optical displays, spacecraft photographic and video processing equipment, microminiaturized electronic components, optical

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

SUPPORTING DATA:

and millimeter wavelength communications equipment, advanced data systems components, vibration and acoustic measurement instrumentation, and extra-vehicular instrumentation equipment. The laboratory space will include special provisions such as a thermally controlled test area for work with infrared and optical instrumentation systems, ultra-clean area for assembly and testing precision instrumentation, and shielded areas for work with radio-frequency components.

PROJECT JUSTIFICATION:

This facility is required to support the Apollo program in the development, fabrication, and evaluation of spacecraft electronic and optical instrumentation components and systems. The North American Aviation Corporation and Grumman Aircraft Engineering Corporation are the prime contractors presently performing these tasks for the major portions of the Apollo program. The Manned Spacecraft Center manages these contracts and also participates in independent test and evaluation of the components and systems being supplied by the contractors to assure conformance with specifications, and compatibility with other spacecraft components and systems.

The proposed facility is required to provide the office and laboratory space for the personnel responsible for the design, development, integration, test, and evaluation of such instrumentation systems as sensors, signal conditioning, transmitters, and tracking beacons which are supplied to the contractors for the early R&D Command/Service Module and Lunar Excursion Module flights. The Center is also responsible for hardware and systems for the later operational flights including the extra-vehicular astronaut suit communication systems, the spacecraft television systems, and the spacecraft camera systems.

An existing building (#15) is being used for the accomplishment of the work related to the early R&D flights. However, the space is overcrowded since it was designed to accommodate 164 personnel instead of the 327 which is its present occupancy. In addition to the above requirements, it is necessary that all the instruments in use at the Manned Spacecraft Center be calibrated.

ESTIMATED FUTURE YEAR FUNDING: None

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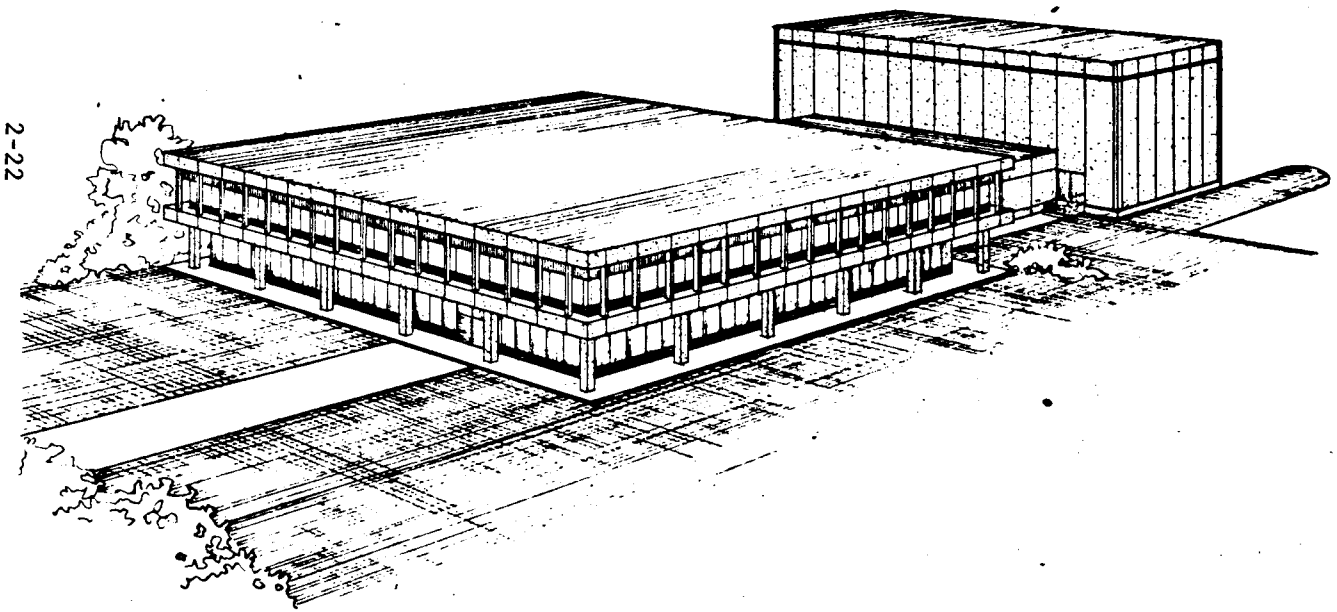
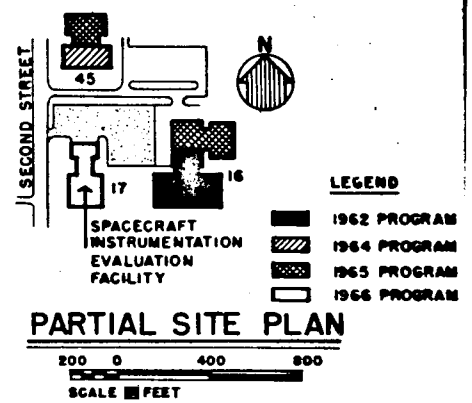
MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

SPACECRAFT INSTRUMENTATION EVALUATION FACILITY



PERSPECTIVE

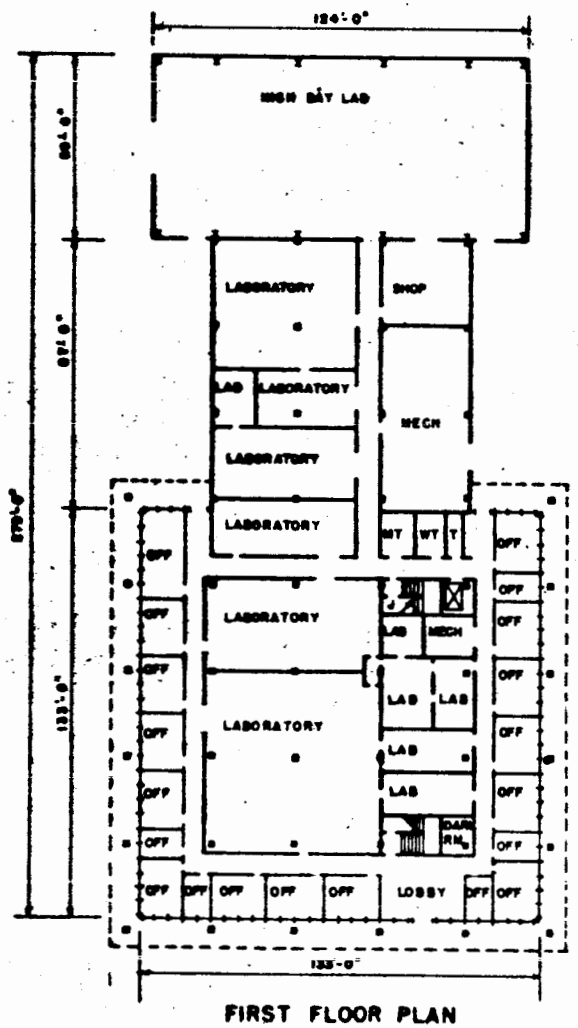


PARTIAL SITE PLAN

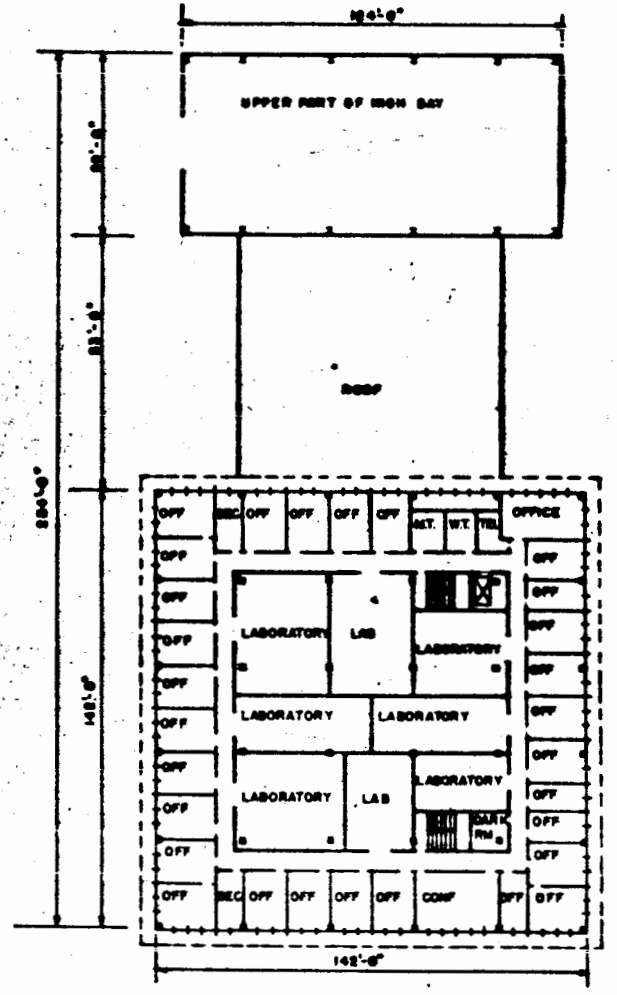
MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

SPACECRAFT INSTRUMENTATION EVALUATION FACILITY



FIRST FLOOR PLAN



SECOND FLOOR PLAN

PLANS

SCALE IN FEET

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Anechoic Chamber Test Facility Addition

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight.

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight.

AUTHORIZATION LINE ITEM: Manned Spacecraft Center.

LOCATION OF PROJECT: Clear Lake, Harris County, Texas.

COGNIZANT NASA INSTALLATION: Manned Spacecraft Center.

TYPE OF CONSTRUCTION PROJECT: Addition

FUNDING:

FY 1964 and Prior Years	$3,592,600
FY 1965 Estimate	41,000
FY 1966 Estimate	742,200
Total Funding Through FY 1966	$4,375,800

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	-	-	-	-
Construction				$607,200
Building	SF	19,385	31.32	607,200

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Anechoic Chamber Test Facility Addition

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment	LS	-	-	$135,000
Design	-	-	-	-
Fallout Shelter	-	-	-	-
			TOTAL	$742,200

PROJECT DESCRIPTION:

This project provides for a two-story integrated office-laboratory extension to the Anechoic Chamber Test Facility (Building No. 14). The structure will be standard steel frame with precast concrete wall panels. It will have first floor dimensions of approximately 28 feet by 161 feet and second floor dimensions of approximately 87 feet by 171 feet. The total gross area will be approximately 19,385 square feet. All utilities will be extended from the existing structure.

PROJECT JUSTIFICATION:

This extension is required to provide the necessary office and laboratory space for additional NASA and contractor personnel employed in the development and evaluation of contractor manufactured items relative to manned spacecraft antennas, RF and microwave equipment and materials, electromagnetic and radio frequency interference, dielectric and radome materials, and advanced optical communications systems (including optical radar being developed by MIT for possible use in the Apollo Spacecraft). The tasks include conducting radio frequency interference tests in which all equipment in the Apollo Spacecraft are turned on and the results of interference on each system observed and corrected. Also, the spacecraft antennas must be evaluated as single units as well as an integrated system to determine antenna patterns, antenna gains, antenna voltage, and standing wave ratio and propagation characteristics. The spacecraft communication systems and components including telemetry transmitters, multiplexes command receivers, C-Band

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SUPPORTING DATA:

beacons, power dividers, phase shifters, and recovery beacons will all be evaluated from very high frequencies through microwave frequencies under full scale "free-space" simulation. All these tasks must be performed under the most realistic conditions possible to assure proper operation.

The existing Anechoic Chamber Building was originally included as part of the Fiscal Year 1964 CofF Launch Environment and Antenna Test Facility project which also provided for a vibration laboratory and an acoustic laboratory. Subsequent to the FY 64 budget submission and following an engineering study, the anechoic chamber was separated from the balance of the building since it was concluded that the three operations were not functionally compatible and, therefore, could not be housed in one building. Therefore, two facilities were constructed: the Vibration and Acoustic Laboratory Facility and the Anechoic Chamber Building. This resulted in the deletion of the laboratory space allocation for the Anechoic Chamber Facility since it was necessary that certain common areas such as spacecraft assembly, rest rooms and mechanical rooms be constructed in each building. The present facility will accommodate 80 personnel. This includes office space for 40; however, no laboratory space is provided where individual systems can be evaluated prior to and after testing under full scale free-space simulated conditions. On an interim basis the shop and assembly area provided in the original facility will be used for this function; however, by December 1966 when practically complete Command Module and Lunar Excursion Module will be ready for test and evaluation, the present facility will be inadequate. Also, by that time, because of the more complex testing of the integrated spacecraft systems, the manpower requirement will be increased from 80 to 120 personnel (45 NASA and 75 contractor).

This testing must be conducted at the Manned Spacecraft Center since the Anechoic Chamber is the only facility of its type in the United States designed for housing and testing the Apollo spacecraft.

ESTIMATED FUTURE YEAR FUNDING: None

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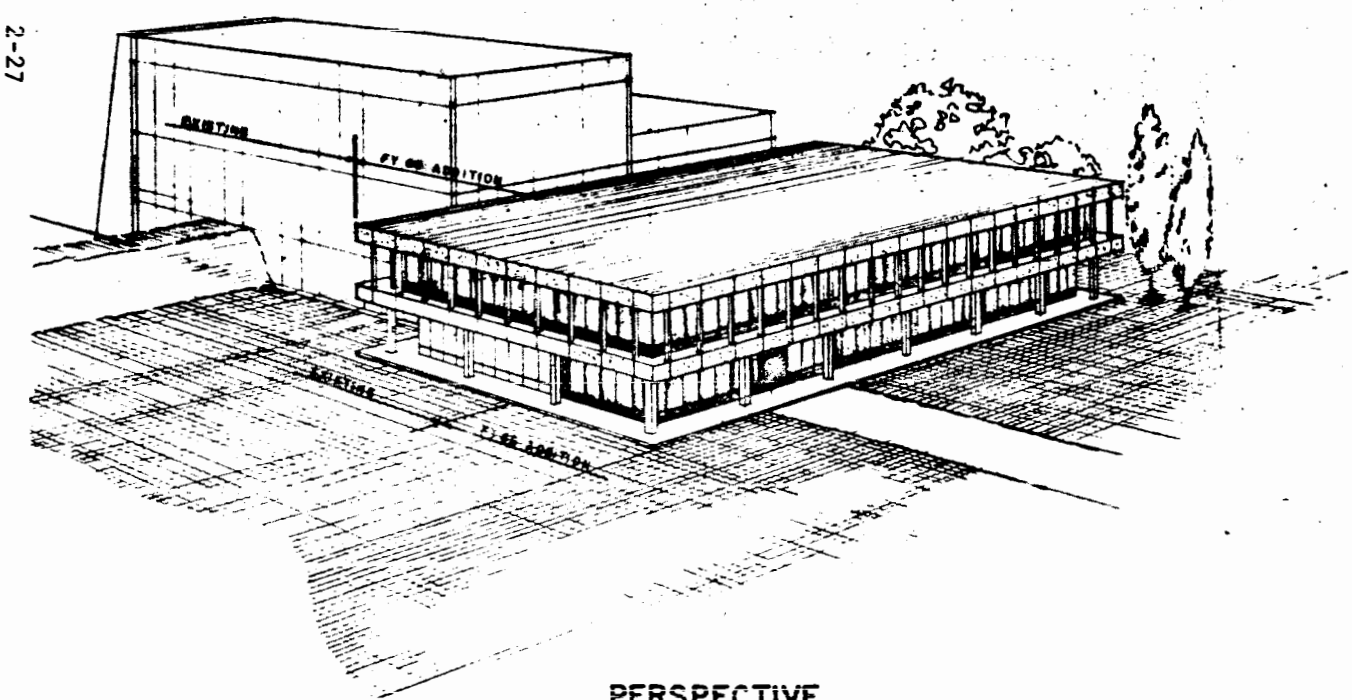
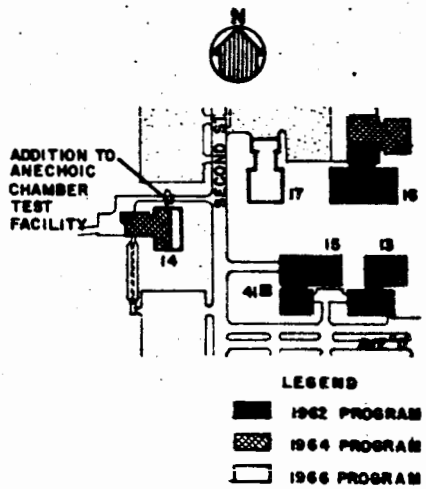
MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

ANECHOIC CHAMBER TEST FACILITY ADDITION



PERSPECTIVE



PARTIAL SITE PLAN

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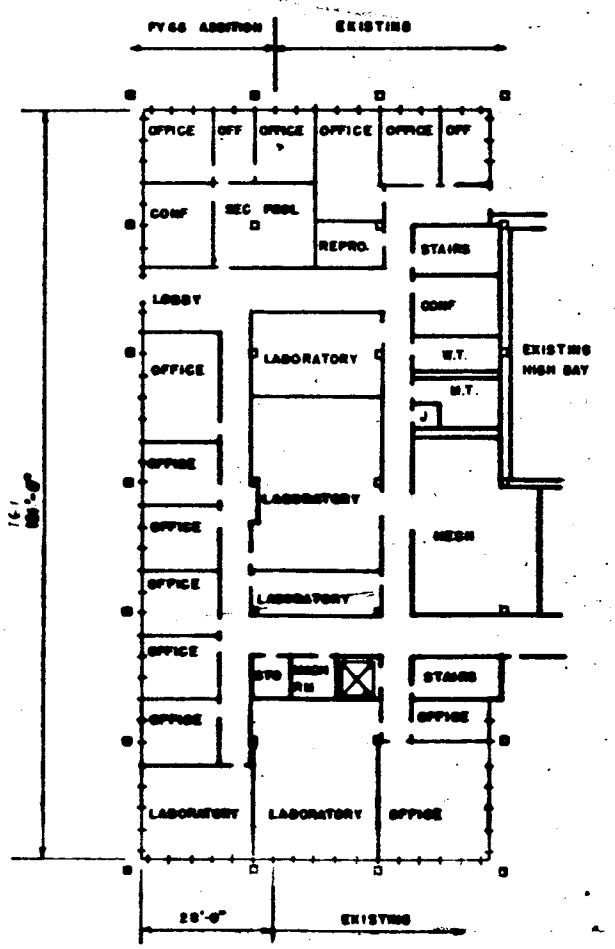
SCALE IN FEET

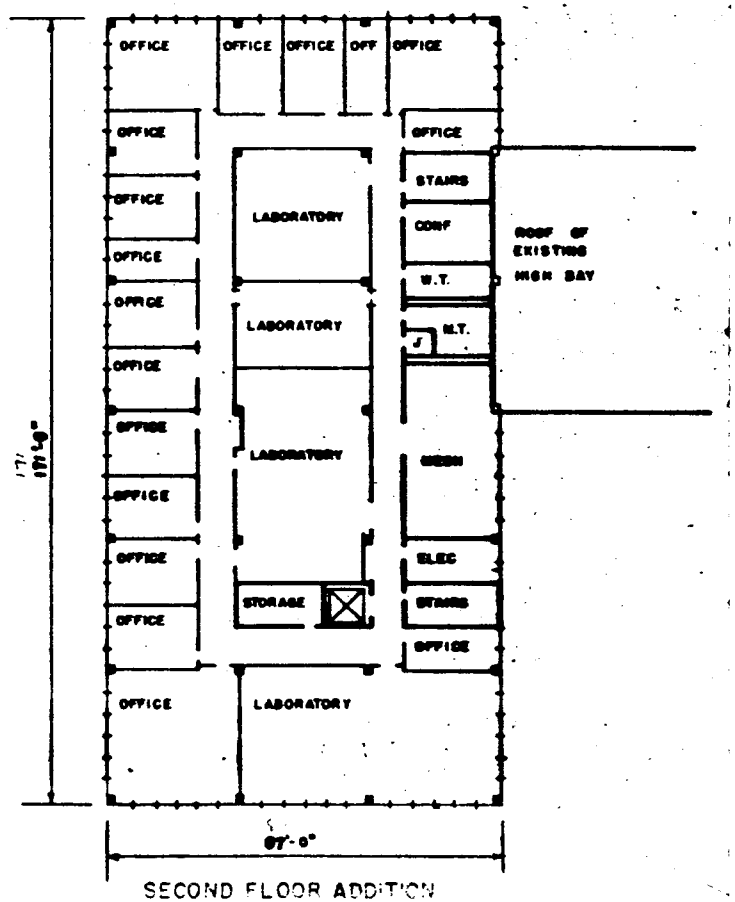
MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

ANECHOIC CHAMBER TEST FACILITY ADDITION



FIRST FLOOR ADDITION



SECOND FLOOR ADDITION

PLANS

SCALE IN FEET

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Marshall Space Flight Center	Manned Space Flight	Huntsville, Alabama	Madison	Huntsville, Alabama

INSTALLATION MISSION

The Marshall Space Flight Center (MSFC) has as its primary mission the development of launch vehicles, engines and vehicle systems for manned space flight programs. The Center also performs advanced studies and research in the general field of astronautics.

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL *(End of Year)*	7,334	7,220	7,195
CONTRACTOR & OTHER PERSONNEL	5,454	5,706	5,808
TOTAL ALL PERSONNEL	12,788	12,926	13,003

INVENTORY		
ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	---	
LAND *(Lease or Permit)*	1,850	
PLANT VALUE *(as of June 30, 19)*		223,843
TOTAL	1,850	223,843

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1964 AND PRIOR YEARS	FY 1965 *(Estimated)*	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Test Engineering Building Extension	MSF	1,418.3	34.0	616.0	-	2,068.3
Extension to High Pressure Gas Systems	MSF	47.0	85.0	1,415.0	-	1,547.0
Primary Utility Extensions	MSF	-	29.0	534.0	-	563.0
Additions to Materials Laboratory	MSF	12.0	60.0	1,107.0	-	1,179.0
Non-Destructive Testing Laboratory	MSF	20.0	39.0	708.0	-	767.0
Space Vehicle Research Laboratory	MSF	15.0	66.0	1,285.0	-	1,366.0
LOX Storage Facilities for F-1 Stand	MSF	25.0	42.0	755.0	-	822.0
Engineering and Laboratory Building	MSF	10.0	81.1	1,945.1	-	2,036.2
TOTAL FOR PROJECTS IN FY 1966 ESTIMATE				8,365.1		

NASA FORM 1029 DEC 63

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Test Engineering Building Extension

SUPPORTING DATA:

PROGRAM OFFICE OF THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Marshall Space Flight Center

LOCATION OF PROJECT: Huntsville, Madison County, Alabama

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Extension

FUNDING:

FY 1964 and Prior Years	$1,418,329
FY 1965 Estimate	34,000
FY 1966 Estimate	616,000
Total Funding through FY 1966	$2,068,329

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--
Construction	--	--	--	$592,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Test Engineering Building Extension

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Building	S.F.	19,500	26.00	507,000.
Site Development	L.S.	---	15,000	15,000.
Utilities & Paving	L.S.	---	70,000	70,000.
Equipment				24,000.
Office Furniture	L.S.	---	24,000	24,000.
Design	---	---	---	---
Fallout Shelter	---	---	---	---
			TOTAL	$616,000.

PROJECT DESCRIPTION:

This project provides for a 19,500 square foot extension to the existing Test Engineering Building 4666. The building will be a two-story, reinforced concrete structure, 40 feet wide by 225 feet in length, connected to the existing building by a two-story corridor. It will be equipped with movable type partitions, fluorescent lighting, composition tile floor, and the necessary heating and cooling systems. The building will provide space for approximately 125 people.

PROJECT JUSTIFICATION:

Personnel of the Marshall Space Flight Center Test Division require administrative and engineering space within the remotely sit[illegible] Test Division Area. Currently, two administrative type buildings are available with a total net available floor area of 37,500 square feet. These buildings are now housing, at 85 square feet per person, a total of 442 Test Division employees. However, the Division complement is 672 people; consequently, 230 people

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SUPPORTING DATA:

must be housed within 36 trailers with a total of 20,000 square feet, or 87 square feet per person.

The trailers are deemed to be a totally ineffective and inefficient method for housing administrative type employees. Within the Test Division Area, trailers are even more unsatisfactory since evacuation is necessary during the numerous static test firings of the F-1 engine and S-1 vehicles. In addition, activation of the S-1C Static Test Stand will require relocation of the trailers away from the Test Division center of operations. Thus, operational effectiveness and efficiency will be downgraded even further.

Acquisition of a 19,500 square foot addition to the Test Engineering Building will provide space for a hard-core of Test Division employees in quarters which will permit support of the Apollo Program with maximum effectiveness.

Since a general administrative space deficiency exists at the Marshall Space Flight Center (see attached sheet), space is not available within the Marshall Space Flight Center to house Test Division personnel.

ESTIMATED FUTURE YEAR FUNDING: None

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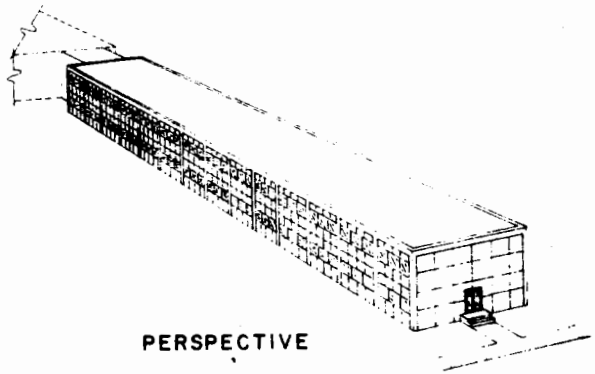
MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

TEST ENGINEERING BUILDING EXTENSION

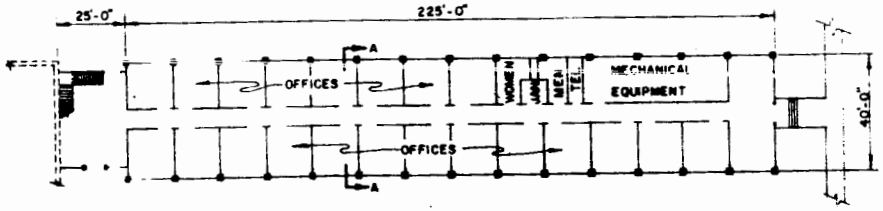
EAST ELEVATION



PERSPECTIVE

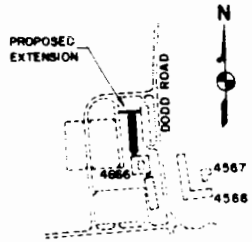
SECTION A-A

NORTH ELEVATION



FLOOR PLAN

0 20 40 60
FEET



SITE PLAN

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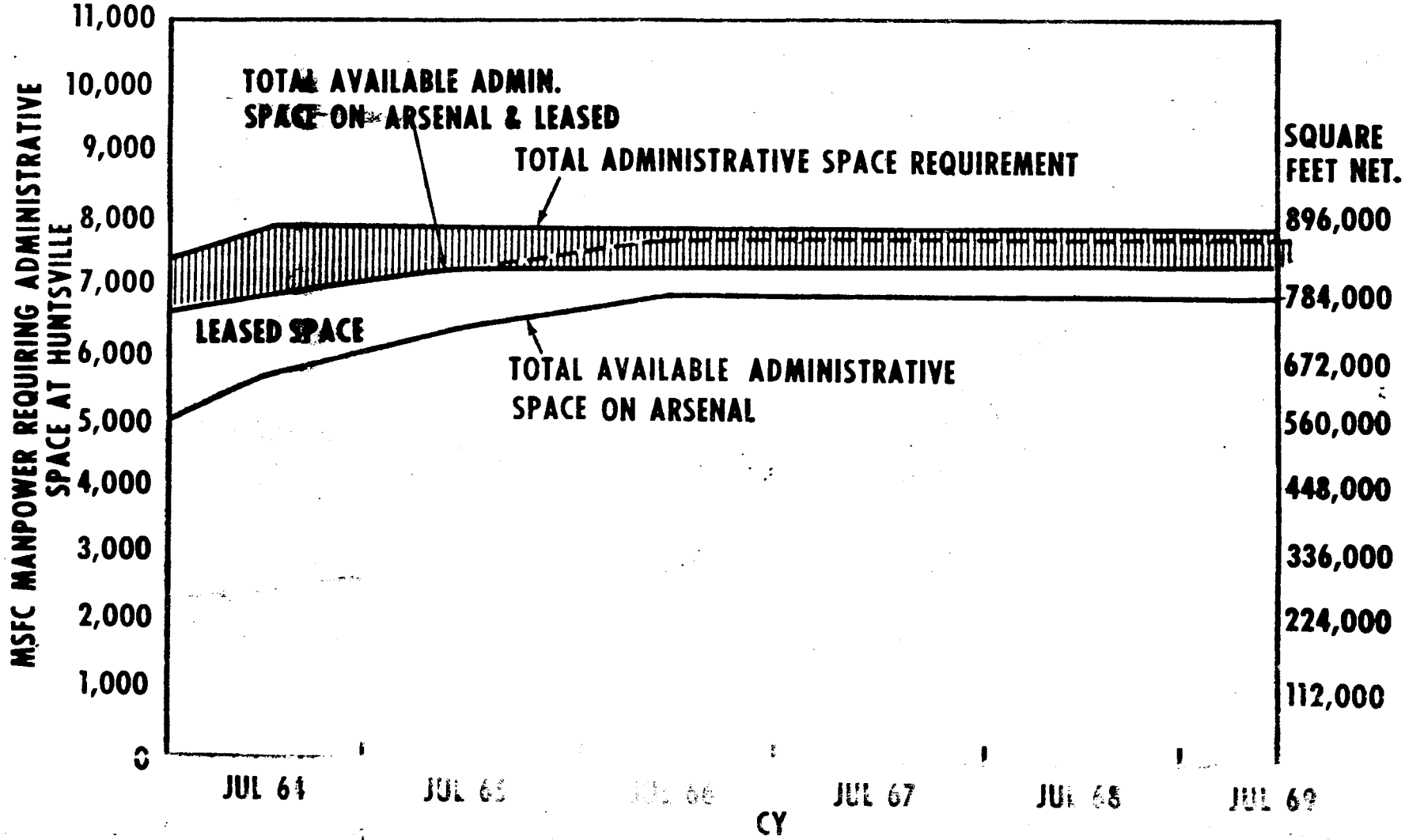
MARSHALL SPACE FLIGHT CENTER

ADMINISTRATIVE SPACE REQUIREMENTS VS AVAILABLE



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Extension to High Pressure Gas Systems

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Marshall Space Flight Center

LOCATION OF PROJECT: Huntsville, Madison County, Alabama

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Extensions

FUNDING:

FY 1964 and Prior Years	$ 47,000
FY 1965 Estimate	85,000
FY 1966 Estimate	1,415,000
Total Funding Through FY 1966	$1,547,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Extension to High Pressure Gas Systems

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Construction				$ 526,000
Building	SF	6,500	25.00	162,500
Site Development and Utilities	LS	---	---	363,500
Equipment				889,000
Compressors, piping & valves	LS	---	---	604,000
Storage Vessels	LS	---	---	285,000
Design	---	---	---	---
Fallout Shelter	---	---	---	---
			TOTAL	$1,415,000

PROJECT DESCRIPTION:

This project will provide for an extension to the MSFC centralized High Pressure Gas Systems Facility in the Test Laboratory Area to expand the air system and to add helium capacity by relocating and upgrading an existing helium system. The work will include additions to the air compressor building; expansion of the air compressor and storage facilities; the addition of helium transfer, compressor, purification, storage, and distribution facilities, and extension of required utilities, services, and site development.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Extension to High Pressure Gas Systems

SUPPORTING DATA:

Expansion of the air compressor facilities will include the addition of two 20 ft. bays to the east end of the air compressor building; provision of two air compressors having combined capacity of 1,100 SCFM at 3,500 psig, and two 1,250 cu. ft. compressed air storage bottles, with connections to the existing distribution system, and a central control system.

Additions to the high pressure helium facilities include: (a) the addition of four 20 ft. bays to the west end of the air compressor building; (b) the installation of two existing 5,000 psig helium compressors which will be relocated from the remote Helium Compressor Station to the air compressor building, a new low temperature type helium purification system, valves, piping and central control system; (c) two 500 psig, 6,000 cu. ft. helium receivers for rail car shipments and one 5,000 psig 1,250 cu. ft. helium bottle for high pressure storage; (d) extension of approximately 800 ft. to the existing rail siding with a rail car unloading station and a high pressure trailer loading station and parking area for ten trailers; (e) approximately 2,300 ft. of 3" underground line from the storage bottle to the existing Test Area distribution line, 2,400 ft. of 1½" underground line from the storage bottle to the GSE Area and 750 ft. of 1½" line from the Test Area distribution line to the Saturn I Dynamic Test Facility.

The project will also include the addition of approximately 500 sq. ft. of support area to the existing building, extension and expansion of electrical power and water systems in the area, paving, drainage and related site work.

PROJECT JUSTIFICATION:

This project is required in support of the Saturn V program, to provide additional capacity for 3,500 psig air and to improve system efficiency for the 5,000 psig helium system. By early Calendar Year 1967, four major new facilities (S-1C Static Test Stand, F-1 Engine Test Stand, Saturn V Dynamic Test Stand, and the Second Dual Components Test Stand) will be approaching full operation and will overtax existing system for supplying high pressure air and helium to the Test Area.

The present air compressor capacity at MSFC is only 2,200 SCFM. In FY 65 additional compressors are being installed to double this amount. An 1,100 SCFM addition is required through this project to meet the estimated demand by 1967 of 50,000,000 SCF per month. This expansion of the compressed air system will provide capacity to satisfy currently estimated future demands and permit equipment shut-downs for proper preventive maintenance.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Extension to High Pressure Gas Systems

SUPPORTING DATA:

Present usage of gaseous helium at MSFC averages approximately 220,000 SCF per month, all of which is supplied to users in the test area by tube trailers. The Helium Compressor Station is located outside the test area, approximately two miles from the principal area of helium usage. Further, the station is supplied by "K" bottles (capacity approximately 230 SCF) requiring considerable manual handling. Present usage, therefore, requires the inefficient manual handling of nearly 1,000 such bottles per month.

By early 1967, the operational date of the proposed facilities, it is estimated that helium usage will have increased to approximately 2,500,000 SCF per month. This increase is attributable primarily to new facilities using liquid hydrogen, where other inert gases cannot be used because residual quantities will solidify in the system. Even though much of the increase will be used by the west area compressor station, there will be a continuing requirement for full utilization of existing compressors. In order to make the most efficient use of these compressors, which will represent approximately 30% of the center capacity for high pressure helium, it is necessary that they be relocated to the test area and incorporated into the existing helium distribution system. Relocation of existing equipment to the High Pressure Gas Facility in the test area, including the provision for rail delivery of helium, will result in a savings in man-hours for manning the equipment and a reduction in the cost of helium because of rail delivery. The purification system will upgrade the system by insuring that contamination is removed from the helium. Removal is necessary since contaminates tend to solidify at cryogenic temperatures and some are combustible on contact. Liquid hydrogen is pumped by helium gas pressure, and liquid oxygen is pressurized by helium; therefore, purification is mandatory for safety to both equipment and personnel.

ESTIMATED FUTURE YEAR FUNDING: None

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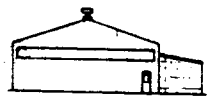
MARSHALL SPACE FLIGHT CENTER

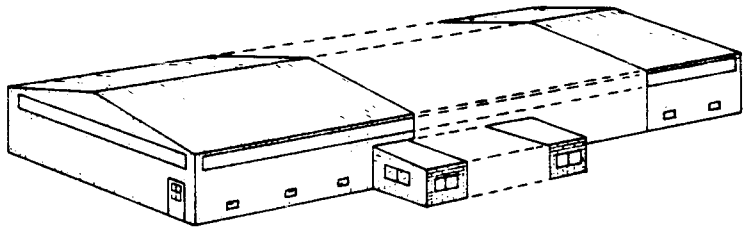
FISCAL YEAR 1966 ESTIMATES

EXTENSION TO HIGH PRESSURE GAS SYSTEMS

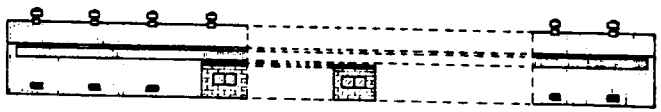


ELEVATION

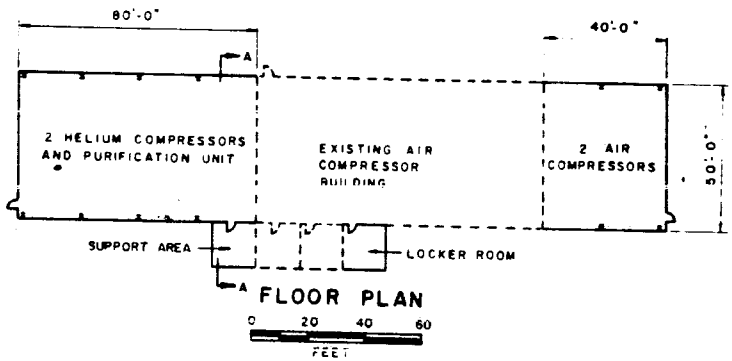
SECTION A-A



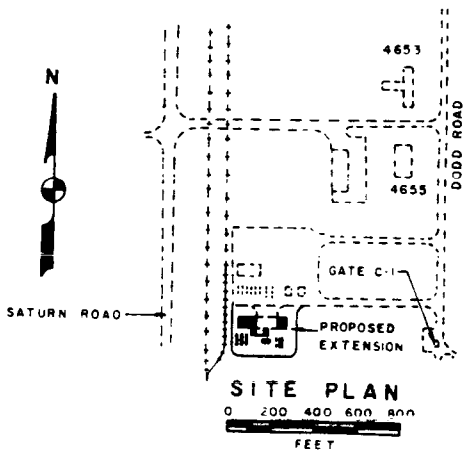
PERSPECTIVE



ELEVATION



FLOOR PLAN



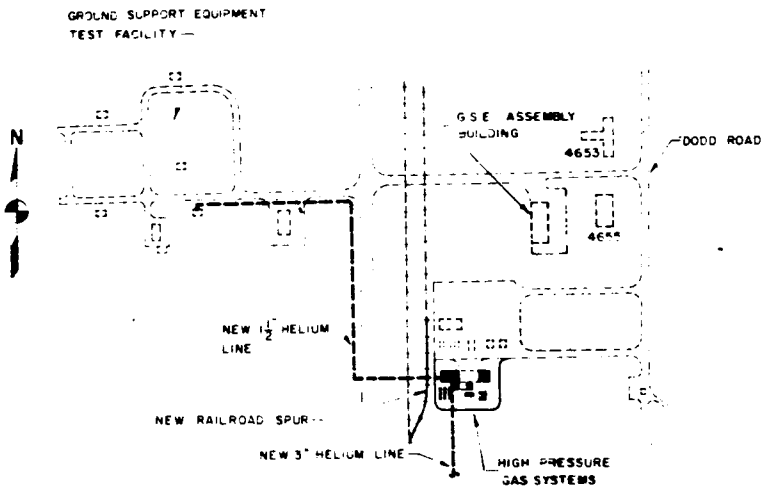
SITE PLAN

COMPRESSOR BUILDING

MARSHALL SPACE FLIGHT CENTER

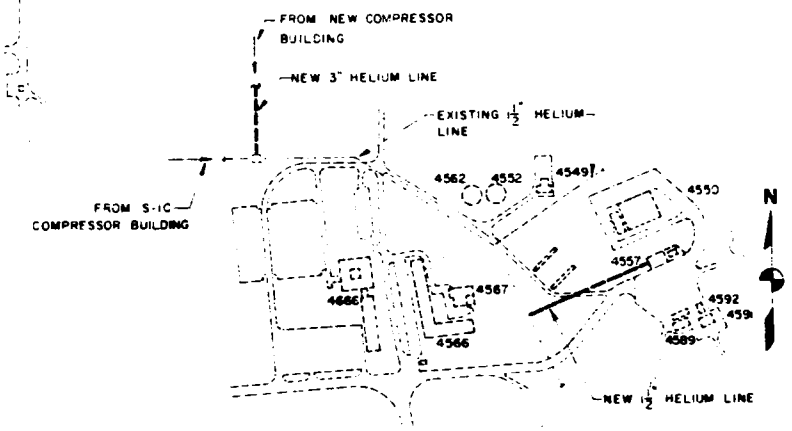
FISCAL YEAR 1966 ESTIMATES

EXTENSION TO HIGH PRESSURE GAS SYSTEMS



SITE PLAN

0 200 400 600 800
FEET



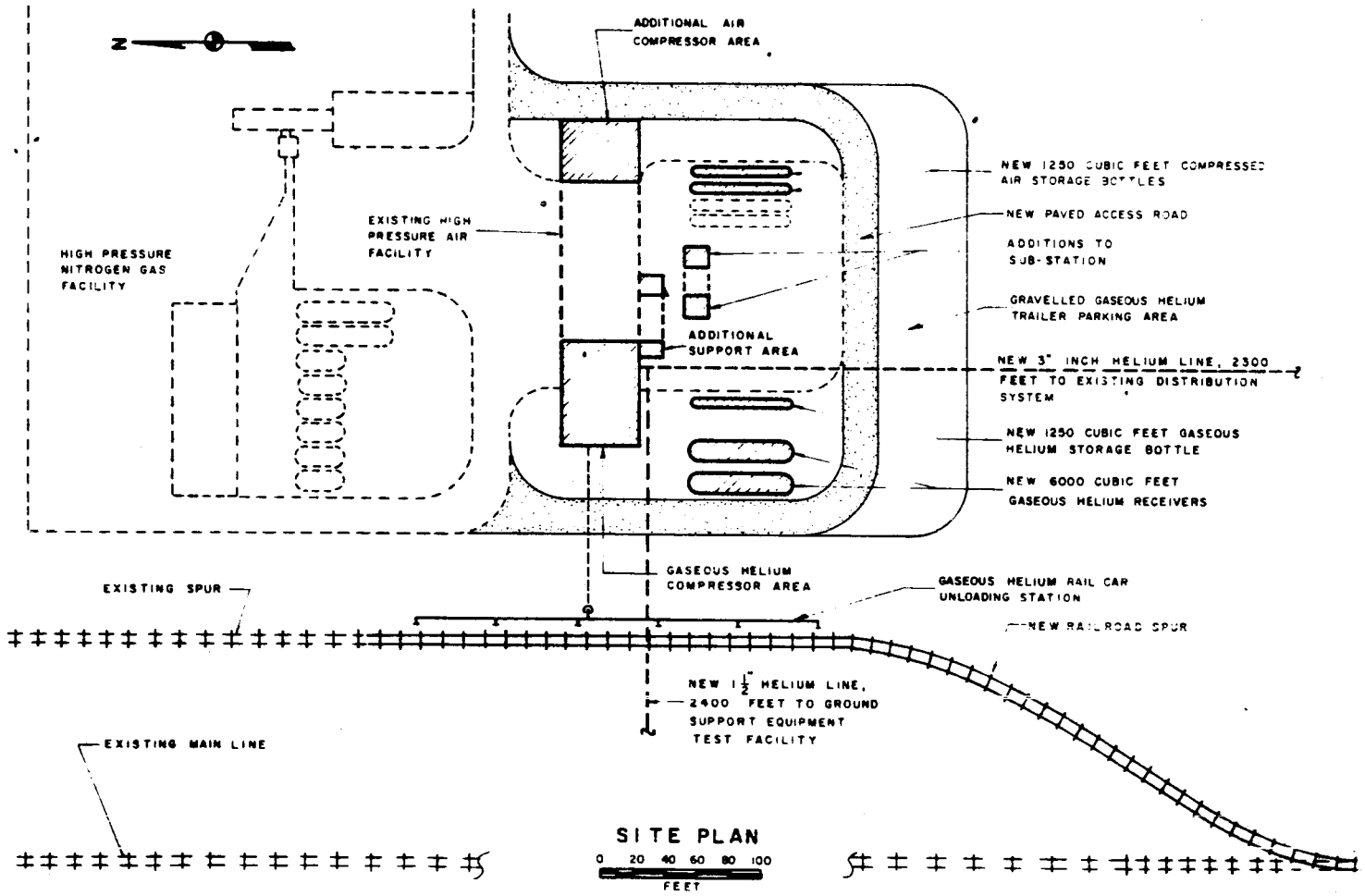
SITE PLAN

0 200 400 600 800
FEET

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

EXTENSION TO HIGH PRESSURE GAS SYSTEMS



SITE PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Primary Utility Extensions

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Marshall Space Flight Center

LOCATION OF PROJECT: Huntsville, Madison County, Alabama

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Extensions

FUNDING:

FY 1964 and Prior Years	--
FY 1965 Estimate	29,000
FY 1966 Estimate	534,000
Total Funding Through FY 1966	$563,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--
Construction	--	--	--	534,000
Utilities	LS	--	534,000	534,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Primary Utility Extensions

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment	--	--	--	--
Design	--	--	--	--
Fallout Shelter	--	--	--	--
			TOTAL	$534,000

PROJECT DESCRIPTION:

This project provides for extensions to existing utility systems in order to serve new areas of construction and expand the communications system between the Test Area and computation centers. Steam, sanitary sewers, and electrical power will be extended to the Space Vehicle Research Laboratory. The communications system expansion provides multi-purpose cables and data banks for routine and data link systems.

JUSTIFICATION:

Inasmuch as the Space Vehicle Research Laboratory will be constructed within a newly developed area, all basic utility systems must be extended from existing points of availability.

The MSFC communications center requires expansion in order to support such vital programs as LIEF (Launch Information Exchange Facility) through data links with the Kennedy Space Center and Manned Spacecraft Center; PRINCE (Parts Reliability Information Center Program) through data links with NASA Centers and contractors, and test management data from points of acquisition within the Test Area to computations centers within the Marshall Space Flight Center.

ESTIMATED FUTURE YEARS FUNDING: None

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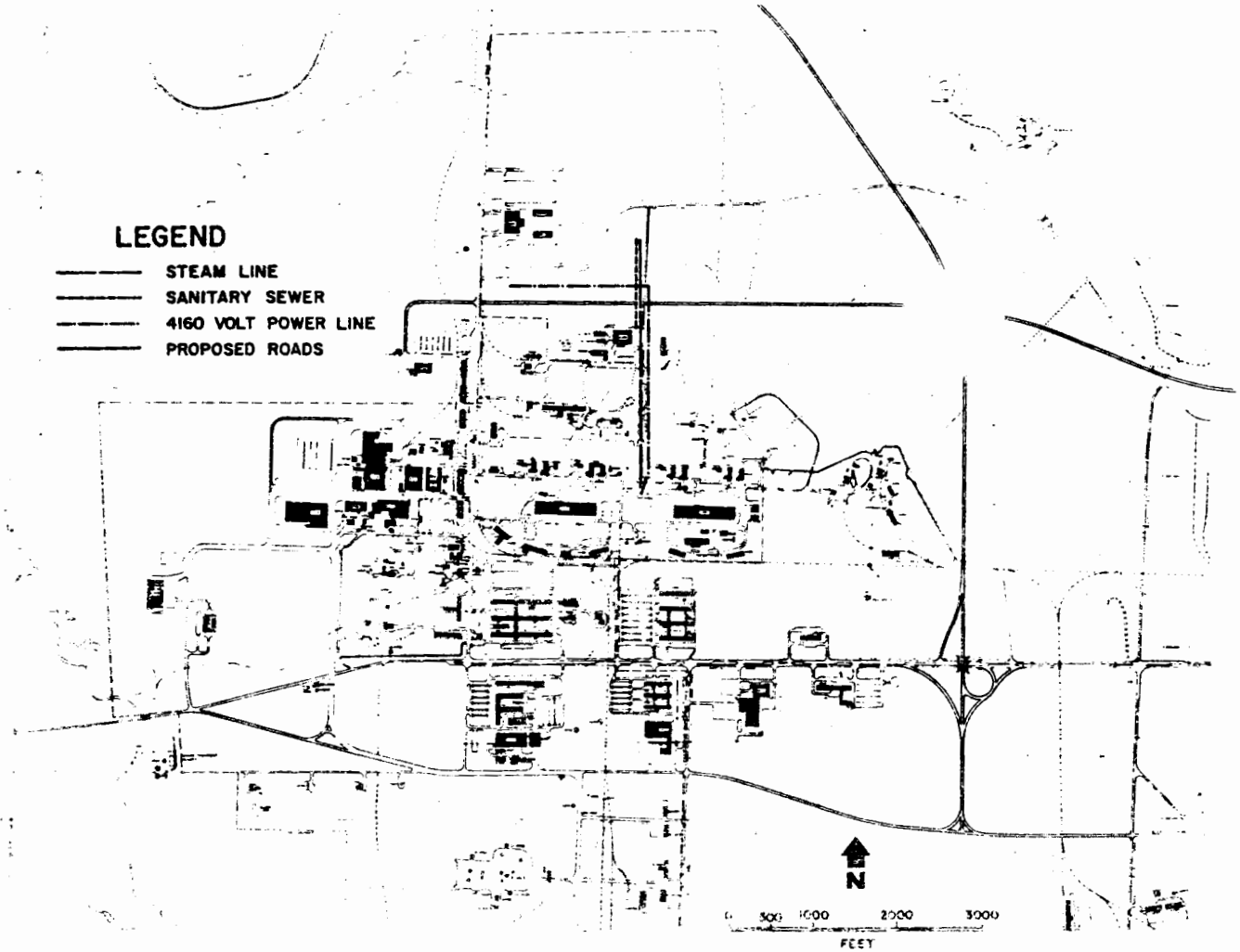
MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

PRIMARY UTILITY EXTENSION



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Additions to Materials Laboratory

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Marshall Space Flight Center

LOCATION OF PROJECT: Huntsville, Madison County, Alabama

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Additions

FUNDING:

FY 1964 and Prior Years	$12,000
FY 1965 Estimate	60,000
FY 1966 Estimate	1,107,000
Total Funding Through FY 1966	$1,179,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--
Construction				$ 939,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Additions to Materials Laboratory

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Building	SF	22,650	35.37	801,000
Site Development	LS	--	48,500	48,500
Utilities & Paving	LS	--	89,500	89,500
				168,000
Equipment				
Laboratory Equipment	LS	--	168,000	168,000
Design:	--	--	--	--
Fallout Shelter	--	--	--	--
			Total	$1,107,000

PROJECT DESCRIPTION:

This project provides for the construction of three additions to the MSFC Materials Laboratory Building and the procurement, fabrication, installation, and checkout of laboratory equipment;

The additions to the east side of the existing structure will be as follows:

1. A single-story L-shaped structure approximately 5,650 square feet connecting the Materials Laboratory Building and the Engineering Office and Shop Building to house a wet instrumental chemical laboratory.

2. A single-story structure 140 feet by 50 feet connected to the east side of the Materials Laboratory Building to house developmental welding and chemical metallurgy laboratories.

3. A two-story addition 100 feet by 50 feet to the northeast wing of the Materials Laboratory Building to house physics, engineering and environmental laboratories.

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SUPPORTING DATA:

Construction features will be compatible with the existing building (concrete slab; concrete block) and partitioned into laboratory and office space containing necessary heating, air conditioning and utilities.

PROJECT JUSTIFICATION:

The Materials Division provides direct support to all Marshall Center elements and in the area of materials technology, supervises and evaluates supporting research technology contractors and the Marshall prime contractors' materials programs. This includes engineering development, design, evaluation, testing, inspection, and failure analyais of materials used on launch vehicles. Continuous surveillance, testing, and inspection must be done throughout the life of each vehicle with continued improvements being incorporated to insure the highest degree of reliability. To insure the vehicle integrity and to realize improvements, it is mandatory that work be carried on in the areas of new materials (such as newer titanium alloys, beryllium and beryllium composite materials, superalloys, magnesium-lithium alloys, polymeric materials, ceramic materials, and specialty materials including lubricants, fluids, and electrical materials) and new techniques (such as improved welding and joining methods, non-destructive testing, cryogenic and high temperature insulation schemes, filament windings and material reinforcements, and improved energy conversion and regulation methods). Furthermore, since many vehicle and ground support equipment problems develop because of material or component failures, it is essential that an extensive and comprehensive program and capability be maintained to diagnose failures, recommend remedial action, and attempt to preclude reoccurrence of the failures. For example, the laboratory is currently investigating weld design allowables and tolerances in an effort to reduce the weight of launch vehicle stages without reducing the structural integrity. Some of the laboratory's past contributions include: (1) the development of a special external insulation material which reduced the S-II stage by 1500 pounds; and (2) the development of a new type of lubricant suitable for both space environment and extremely high load conditions on the launch pads.

The existing Materials Division Laboratory was constructed by the Army in support of the material engineering requirements for the Redstone and Jupiter programs. With the transfer of the facility to NASA at its establishment and the advent of the Saturn programs, the progressively increasing responsibility and workload of the Materials Division has necessitated nearly doubling the number of personnel originally intended for assignment at the facility and increasing the amount and size of test and laboratory equipment without the benefit of providing additional laboratory space. This condition has resulted in an overcrowded facility which prevents the installation of laboratory apparatus needed for expanded and new requirements. The three additions to this laboratory are intended to alleviate the presently overcrowded condition and permit the relocation of certain expensive and sensitive pieces of laboratory equipment into adequate surroundings.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Additions to Materials Laboratory

SUPPORTING DATA:

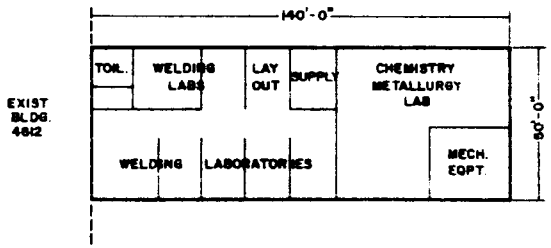
ESTIMATED FUTURE YEAR FUNDING: None

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

MARSHALL SPACE FLIGHT CENTER

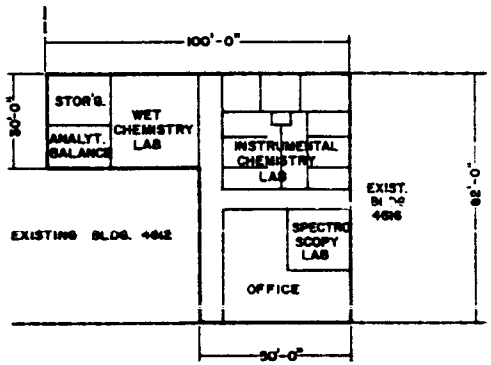
FISCAL YEAR 1966 ESTIMATES

ADDITIONS TO MATERIALS LABORATORY

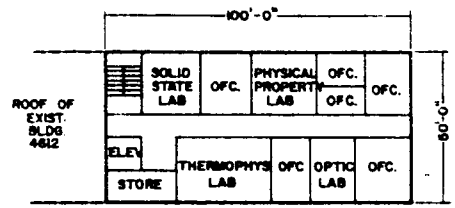


ADDITION B

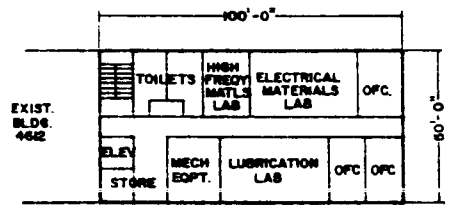
SCALE FOR ALL FLOOR PLANS



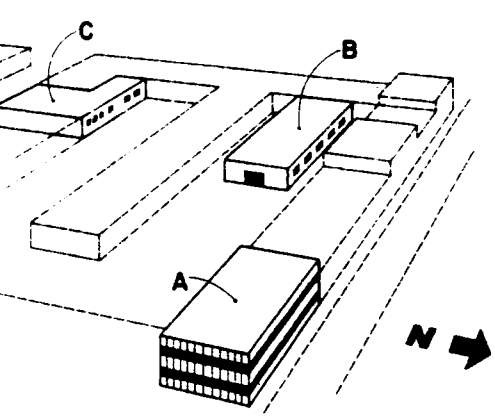
DITION C



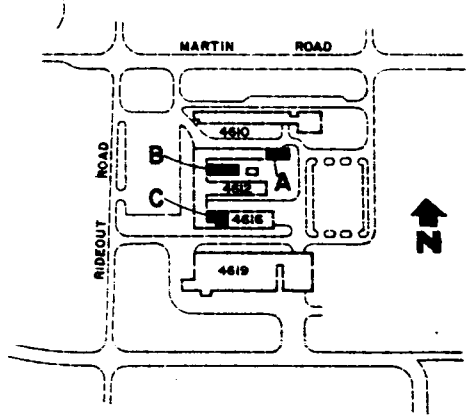
ADDITION A 2nd FLOOR



ADDITION A 1st FLOOR



PERSPECTIVE



SITE PLAN

100 0 400 800 FEET

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Non-Destructive Testing Laboratory

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight.

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight.

AUTHORIZATION LINE ITEM: Marshall Space Flight Center.

LOCATION OF PROJECT: Huntsville, Madison County, Alabama.

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center.

TYPE OF CONSTRUCTION PROJECT: New.

FUNDING:

FY 1964 and Prior Years	$ 20,000
FY 1965 Estimate	39,000
FY 1966 Estimate	708,000
Total Funding Through FY 1966	$767,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$517,000
Building	SF	8,550	47.85	409,000
Site Development	LS	---	30,000	30,000
Utilities & Paving	LS	---	78,000	78,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Non-Destructive Testing Laboratory

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment				$191,000
Laboratory Equipment	LS	---	191,000	191,000
Design	---	---	---	---
Fallout Shelter	---	---	---	---
		TOTAL		$708,000

PROJECT DESCRIPTION:

This project will provide a laboratory for developing non-destructive testing techniques. It will be located at MSFC in the hazardous test area, southwest of the existing Propulsion and Vehicle Engineering complex. The structure will be one story approximately 90 feet wide by 95 feet long with 8,550 square feet of floor area. The building will be constructed of reinforced concrete. Where radiation shielding is required, interior walls will be monolithic reinforced concrete. The interior area will be divided into laboratory space, a small office area, mechanical equipment room, and rest rooms, a radiation monitoring system, access and interlock system, and automatic shutdown equipment will be included with this facility. The facility will house 15 laboratory personnel.

The project will also provide for the purchase, installation, and checkout of high-energy inspection equipment, ultrasonic and eddy current inspection equipment, X-ray diffraction and infrared radiation instrumentation, and surface inspection equipment.

NASA FORM 946 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Non-Destructive Testing Laboratory

SUPPORTING DATA:

PROJECT JUSTIFICATION:

Non-destructive testing is a technique which utilizes physical principles to detect and measure defects in materials without impairing the usefulness or degrading the properties of tested materials. It is one of the most important means of testing available to the space vehicle program. However, the state-of-the-art of non-destructively inspecting materials, components, and structures built at the Marshall Space Flight Center, or at associated contractor's plants, lags far behind the development of new materials and the application of these materials. Adequate techniques do not exist even for inspecting current hardware.

The penalty to the space program is the need for additional safety factors which results in increased weight or compromised reliability. Therefore, a systematically conducted program of technique and methodology development is imperative to the space program.

All known methods for non-destructive testing require development. Solutions to complex problems will include several or a combination of techniques, such as X-ray, isotropic radiography, ultra-sonic, eddy current, infrared inspection, and chemical surface inspection. Combining a number of techniques requires the integration of personnel and associated equipment within a single facility. Since the materials and instruments are frequently a potential hazard because of the high energy and radiation sources involved, the facility must be isolated. A facility which meets these standards is not currently available.

Since non-destructive testing equipment is essential to diagnostic studies associated with material and component failure analyses consolidation into a single facility located at the Marshall Space Flight Center will also permit integrated use in conjunction with other analytical equipment used by the Materials Division.

ESTIMATE FUTURE YEAR FUNDING: None

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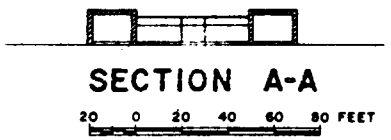
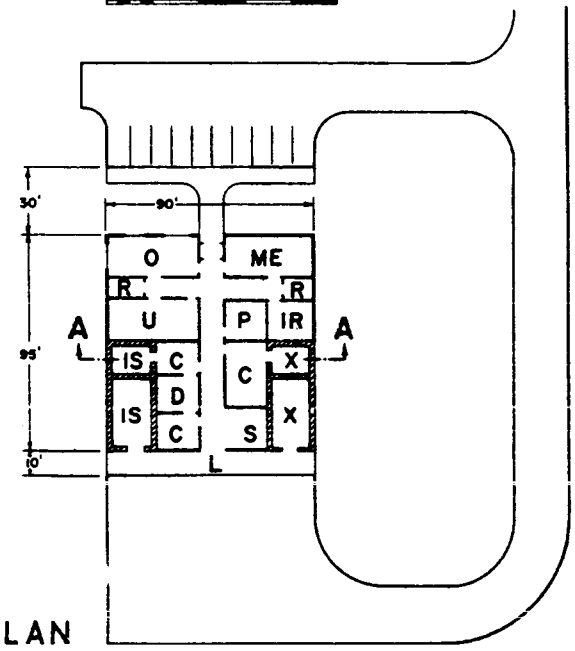
MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

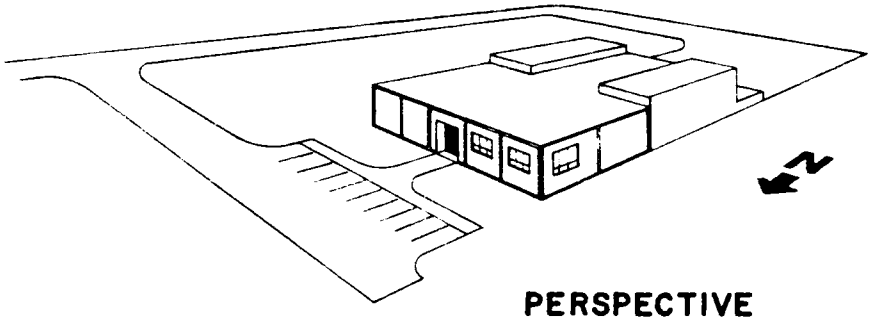
NON-DESTRUCTIVE TESTING LABORATORY



SECTION A-A



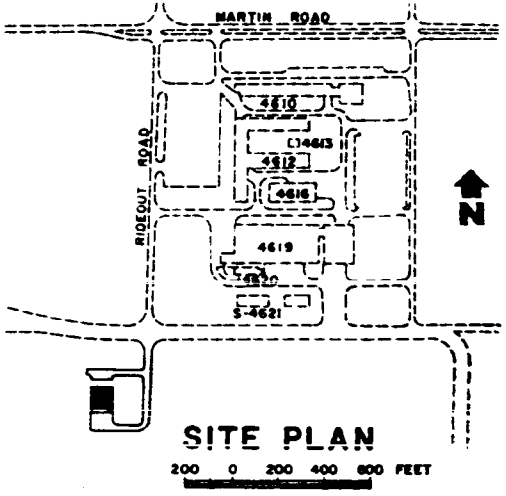
PLAN



PERSPECTIVE

LEGEND

- C CONTROL ROOM
- D DARK ROOM
- IS ISOTOPIC SOURCE
- IR INFRARED ROOM
- L LOADING DOCK
- ME MECHANICAL EQUIPMENT SET-UP, STORAGE
- O OFFICE
- P PENETRANT
- R REST ROOM
- S SET UP ROOM
- U ULTRASONIC AND EDDY CURRENT LAB
- X X-RAY ROOM



SITE PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Space Vehicle Research Laboratory

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Marshall Space Flight Center

LOCATION OF PROJECT: Huntsville, Madison County, Alabama

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ 15,000
FY 1965 Estimate	66,000
FY 1966 Estimate	1,285,000
Total Funding Through FY 1966	$1,366,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--
Construction	--	--	---	930,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Space Vehicle Research Laboratory

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Building	SF	27,500	29.92	822,700
Site Development	LS	--	22,500	22,500
Utilities and Paving	LS	--	84,800	84,800
quipment	--	--	--	355,000
Equipment, Instrumentation & Support Systems	LS	--	--	355,000
Design	--	--	--	--
Fallout Shelter	--	--	--	--
			TOTAL	$1,285,000

PROJECT DESCRIPTION:

This project will provide for the construction of a Space Vehicle Research Laboratory to be located at MSFC east of the administrative complex on Neal Road. The facility will consist of a two story steel frame structure with masonry walls, 56 feet wide by 245 feet long containing approximately 27,500 square feet of floor space. The building will be air-conditioned. Heat will be provided by steam from an existing central plant. The facility will provide laboratory space for scientific personnel with appropriate administrative and support areas. A total of 120 persons will be housed in the facility. The project also pr[illegible] for access roads and parking for 60 vehicles.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Space Vehicle Research Laboratory

SUPPORTING DATA:

Included in this project are air and gas systems, small laboratory type vacuum chambers, special power sources, and minor shielding for radiation work. Funds are included for equipment and instrumentation, needed to supplement available items.

PROJECT JUSTIFICATION:

This building is required to house scientific personnel now located in scattered unsuitable structures within Marshall Space Flight Center. The existing structures include a warehouse and a modified portion of an active machine shop as well as other smaller structures. This type of laboratory space is neither suitable for, nor conducive to, the nature of research effort that must be conducted here. These structures cannot be expanded or modified to meet the increased workload that the personnel are now being called upon and will be called upon in the future to accomplish. There are no facilities within Marshall that can be expanded to provide adequate space where this research work can be accomplished.

The facility will be staffed by an existing specialized group of scientists who are supporting NASA's scientific programs primarily for Manned Space Flight. This group is heavily involved in the many aspects of space physics research as it applies to the development of launch vehicles and spacecraft. It is now beginning a major effort in the analysis and definition of both lunar and space environments in support of the later phases of the Apollo Program as well as for future mission planning. This effort will be considerably increased by 1966 as preliminary data becomes available from other space missions. An outline of the research programs to be conducted in the Spa e Vehicle Research Laboratory includes thermophysics, radiation physics, meteoroid physics, lunar physics, space environment and integration of scientific mission objectives.

An active in-house research program in adequate laboratory facilities is essential to maintain and develop scientific proficiency in the physical sciences and is required to effectively plan and manage contracted research effort.

ESTIMATED FUTURE YEAR FUNDING: None

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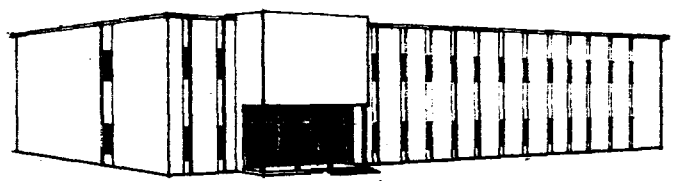
MARSHALL SPACE FLIGHT CENTER

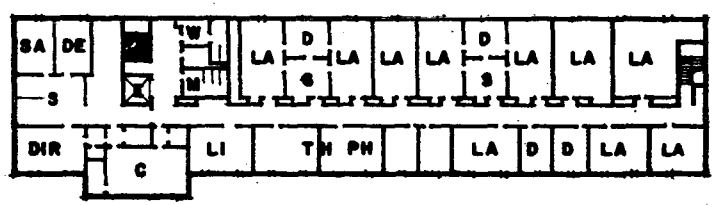
FISCAL YEAR 1966 ESTIMATES

SPACE VEHICLE RESEARCH LABORATORY

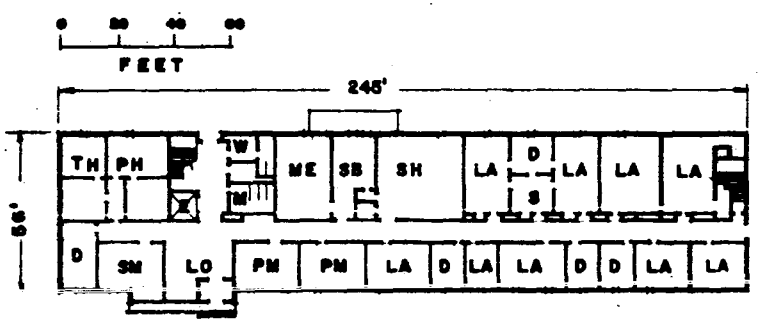
ELEVATION



PERSPECTIVE



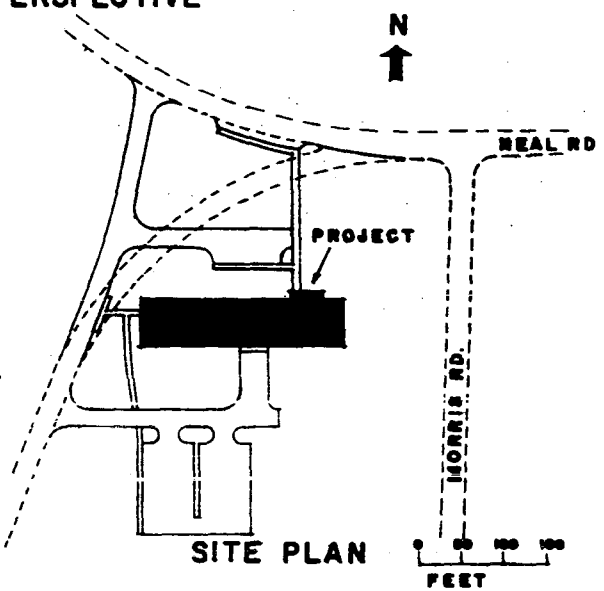
SECOND FLOOR PLAN



FIRST FLOOR PLAN

LEGEND

- C CONFERENCE ROOM
- D DESK SPACE
- DE DEPUTY DIRECTOR
- DIR DIRECTOR
- LA LABORATORY
- LI LIBRARY
- LO LOBBY
- ME MECH. EQUIPMENT
- S SECRETARY
- SA SPECIAL ASSISTANT
- SB SNACK BAR
- SM SEMINAR
- SH SHOP
- TH PH THEORET. PHYSICS



SITE PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	LOX Storage Facilities for F-1 Stand

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight.

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight.

AUTHORIZATION LINE ITEM: Marshall Space Flight Center.

LOCATION OF PROJECT: Huntsville, Madison County, Alabama.

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center.

TYPE OF CONSTRUCTION PROJECT: New.

FUNDING:

Fy 1964 and Prior Years	$ 25,000
FY 1965 Estimate	42,000
FY 1966 Estimate	755,000
Total Funding Through FY 1966	$822,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--
Construction	--	--	--	100,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	LOX Storage Facilities for F-1Stand

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Tank Pad & Foundation & Transfer System	LS	--	62,000.00	62,000
Site Development & Utilities	LS	--	38,000.00	38,000
Equipment	--	--	--	655,000
Tank	Gal	225,000	2.67	600,000
Piping	LS	--	55,000.00	55,000
Design	--	--	--	--
Fall-out Shelter	--	--	--	--
			Total	$755,000

PROJECT DESCRIPTION:

This project provides for the construction of a LOX Storage Facility in the West Test Area. The project will be located near the F-1 Engine Test Stand in order to provide ready storage for F-1 Engine tests. The tank, however, will be connected to the S-IC storage facilities to provide support for that stand as well. Tank size will match those at the S-IC Test Stand so that if either is temporarily out of service, the required back-up for full duration firing will be available.

The facility will consist of a 225,000 gallon spherical, vacuum jacketed storage tank; transfer piping, including a connection to the existing 6" line from the S-IC Stand; provision of safe disposal for normal and emergency boil off; transfer control station; pumps, filters, valves and piping for both truck and tank car unloading; paving for tank truck unloading plus a rail siding for tank car unloading; necessary utilities and services, and site work.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	LOX Storage Facilities for F-1 Stand

SUPPORTING DATA:

An existing design previously used for construction of the S-IC LOX Storage Facilities is available and will be utilized to the maximum degree practicable for the project. However, in addition, provisions are to be included for storing liquid hydrogen with minimum future modifications to the facility. This will provide initially, at relatively small cost, flexibility for conversion to hydrogen programs.

PROJECT JUSTIFICATION:

The F-1 Engine requires approximately 75,000 gallons of LOX, including losses, for a full duration firing. At present LOX must be drawn from the two 225,000 gallon LOX storage tanks at the S-IC Test Stand to satisfy the F-1 Test Stand requirements. LOX requirements for a full duration firing on the S-IC Stand including boil off losses under adverse temperature and wind conditions will total approximately 425,000 gallons. If holds (in excess of four hours) are encountered, this quantity rises. Thus, the existing storage capacity of 450,000 gallons becomes marginal for the S-IC Booster alone. Further, if either of the two tanks must be taken out of service for maintenance or repairs because of transfer system breakdowns, vacuum system failures, etc., a full duration firing would be impossible without the alternative of back-up storage. The S-IC development program now includes a requirement to simulate the 12 hour holding condition. This test will require "topping-off" at a rate of 16,000 gallons per hour to make up the boil off rate. The existing system will not permit this test.

Originally, the LOX supplier set-up plants in the Huntsville area to supply NASA and Army needs. In an effort to achieve stable operations, the LOX manufacturers also supply the steel mills in Birmingham and other areas. Only one-half of the suppliers capacity is now available for NASA operations. More suppliers at remote locations must, therefore, be utilized which further complicates LOX delivery schedules. The situation is made particularly critical because of the virtually impossible problem of scheduling LOX requirements. There are many factors which influence the timing or readiness for major tests. Factors such as adverse weather, equipment failures, hardware delays, and minor system or instrumentation difficulties are continuously encountered. Under these conditions it is not possible to forecast reliable LOX delivery schedules sufficiently far in advance to permit suppliers to integrate intermittent and heavy requirements into their production operations. This combination of circumstances is expected to result in costly test delays unless additional local storage is provided to minimize the periodic impact on suppliers.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	LOX Storage Facilities for F-1 Stand

SUPPORTING DATA:

LOX unloading capability adjacent to the storage tank is required to avoid a conflict with unloading operations at the S-IC tanks and also to dispense with heavy system and transfer line losses which would result from routine unloading via the S-IC unloading station approximately 1100 feet away.

ESTIMATED FUTURE YEAR FUNDING: None

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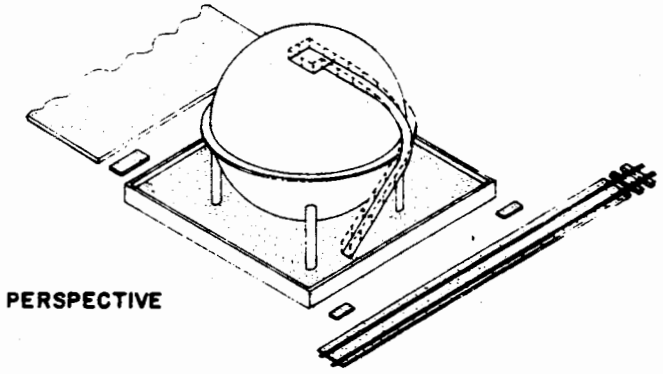
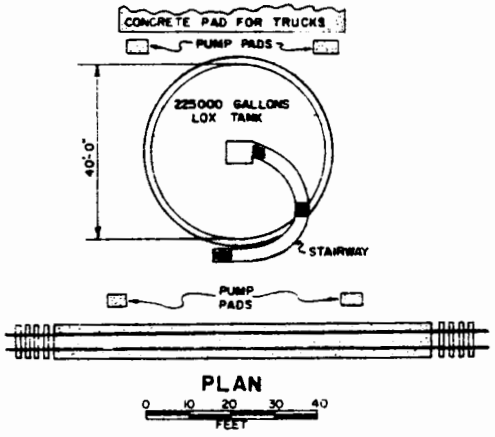
MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

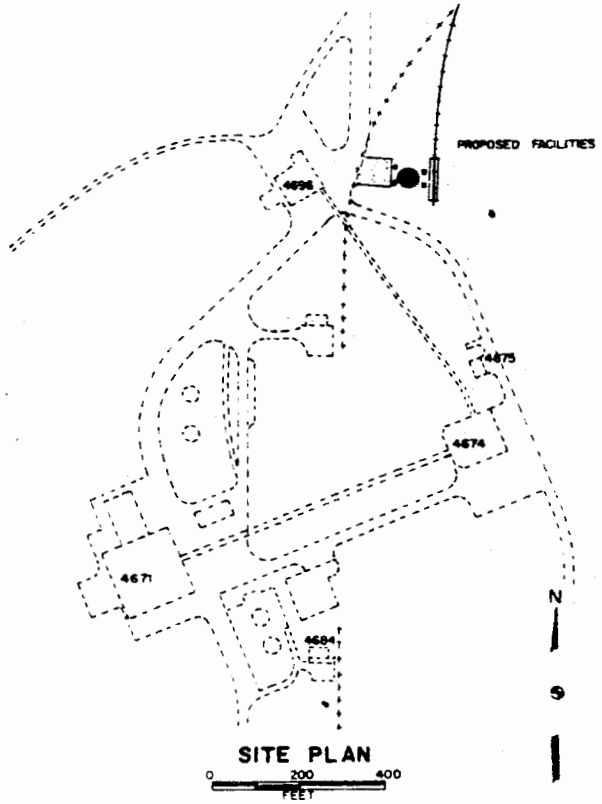
LOX STORAGE FACILITIES FOR F-I STAND



PERSPECTIVE



PLAN



SITE PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Engineering & Laboratory Building

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Marshall Space Flight Center

LOCATION OF PROJECT: Huntsville, Madison County, Alabama

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ 10,000
FY 1965 Estimate	81,100
FY 1966 Estimate	1,945,100
Total Funding thru FY 1966	$2,036,200

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--
Construction	--	--	--	1,641,500
Building	SF	68,800	21.60	1,486,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Engineering & Laboratory Building

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Site Development, Utilities and Paving	LS	--	155,500	155,500
Equipment	--	--	--	303,600
Equipment & Support Systems	LS	--	125,000	125,000
Medical Equipment	LS	--	178,600	178,600
Design	--	--	--	--
Fallout Shelter	--	--	--	--
			TOTAL	$1,945,100

PROJECT DESCRIPTION:

This project provides for the acquisition of an engineering and administrative building at the Marshall Space Flight Center. The primary purpose of the building is to house personnel of the Astrionics Laboratory. However, approximately 8,800 square feet will be used by the Occupational Health Program.

The area of the proposed building will be 68,800 square feet. It has been planned as a fully air-conditioned three story, with basement, structure which will house about 384 employees.

Construction features include a steel frame structure, masonry walls, elevators, movable partitions, fluorescent lighting, and tile floors. An existing steam plant will serve as the source of all heating requirements. All necessary site improvements, utility connections, access roads, and parking for 242 vehicles are also included. Requirements for office furniture, medical and clinical equipment and communications are also a part of this project.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Engineering & Laboratory Building

SUPPORTING DATA:

PROJECT JUSTIFICATION:

The activities of the Astrionics Laboratory have been severely hampered by a lack of laboratory and administrative space. Currently only 89 square feet per person are available for administrative and laboratory personnel. This factor is far below the administrative average of 112 square feet per person and a laboratory average of 220 - 350 square feet per person.

The Astrionics Laboratory is responsible for the integration of total vehicle systems. This is particularly related to the electronic systems and subsystems of all launch vehicles. As the Saturn Program approaches the launch date, the activities of the Astrionics Laboratory will become even more significant as requirements for reliability, quality control and weight reduction become paramount areas of concern. For example, a requirement now exists to equip 12,500 square feet of existing space as a laboratory so that developmental research may be carried on in such areas as integrated circuits, micro-miniaturization, printed cables, plastics chemistry, adhesives, electrochemicals and master designs for multilayer and micro-miniaturized printed circuits. This action, while necessary, will deprive 160 engineers and clerical personnel of administrative type space. The recurrence of similar actions will continue to result in severe overcrowding of existing space and necessitate the use of trailers and substandard buildings.

There are no existing facilities available at the Marshall Space Flight Center which can be used to alleviate the space problems encountered by the Astrionics Division. Administrative and laboratory space has been in a continual state of deficiency. (See attached chart) Facilities authorized through the Fiscal Year 1963, 64, and 65 programs have provided about 224,000 net square feet of administrative space. Thus, the space availability factor has increased from 5,000 to about 6,900 personnel. However, the Marshall Space Flight Center requires space for 7,742 personnel. The deficiency has been and will continue to be made up only through leasing, crowding, trailers and the use of substandard facilities.

The predicament of the Astrionics Laboratory is particularly evident through a study of space currently allotted. The laboratory is now scattered throughout fourteen buildings at the Marshall Space Flight Center and the City of Huntsville.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Engineering & Laboratory Building

SUPPORTING DATA:

The following is a recapitulation of space available to the Astrionics Laboratory:

Building	Area (Net)	Head Count
4481	11,529	94
4487	160,536	1,378
4492	8,058	61
4493	8,795	43
4741	4,375	15
4194	744	6
4436	6,545	18
4478	1,203	2
4708	4,296	11
7231	12,200	-
7237	12,200	2
HIC (Leased)	16,990	125
4742	300	-
Green Mountain	1,036	3
Trailers	2,150	50
Total	250,957	1,808

A further breakdown of the net usable area of 250,957 square feet utilized by the Astronics Laboratory is as follows:

Area	Net S.F.	Personnel
Office and Engineering	103,996	1,174
Shop and Laboratory	58,104	584
Special Equipment	55,572	0
Storage	31,135	0
Trailers	2,150	50
Total	250,957	1,808

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Marshall Space Flight Center	Construction of Facilities	Engineering & Laboratory Building

SUPPORTING DATA:

Construction of the requested facility will make it possible to reassign the 160 persons displaced by the laboratory; the fifty personnel now housed in trailers and to relieve overcrowded conditions be relocating 150 personnel now located in Building 4487. While availability of this facility will alleviate the laboratory problem and provide relief for administrative personnel, it will not eliminate the total Center space deficiency.

Approximately 8,800 square feet of the proposed building will be assigned to the Occupational Health Program. This program is oriented to the work environment and the health of the employee as it relates to his occupation. Currently, the Marshall Space Flight Center is woefully deficient in this area. The industrial medical care program is now provided by the Army as a bare minimum type service. It includes only first aid services for illness and injuries incurred on the job as well as a limited program of pre-employment and executive physical examinations. The Army is not in a position to provide a reasonable occupational health service because it lacks staffing (one doctor and two nurses for 13,000 employees) and a physical plant (2,400 square feet).

An adequate occupational health program is managements' recognition of its responsibility to maintain on-the-job effectiveness and high productivity of employees through a sound occupational health program which guards the employees work environment and provides for emergency care of job incurred illnesses and injuries.

This objective can be realized through a program which encompasses the following basic activities:

a. Diagnosis and treatment of personnel for job incurred illness and injuries.

b. Emergency service and treatment.

c. Performance of preventive medicine activities.

d. Initiation of medical surveys and studies necessary to provide for evaluation and controlling hazardous environments at MSFC.

e. Operation of an adequate clinical laboratory.

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SUPPORTING DATA:

f. Exercising epidemiological control of all MSFC areas.

g. Provision of immunization program for all MSFC personnel (eg. tetanus toxoid, influenza, polio, smallpox, etc.)

h. Performance of health examination for MSFC personnel. The examinations would include pre-employment examinations, periodic examinations, surveys (chest x-ray, hearing, diabetes tests, etc.) examinations of employees returning from sick leave and examinations for disability retirement.

i. Inspection of food handling and preparation services and facilities.

j. Provision of pharmacy service in support of the health program.

k. Maintenance of effective liaison with safety personnel and provision of adequate medical support in the programs they pursue.

In order to execute a program of reasonable proportions, as outlined above, resources are required in terms of staff and facilities. This project addresses itself to the total lack of facilities at the Marshall Space Flight Center. New facilities are necessary because the Center has been under the stress of an overall space deficiency as previously stated in this project.

ESTIMATED FUTURE YEAR FUNDING: None

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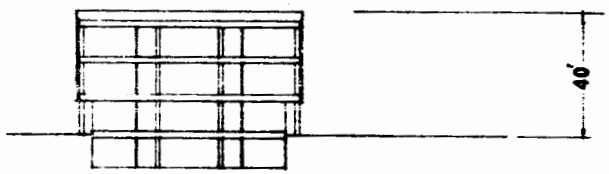
MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

ENGINEERING & LABORATORY BUILDING



SECTION A-A

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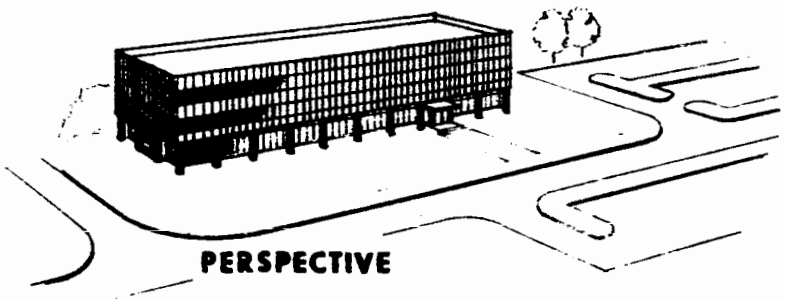
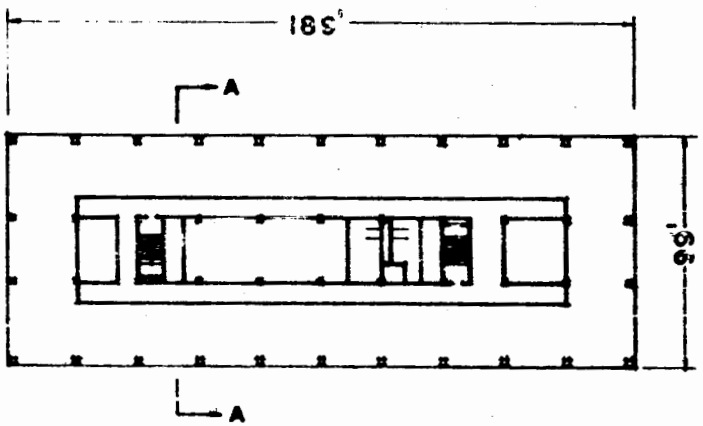


PERSPECTIVE



FLOOR PLAN

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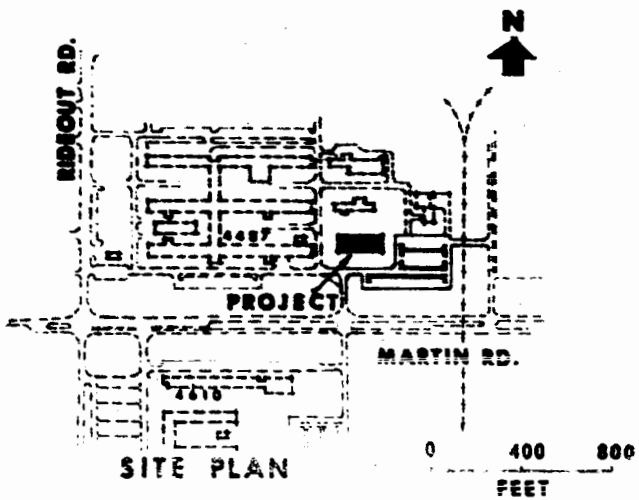

SITE PLAN

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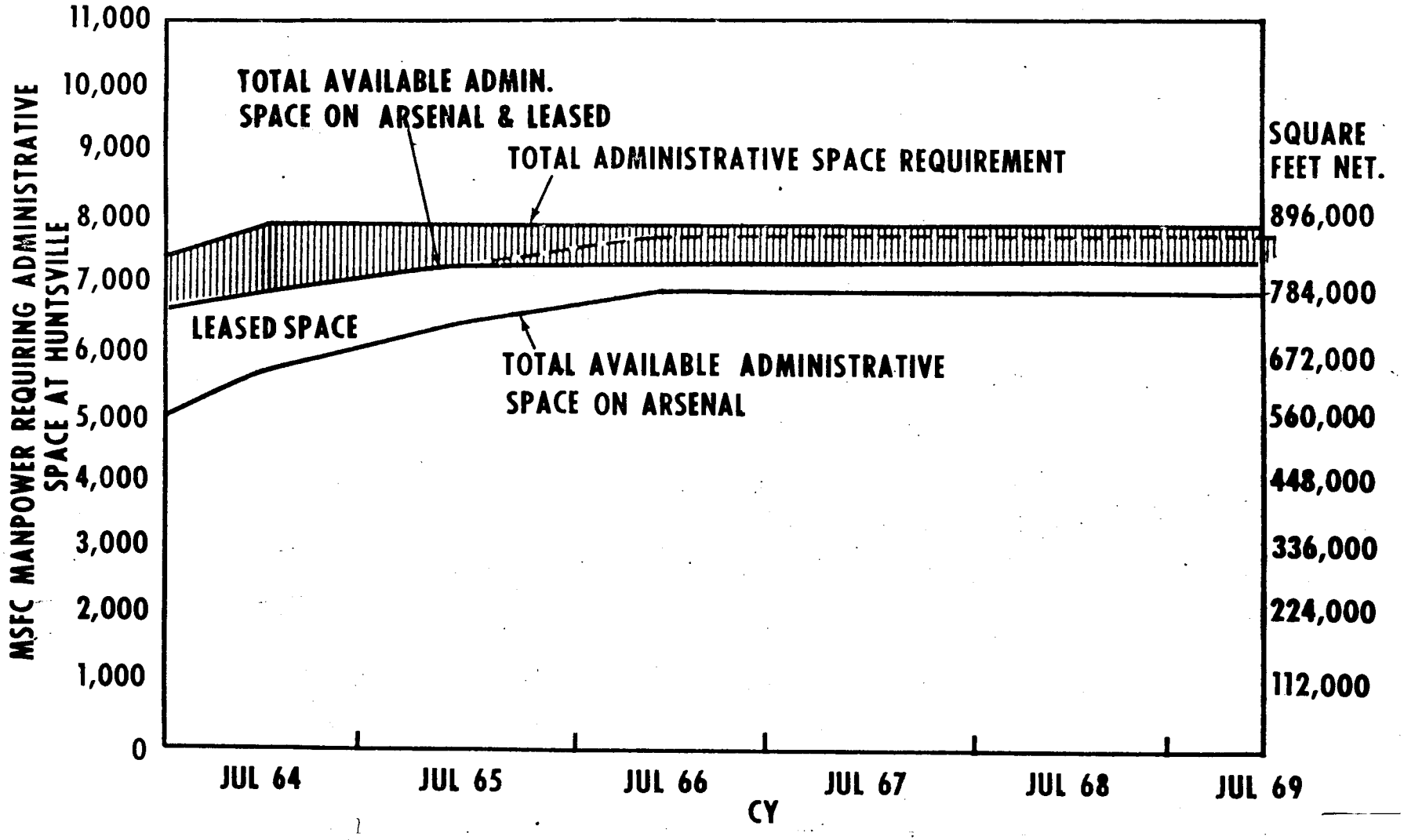
FEET

MARSHALL SPACE FLIGHT CENTER

ADMINISTRATIVE SPACE REQUIREMENTS VS AVAILABLE



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Michoud Plant	Manned Space Flight	New Orleans, La.	Orleans Parish	New Orleans

INSTALLATION MISSION

The mission of the Michoud Plant is the manufacturing of the booster stage for the Saturn family of launch vehicles.

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL *(End of Year)*	281	312	320
CONTRACTOR & OTHER PERSONNEL	8,865	9,790	9,454
TOTAL ALL PERSONNEL	9,146	10,102	9,774

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	839	
LAND *(Lease or Permit)*	72	
PLANT VALUE *(as of June 30, 1964)*		100,651
TOTAL	911	100,651

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1964 AND PRIOR YEARS	FY 1965 *(Estimated)*	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Improvements to the Storm Drainage System	MSF	8.0	16.5	300.0	--	324.5
TOTAL FOR PROJECTS IN FY 1966 ESTIMATE				300.0		

NASA FORM 1029 DEC 63

GPO 870-099

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Michoud Plant	Construction of Facilities	Improvements to Storm Drainage System

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Michoud Plant

LOCATION OF PROJECT: New Orleans, Orleans Parish, Louisiana

COGNIZANT NASA INSTALLATIONS: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$8,000
FY 1965 Estimate	16,500
FY 1966 Estimate	300,000
Total Funding Through FY 1966	$324,500

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$300,000
Equipment	---	---	---	---

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Michoud Plant	Construction of Facilities	Improvements to Storm Drainage System

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Design	---	---	--	---
			TOTAL	$300,000

PROJECT DESCRIPTION:

This project provides storm drainage improvements in support of existing facilities at the Michoud Plant such as the manufacturing building, the final stage checkout building, the high pressure test building, roads and parking areas.

The present drainage system for Michoud includes a series of open ditches and drain pipes leading to catch basins and reservoirs. From the reservoirs the water is pumped over a levee into a canal. A minimum level of water is retained in the reservoirs to supplement the Michoud fire protection system.

This work will include: rehabilitation of the east and south storage reservoirs adjacent to the levees; replacing deficient drain lines; constructing new open ditches to carry storm drainage to the reservoirs; constructing new drain lines and catch basincs to connect with the new ditches; filling and grading areas adjacent to the new ditches and existing reservoirs in order to improve the storm run-off; and seeding and sodding the graded areas to control erosion.

PROJECT JUSTIFICATION:

The New Orleans area, where Michoud is located, is subject to heavy rainfall. Weather Bureau records, based on a 15-year frequency, show that the average annual rainfall is 64 inches; the maximum rate is 13.7 inches in a 24-hour period and 3.4 inches in a one-hour period. The area is also subject to tropical storms occurring at a frequency of once every two years. To complicate the problem, the Michoud area is flat with minimal natural drainage features. Heavy precipitation falling on such flat terrain has caused silt and sludge to accummulate within the existing storm drainage system, thereby reducing its effectiveness. Ponding in large areas within the Michoud property is also evident throughout the year.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Michoud Plant	Construction of Facilities	Improvement to Storm Drainage System

SUPPORTING DATA:

This project is required to rehabilitate the existing system by replacing inoperative drains, cleaning the sludge, grading the ponded areas as well as constructing new open ditches to increase the effectiveness of the overall system. Some corrective drainage work was done in the past three years within available maintenance funds and in support of new construction. However such work was minimal and was limited to keeping the ditches open and meeting the immediate construction requirement.

Without this work, a potential hazard exists that excessive rainfall from a storm can inundate the ground floors of buildings and roads, thereby causing great damage to plant and equipment.

ESTIMATED FUTURE YEARS FUNDING: None

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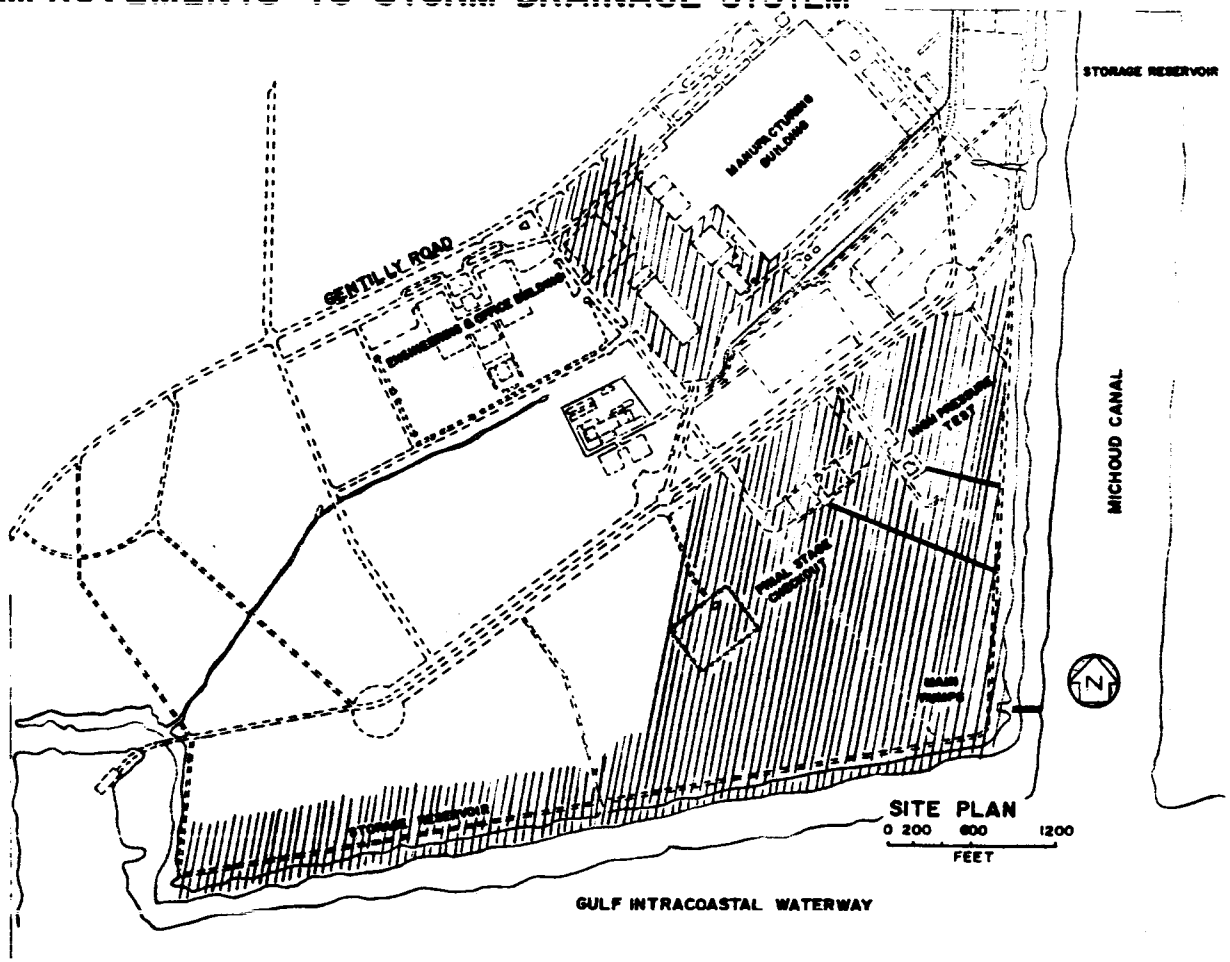
MICHOUD OPERATIONS

FISCAL YEAR 1966 ESTIMATES

IMPROVEMENTS TO STORM DRAINAGE SYSTEM



LEGEND:

AREAS TO BE REWORKED

DRAINAGE DITCHES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

ASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Mississippi Test Facility	Manned Space Flight	Pearl River, Miss.	Hancock	Bay St. Louis, Miss.

NSTALLATION MISSION

The mission of Mississippi Test Facility is the static test firing of large vehicle stages and propulsion systems.

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL *(End of Year)*	43	126	146
CONTRACTOR & OTHER PERSONNEL	485	1,250	2,539
TOTAL ALL PERSONNEL	528	1,376	2,685

INVENTORY		
ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	26,624	
LAND *(Lease or Permit)*	115,326	
PLANT VALUE *(as of June 30, 1964)*		57,103
TOTAL	141,950	57,103

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1964 AND PRIOR YEARS	FY 1965 *(Estimated)*	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Addition to S-II Stage Checkout & Storage Fac.	MSF	---	4,748.7	1,177.0	---	5,925.7
General Support Facilities	MSF	8.0	52.0	944.0	---	1,004.0
TOTAL FOR PROJECTS IN FY 19	ESTIMATE			2,121.0		

NASA FORM 1029 DEC 63

GPO 870-099

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Mississippi Test Facility	Construction of Facilities	Addition to S-II Stage Checkout and Storage Facility

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Mississippi Test Facility

LOCATION OF PROJECT: Pearl River, Hancock County, Mississippi

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION: Addition

FUNDING:

FY 1964 and Prior Years	-----
FY 1965 Estimate	4,748,700
FY 1966 Estimate	1,177,000
Total Funding Thru FY 1966	$5,925,700

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$ 970,900
Site Development	LS	---	13,800	13,800

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Mississippi Test Facility	Construction of Facilities	Addition to S-II Stage Checkout and Storage Facility

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Vertical Checkout Bay (125 ft. high - 6 floors @ 60 X 63 ft.)	Sq. Ft.	22,680	42.20	957,100
Equipment	---	---	---	206,100
Design	---	---	---	---
Fallout Shelter	---	---	---	---
		TOTAL		$1,177,000

PROJECT DESCRIPTION:

This project provides for the construction of a second vertical checkout bay for the post-static checkout of the S-II stage. The structure, 125 feet high, will be designed for hurricane wind velocities. The wall panels will be designed to resist fragmentation damage in case of vehicle tank rupture under pressure. Sliding doors, 115 feet high, will be provided to permit stage entry in the vertical position. Requirements include five movable work platforms, a three-ton traveling overhead crane, a stage checkout dolly and technical systems.

PROJECT JUSTIFICATION:

This facility is required to provide post-static checkout tests as the final phase of acceptance testing of S-II stages. The checkout to be accomplished is considered a vital phase in establishing stage flight readiness since it will be the last complete checkout of the S-II stage prior to flight from Cape Kennedy.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Mississippi Test Facility	Construction of Facilities	Addition to S-II Stage Checkout and Storage Facility

SUPPORTING DATA:

The tests consist of: mechanical systems checks, electrical systems checks, individual component checks, systems integration checkout, sequence tests, leak checks, hydrogen tank insulation check, S-1C/S-II interstage electrical integrity checkout, telemetry checkout, refurbishment of the S-II stage, rework and corrections as necessary as a result of the above tests, and recalibration of the ground support equipment. Time required for these checks is estimated to be three to four months per stage.

To accomplish these tests, two vertical checkout bays are required. The first was funded in fiscal year 1965. The second vertical bay is required and must be funded in fiscal year 1966 in order to be available in May 1967 for the post-static checkout of the S-II-5 flight stage. At that time, the S-II-4 stage will be undergoing checkout in the first bay. From this time on, the two vertical bays are required to meet the planned delivery schedules.

ESTIMATED FUTURE YEAR FUNDING: None

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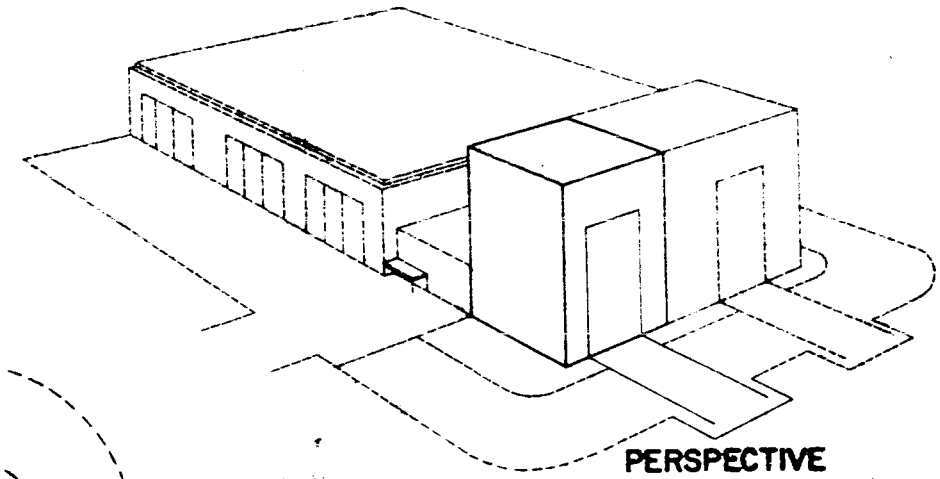
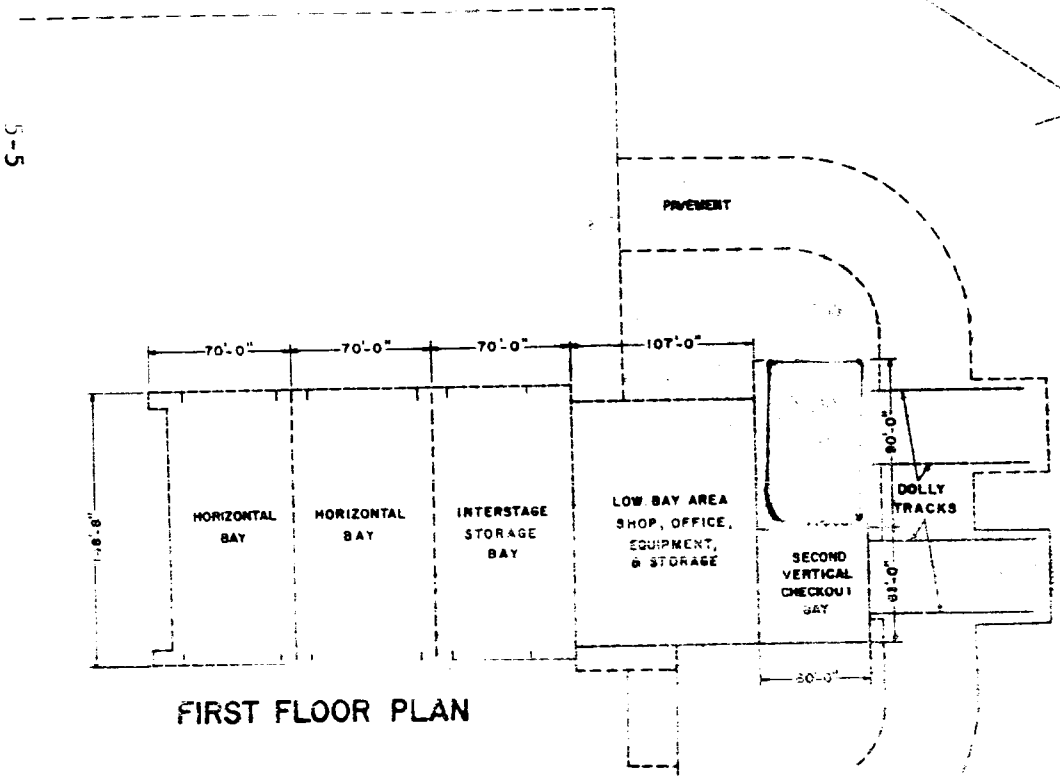
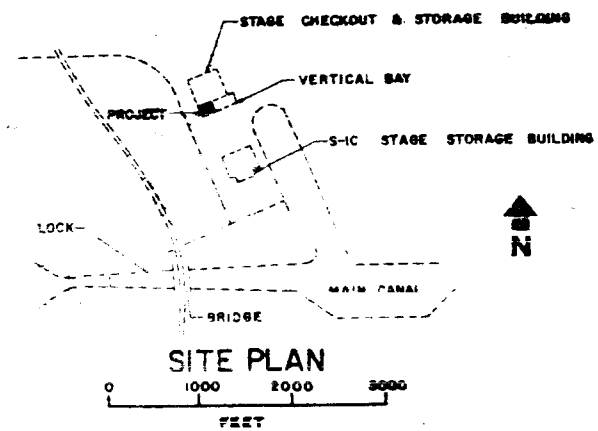
MISSISSIPPI TEST OPERATIONS

FISCAL YEAR 1966 ESTIMATES

ADDITION TO S-II STAGE CHECKOUT & STORAGE BUILDING







NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Mississippi Test Facility	Construction of Facilities	General Support Facilities

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Mississippi Test Facility

LOCATION OF PROJECT: Pearl River, Hancock County, Mississippi

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$8,000
FY 1965 Estimate	52,000
FY 1966 Estimate	944,000
Total Funding Through FY 1966	$1,004,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$940,000
Liquid Hydrogen Storage Tank	Gallons	500,000	$1.60	800,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Mississippi Test Facility	Construction of Facilities	General Support Facilities

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Railroad Terminal				
Building	SF	1,800	18.00	32,400
Utilities	LS	--	39,600.00	39,600
Railroad	LF	1,000	30.00	30,000
Site Preparation	LS	--	38,000	38,000
Equipment				4,000
Railroad Terminal Equipment	LS	--	--	4,000
Design	--	--	--	--
Fallout Shelter	--	--	--	--
			TOTAL	944,000

PROJECT DESCRIPTION:

This project will provide the following support facilities at the Mississippi Test Facility:

Liquid Hydrogen Storage Tank - This item consists of a 500,000 gallon liquid hdyrogen storage tank, two transfer platforms and associated equipment. The storage tank, its supporting structure, and associated equipment will be designed for blast loading.

Railroad Terminal Building - This facility will be a prefabricated sheet metal structure of about 1,800 square feet. Included will be a concrete floor, railroad track into the building, lockers, toilet, office, small tool room and equipment for basic minatenance and minor repairs. A concrete pit will be provided within the building for inspection and maintenance activities.

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SUPPORTING DATA:

Railroad Spur - This item consists of 1,000 linear feet of railroad from the main track to the railroad terminal building. Also included are drainage culverts and necessary site work.

Utilities - Included in this item will be extension of water and electrical distribution from main utility lines to the railroad terminal building. Sewage treatment will be provided by a septic tank system. A fuel oil storage and dispensing system as well as outside storage for sand will be provided.

PROJECT JUSTIFICATION:

Liquid hydrogen will be transported from a liquid hydrogen plant to the Mississippi Test Facility by barge. In addition to functioning as carriers, the barges will also be used as storage vessels. However, a liquid hydrogen storage tank is required to allow a degree of flexibility in this type of storage and permit a more economical operation for the following reasons:

1. To provide reserve capacity when the barges are being serviced, or in case of damage to one of the barges.

2. To top off partially empty barges, thus reducing the number of trips to the hydrogen plant. A round trip is 80 miles by water and requires 30 hours of barge travel time.

3. To supply liquid hydrogen short term test demands when weather precludes barge movement. Thus testing can proceed on schedule regardless of weather conditions.

4. To provide liquid hydrogen requirements in case of damage to the lock.

Without this facility, testing schedules can be delayed due to adverse weather conditions or damage to barge, lock or any segment of the water transportation system.

A railroad terminal building is required to provide for periodic inspection and minor routine maintenance of the government-owned locomotive which is used for switching within the Fee Area. It will also provide shelter for the

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SUPPORTING DATA:

locomotive when not in use, and a storage area for supplies needed to operate and maintain the locomotive. Movement of the locomotive to and from a distant off-site shop was considered to be an expensive and time-consuming alternative for the performance of minor day-to-day maintenance function. Consideration was also given to contracting for switching services with Southern Railway System. However, the company has indicated no desire to provide these services.

ESTIMATED FUTURE YEAR FUNDING: None

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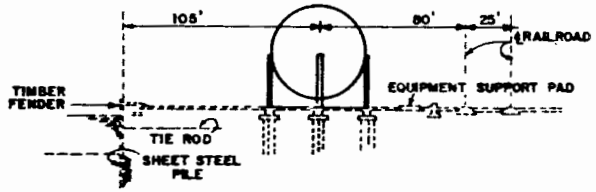
MISSISSIPPI TEST OPERATIONS

FISCAL YEAR 1966 ESTIMATES

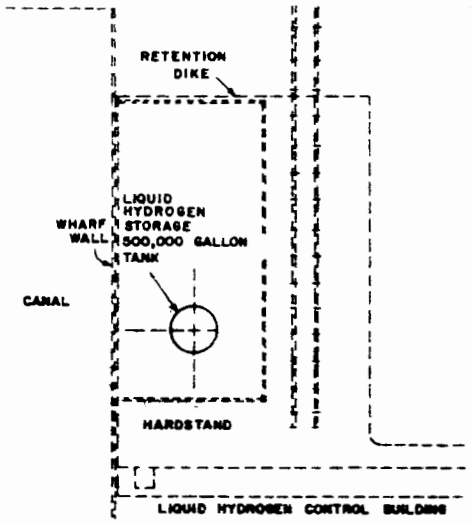
GENERAL SUPPORT FACILITIES



TYPICAL SECTION

AT STORAGE TANK

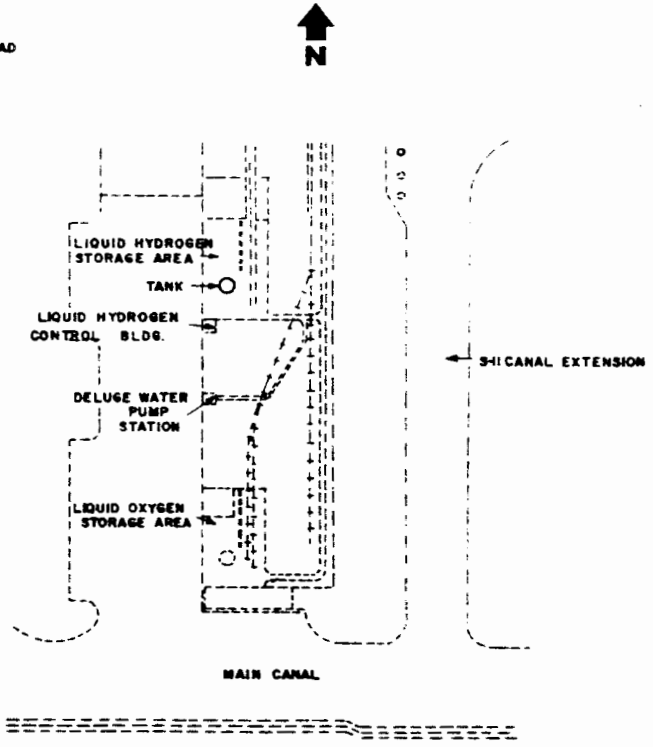
NO SCALE



PLAN

0 100 200

SCALE IN FEET



SITE PLAN

0 400 800

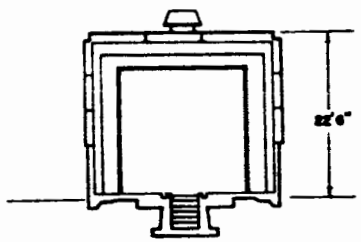
SCALE IN FEET

LIQUID HYDROGEN RECEIVING STORAGE

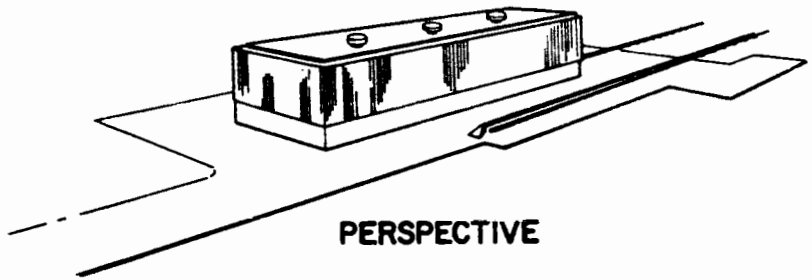
MISSISSIPPI TEST OPERATIONS

FISCAL YEAR 1966 ESTIMATES

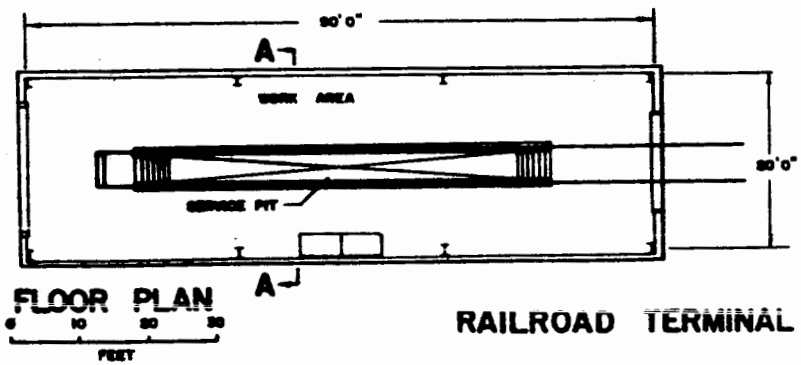
GENERAL SUPPORT FACILITIES



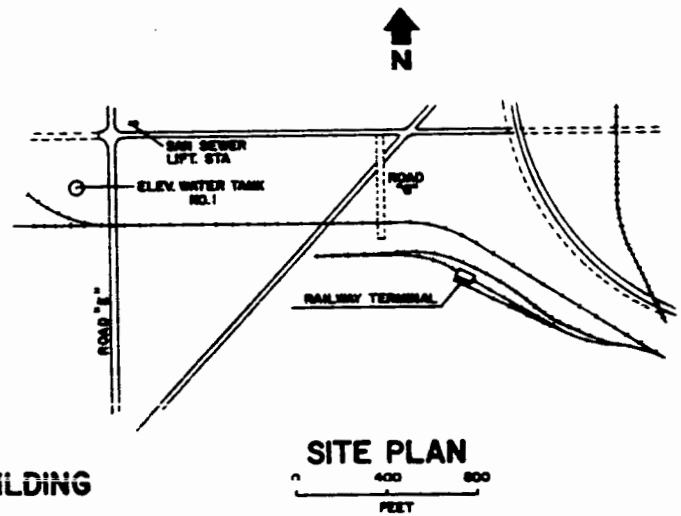
SECTION A-A



PERSPECTIVE



FLOOR PLAN



SITE PLAN

RAILROAD TERMINAL BUILDING

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Goddard Space Flight Center	Space Science & Applications	Greenbelt, Maryland	Prince Georges	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 the moon). In addition, the Center manages NASA's Delta rocket and two world-wide tracking, data acquisition and data reduction networks.

PERSONNEL STRENGTH	FY 19 64	FY 19 65	FY 19 66
NASA PERSONNEL *(End of Year)*	3,675	3,725	3,958
CONTRACTOR & OTHER PERSONNEL	1,892	2,314	2,491
TOTAL ALL PERSONNEL	5,567	6,039	6,449

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	530	
LAND *(Lease or Permit)*	652	
PLANT VALUE *(as of June 30, 19)*		118,739
TOTAL	1,182	118,739

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1964 AND PRIOR YEARS	FY 1965 *(Estimated)*	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated*	TOTAL ALL YEARS *(Estimated)*
NASA Space Sciences Data Center	OSS&A	50	150	3,450	---	3,650
Addition to Research Projects Laboratory	OSS&A	50	110	2,230	---	2,390
Utility Installations	OSS&A	15	30	1,030	---	1,075
TOTAL FOR PROJECTS IN FY 1966 ESTIMATE				6,710		

NASA FORM 1029 DEC 63

GPO 868-667

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	NASA Space Science Data Center

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Goddard Space Flight Center

LOCATION OF PROJECT: Greenbelt, Prince Georges County, Maryland

COGNIZANT NASA INSTALLATION: Goddard Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$50,000
FY 1965 (Estimate)	150,000
FY 1966 (Estimate)	3,450,000
Total Funding through FY 1966	$3,650,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$2,890,000
Building	SF	100,000	$25.00	2,500,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 [illegible]

NAME OF INSTALLATION: Goddard Space Flight Center

APPROPRIATION: Construction of Facilities

PROGRAM OR PROJECT: NASA Space Science Data Center

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Raised Floor System	SF	3,000	$5.00	15,000
City Water Lines	LS	---	19,500	19,500
Chilled Water Lines	LS	---	78,000	78,000
Steam Lines	LS	---	48,000	48,000
Sanitary & Storm Sewers	LS	---	47,500	47,500
Electrical Power & Communications	LS	---	53,000	53,000
Roads, Walks, Parking	LS	---	129,000	129,000
Equipment				560,000
Data Retrieval	LS	---	475,000	475,000
Microfilm and Reproduction	LS	---	85,000	85,000
Design			---	---
For Construction	LS	---	---	---
Fallout Shelter*	---	---	---	---
		TOTAL		$3,450,000

*Based on a recent GSFC fallout shelter survey, adequate shelter areas in buildings existing or under construction are available to house the projected population of the Center.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	NASA Space Science Data Center

SUPPORTING DATA:

PROJECT DESCRIPTION:

This project proposes the construction of a NASA Space Science Data Center to be located north of the Applied Sciences Laboratory, Building #2 at the Goddard Space Flight Center. The Data Center will be approximately 100,000 square feet of area consisting of a ground floor and two additional floors, half of the area utilized for the Data Center Activities and the balance as office space for Center personnel. The construction of the office area is such that conversion of the entire building to Data Center Activity can be readily accomplished with a minimum of cost. The facility will be of concrete and steel construction having masonry walls and masonry and steel partitions and conform to the existing architectural design of the Center. Raised flooring for the installation of cableways for electronic computers, data handling equipment and associated areas is required for efficient operation and low maintenance costs. Air-conditioning will be installed to control temperature and humidity in the data handling and storage areas. Data retrieval, microfilm and reproduction equipment is also included in this project. Offices, including those set aside for study and resident research personnel, and parking facilities will be provided for approximately 450 personnel. By extending existing utilities, the necessary electrical, chilled water, steam and drainage systems will adequately support the proposed facility.

PROJECT JUSTIFICATION:

The National Aeronautics and Space Administration under its original implementing act is required to effect the widest possible dissemination of the results of all its research and development projects internally and to the scientific community. In the past and at present, large accumulations of scientific satellite data have been and are resulting in significant space science discoveries. However, no facility has been established for the control and utilization of much of this valuable and voluminous data. Although space science experiment information is available from various sources to interested personnel there is no single point source existing where the information accumulated from these experiments can be used in cooperation with other data centers, observatories, universities and experimenters to effectively communicate to the scientific community and NASA scientists useful scientific data information. This task has been assigned by the NASA to the Goddard Space Flight Center and to initiate this assigned function, it is necessary that an appropriate facility be

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SUPPORTING DATA:

PROJECT JUSTIFICATION: (Continued)

established to provide the capability for present and foreseeable future requirements. The Space Science Data Center proposed herein will serve as a national repository and dissemination point for all NASA sponsored space science research data. This facility will enable the acquisition, organization, storage and retrieval of this data for dissemination internally and to the scientific community.

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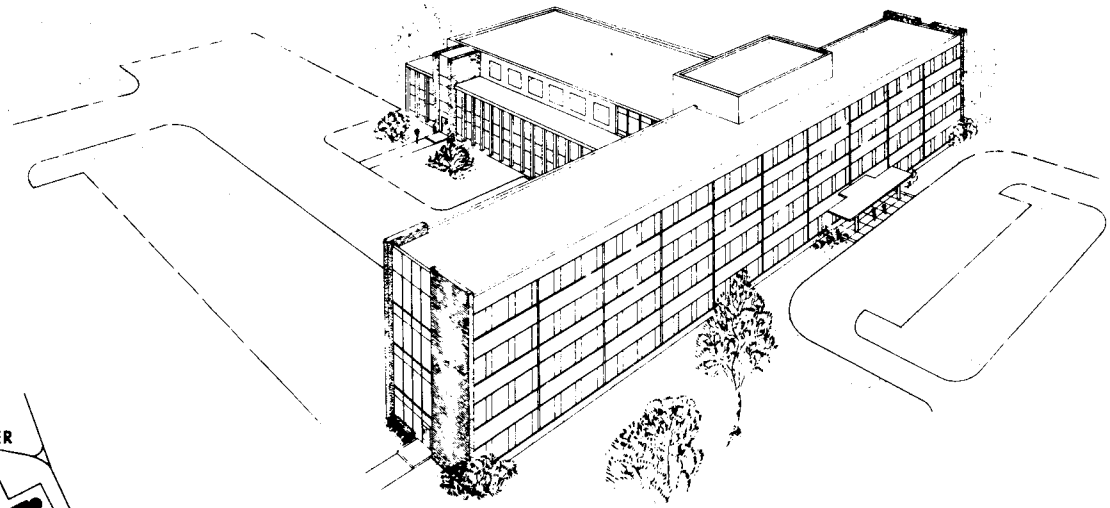
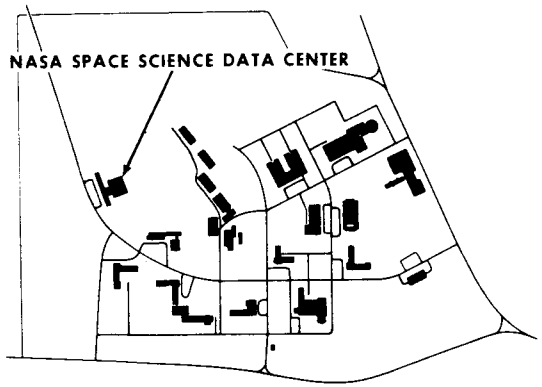
GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1966 ESTIMATES

NASA SPACE SCIENCE DATA CENTER



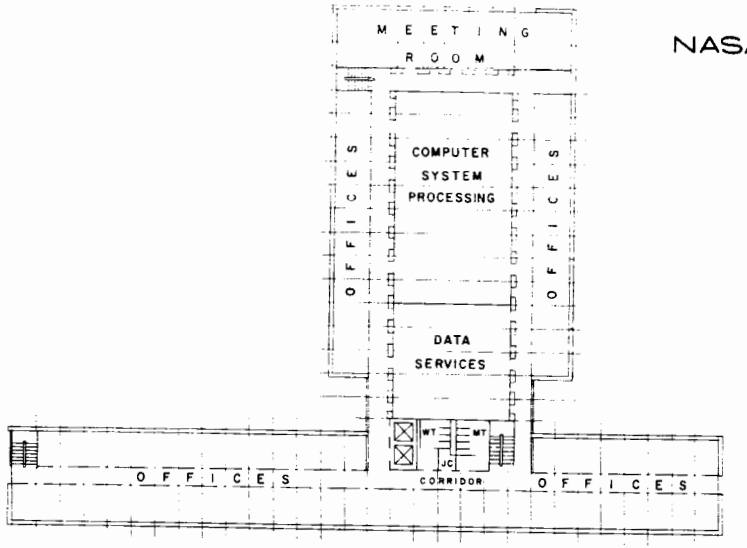
PERSPECTIVE



LOCATION PLAN

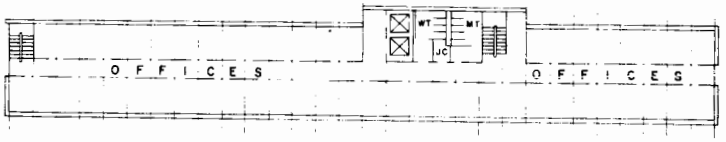
FISCAL YEAR 1966 ESTIMATES

NASA SPACE SCIENCE DATA CENTER

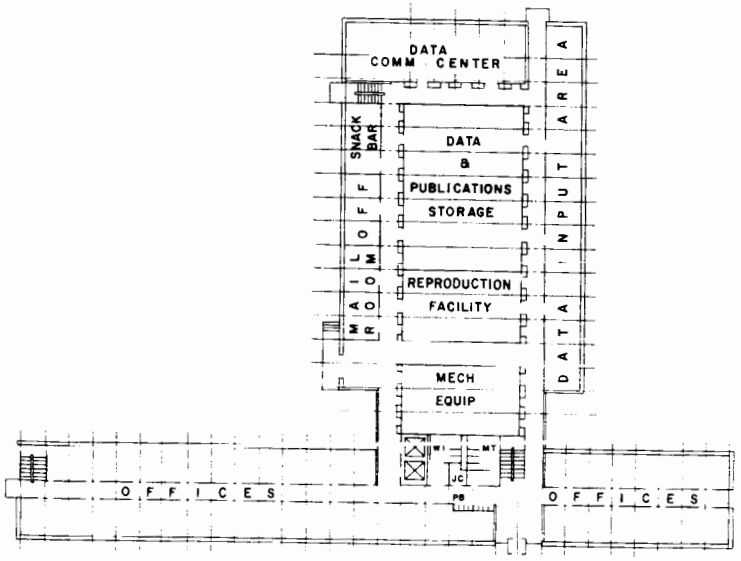


SECOND FLOOR PLAN

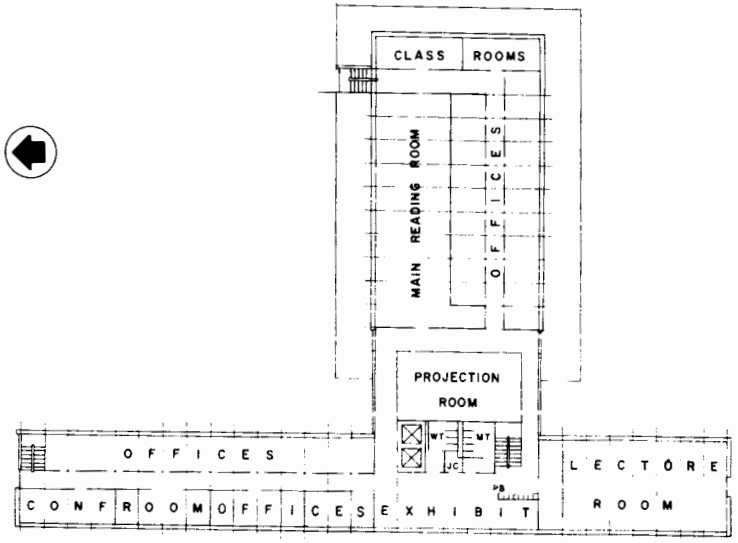
ELEVATION- LOOKING NORTH



FOURTH FLOOR PLAN



FIRST FLOOR PLAN



THIRD FLOOR PLAN

0 50 100
GRAPHIC SCALE IN FEET

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Addition to Research Projects Laboratory

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Goddard Space Flight Center

LOCATION OF PROJECT: Greenbelt, Prince Georges County, Maryland

COGNIZANT NASA INSTALLATION: Goddard Space Flight Center

TYPE OF CONSTRUCTION: Extension

FUNDING:

FY 1964 and Prior Years	$ 50,000
FY 1965 (Estimate)	110,000
FY 1966 (Estimate)	2,230,000
Total Funding thru FY 1966	$2,390,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Addition to Research Projects Laboratory

SUPPORTING DATA:

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,600,000
Research Projects Laboratory Addition	SF	50,000	$30.00	1,500,000
City Water Lines	LS	---	1,500	1,500
Chilled Water Lines	LS	---	15,000	15,000
Steam Lines	LS	---	8,000	8,000
Sanitary & Storm Lines	LS	---	6,000	6,000
Gas Lines	LS	---	5,500	5,500
Electric Power & Communication	LS	---	35,000	35,000
Duct Banks	LS	---	15,000	15,000
Roads, Walks, & Parking	LS	---	14,000	14,000
Equipment				630,000
Analysis Equipment for Extra-Terrestrial Material	LS	---	200,000	200,000
X-Ray Optics System	LS	---	80,000	80,000
Heliostat	LS	---	50,000	50,000
Mod. & Relocation of Existing Dust Particle Accelerator	LS	---	300,000	300,000
Design For Construction	LS	---		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Addition to Research Projects Laboratory

SUPPORTING DATA:

PROJECT COST ESTIMATE: (Continued)

	Unit of Measure	Quantity	Unit Cost	Total Cost
Fallout Shelter*	---	---	---	---
		TOTAL		$2,230,000

* Based on a recent GSFC Fallout Shelter Survey, adequate shelter areas in buildings existing or under construction are available to house the projected population of the Center.

PROJECT DESCRIPTION:

It is proposed to construct a facility of approximately 50,000 square feet of floor area in a ground floor and two additional floors to be located contiguous to the Research Projects Laboratory, Building No. 2. The building will be of concrete and steel construction having masonry walls and interior partitions of steel and cement masonry. Some of the special features required for this facility include a heliostat and dome, mounted on the roof, with a direct optical path to the X-ray Imaging laboratory, high capacity vacuum pumps for several laboratories, cryogenic system to support the low temperature chemistry facility, computer areas, photographic darkrooms, and conference rooms. Shielding, heating, ventilating and air-conditioning systems, and other safety features associated with particle acceleration and radio-chemistry will be included in the design of this facility. Offices, laboratories and parking spaces will be provided to accommodate approximately 110 people. By extending existing utility services to the building, all necessary electrical, chilled water, gas, domestic water, steam and drainage systems will be provided to adequately support the building occupancy.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Addition to Research Projects Laboratory

SUPPORTING DATA:

PROJECT JUSTIFICATION:

Space Science investigations to date have resolved many questions. They have also pointed the way to the further investigations required to understand the processes in the sun, solar-terrestrial relations, radiation in space, and other facets of space science. For some of these forthcoming investigations the facilities for the development and calibration of the required instruments are either in existence or being built. For others, however, new facilities are required. It is the purpose of this project to satisfy the latter requirement and provide unique capabilities in the fields of:

(1) X-Ray imaging systems such as those planned for the Advanced Orbiting Solar Observatory (AOSO)

(2) Detectors for high velocity cosmic dust capable of studying the composition of these particles

(3) Analysis of extra-terrestrial particles such as tektites, micrometeorites, and cosmic dust

(4) Ultra-violet payload calibration

Associated with these unique capabilities will be:

(a) A heliostat to give the solar spectrum in the laboratory

(b) A low temperature chemistry facility to study the formation of cosmic dust.

As indicated above, the proposed facility will provide the equipment and/or space required in four (4) major fields of space science. A concise description of the effort planned in these fields and its importance is as follows:

One major portion of the facility will provide a means for developing and calibrating X-ray telescopes to be used in studying extra-terrestrial sources of which the sun is the strongest. As the solar X-rays are known to be intimately related to solar flares, their study will contribute to our understanding of flares and other processes on the sun. For this reason an X-ray telescope to image the sun is planned for the first AOSO. To align and

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PROJECT JUSTIFICATION: (Continued)

calibrate these telescopes a source of parallel X-ray having wave lenghts between 1 Å and 400 Å is required. The proposed facility will supply the means to meet this requirement and to check-out grazing incidence optics such as those to be used on AOSO. In addition, X-rays have recently been discovered originating from unknown sources in space. It is possible that investigation of these sources with X-ray telescopes may reveal information of the origin of cosmic rays and of stellar evolution.

A second major area which will be supported by this facility is concerned with the detection, collection, and laboratory studies of extra-terrestrial matter. Required are the kinematical, physical, and chemical characteristics of particulate matter in space in order to investigate both the origin of the solar system and of the particles themselves. To accomplish this requires definitive space flight experiments which can only be conducted if the capability exists to simulate the velocities, sizes, and composition of these particles. At present the Center has a two million volt VanDer Graaf accelerator specifically designed for the acceleration of dust particles. It is one of two such accelerators in the country. Included in this project are funds for the modification of this machine, which will consist of raising the energy level from 2 MEV to 20 MEV by constructing a small linear accelerator and using the VanDer Graaf as an injector. When modified the instrument will be capable of accelerating masses in the range of 10^{-13} to 10^{-7} grams to velocities in the range of 1 KM per second to 35 KM per second. The proposed modification is necessary since studies have indicated that particles in space have a minimum velocity of 11 KM per second with respect to the earth.

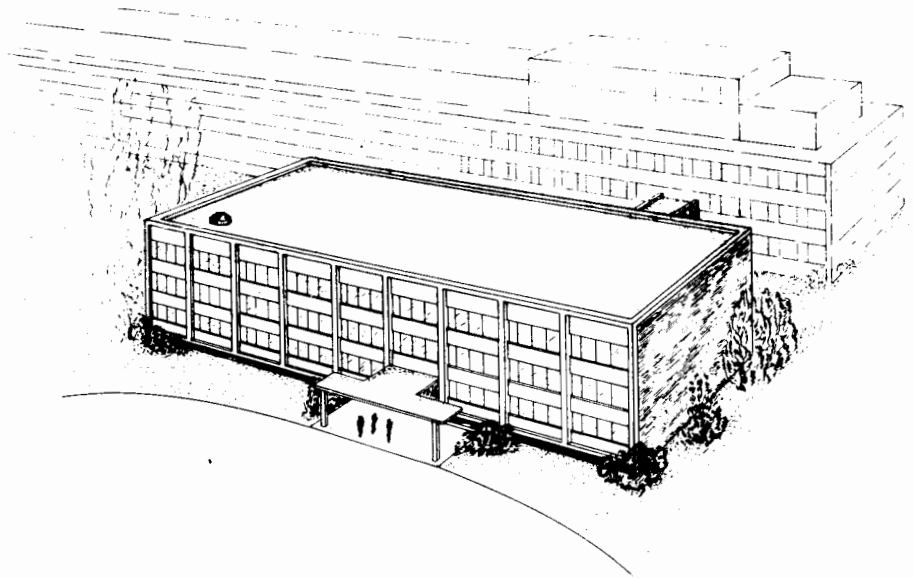
A third major part of this facility is to provide the means for the analysis of samples of the lunar surface and other extra-terrestrial matter and the study of the methods of formation of these particles in space. The sample analysis capability furnished under this project will enable scientists to carry out experimental research on particles such as meteorites, tektites and cosmic dust with the long range goal of conducting detailed studies of lunar samples that will be brought back on Project Apollo. To understand how such aggregates of particulate matter particles can evolve in space and what their composition means in terms of their origin, low temperature and pressure chemistry facilities are required.

The fourth major part of the facility will be used in direct support of the Sounding Rocket Program and to some extent in support of OAO. This portion of the building will provide space for a vacuum tank in which payloads can be placed and calibrated as a function of wave length in the ultra-violet range.

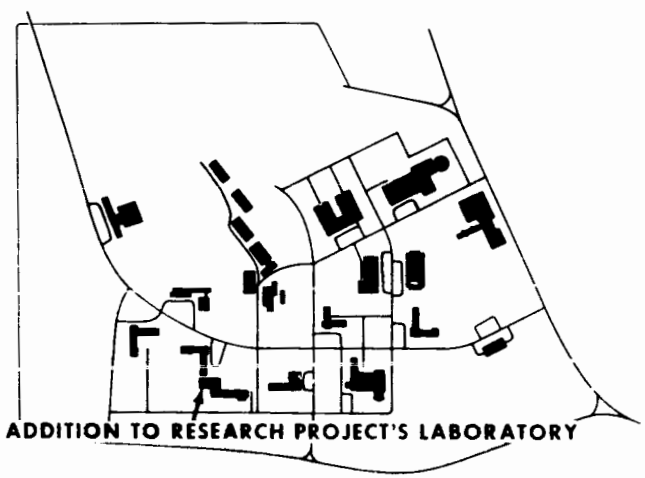
GODDARD SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

ADDITION TO RESEARCH PROJECTS LABORATORY



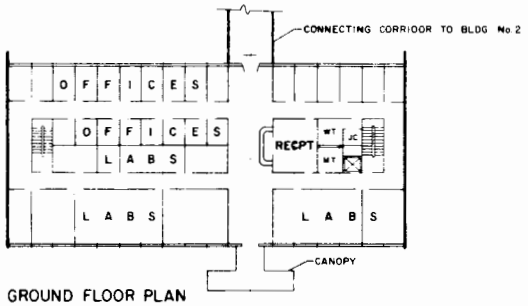
PERSPECTIVE



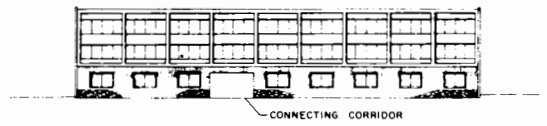
LOCATION PLAN

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1966 ESTIMATES

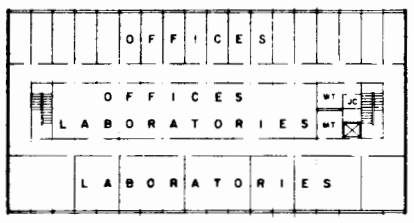
ADDITION TO RESEARCH PROJECTS LABORATORY



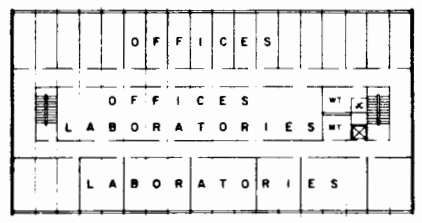
GROUND FLOOR PLAN



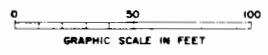
ELEVATION - LOOKING NORTH



FIRST FLOOR PLAN



SECOND FLOOR PLAN



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Utility Installation

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Goddard Space Flight Center

LOCATION OF PROJECT: Greenbelt, Prince Georges County, Maryland

COGNIZANT NASA INSTALLATION: Goddard Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ 15,000
FY 1965 (Estimate)	30,000
FY 1966 (Estimate)	1,030,000
Total Funding through FY 1966	$1,075,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Utility Installation

SUPPORTING DATA:

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$ 120,000
Building Modification including Air-Conditioning and Electrical Systems	LS	---	$120,000	120,000
Equipment				910,000
Diesel Generators	LS	---	150,000	150,000
Electrical Switchgear and Accessories	LS	---	100,000	100,000
Electric Sub-station	LS	---	660,000	660,000
Design				
For Construction	LS	---	---	---
Fallout Shelter	---	---	---	---
			TOTAL	$1,030,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Utility Installation

SUPPORTING DATA:

PROJECT DESCRIPTION:

This project provides for the following items:

Increased Reliability for Computer Systems - The installation of diesel generators and modifications to electrical and air-conditioning systems to accommodate increased reliability requirements of computer systems in the Central Flight Control and Range Operations Laboratory (Building No. 3) and the Spacecraft Operations Facility (Building No. 14). The diesel generators will be installed in the diesel room in the basement of the Central Power Plant adjacent to the existing diesel generators that are presently used for back-up power. The switchgear and all auxiliary equipment required for the operation of the plant will be installed as originally planned in the initial design of the power plant.

Purchase of Electric Substation - Funds are included under this project to purchase the presently leased substation at the Goddard Space Flight Center. The substation is currently owned by the Potomac Electric Power Company and consists essentially of the following components:

1. A steel structure for terminating two (2) incoming 33 KV Feeders.

2. An outdoor type oil circuit breaker for each incoming feeder.

3. An outdoor type high voltage bus and switching structure

4. Four (4) transformers; two (2) 5000/6250 KVA for conversion to 4,160 voltage, and two (2) 15000/20000 KVA for conversion to 13,800 voltage

5. Outdoor type metal clad switchgear for the distribution of both 4,160 and 13,800 volt power.

All necessary auxiliary equipment such as circuit breakers, controls, metering, protective equipment, and automatic features are included in the switchgear equipment.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Utility Installation

SUPPORTING DATA:

PROJECT JUSTIFICATION:

The most critical component of the NASCOM network is the switching system. Failure of the switching system would completely immobilize the NASCOM network; therefore, two identical Univac 490 switching systems are being installed to operate in parallel, thus eliminating equipment failure as a source of network failure. It is planned that during critical missions one 490 would operate on commercial power, the other on diesel power. With this arrangement, failure of either power source would not cause the switching system to fail. During non-mission time, both 490's would operate on commercial power.

The following tabulations illustrate the utilization of existing and new generators:

DIESEL GENERATORS
EXISTING LOADS

Manned Space Flight Tracking Computers, Building No. 3	150 KW
1 Univac 490 Switching System	100 KW
Computer and Communications Air-Conditioning Systems	300 KW
	550 KW

In addition to the loads shown above, approximately 30 KW is for the Nimbus facility, but this load should not be required at the same time the Manned Space Flight Computers are operating under critical coverage.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Utility Installation

SUPPORTING DATA:

PROJECT JUSTIFICATION: (Continued)

The 300 KW shown for air-conditioning systems is required standby to provide acceptable reliability during critical coverage. The two existing 300 KW Diesel units are suitable for these loads.

NEW LOADS

Control Center Branch (2nd floor, Bldg. 14)	200 KW
Data Support Branch (Bldg. 14)	75 KW
Computer and Communication A/C System	250 KW
	525 KW

The 250 KW for air-conditioning systems is required standby to provide acceptable reliability during critical coverage. The two proposed 300 KW Diesel units will be suitable for these new loads.

Now that Center power requirements for the forseeable future have stabilized, the leasing of the electric sub-station is no longer appropriate. Recent cost analysis shows significant advantage to the government over the expected period of use if the sub-station is purchased.

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HOUSING PLAN

Presented on the following pages is the Personnel Housing Plan for the Center. Two separate summary plans are submitted and are identified as Plan "A" and Plan "B". The detail sheets support either plan. The difference in content of plans "A" & "B" is as follows:

PLAN "A"

The personnel housing requirements shown in this plan are in agreement with the current ceilings authorized by OSS&A; i.e., 3,725 in FY 1965 and FY 1966. However, this is a constrained figure and does not reflect the Center's requirements. Goddard's recent letter to Dr. Newell (File #4004, dated Sept. 14, 1964) outlined the actual personnel requirements for FY 1965 and shows a shortage of 140 civil service personnel. As stated in the letter, the Center feels the increase is a necessity to accomplish our current programs. If the civil service ceiling cannot be increased we will be forced to add more contractor personnel. Therefore, the Housing Plan contains the additional personnel requirements in the "Total Contractor and Other" line for FY 1965 and 1966. For FY 1967 and beyond, the figures shown are not constrained and, accordingly, the 140 personnel are deleted from the contractor line.

PLAN "B"

This plan reflects the additional 140 personnel in the "Total NASA" line in FY 1965 and our projected, unconstrained requirements in FY 1966 and beyond.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
WALLOPS STATION	Space Science & Application	Eastern Shore of Virginia	Accomack, Virginia	40 miles Northeast Salisbury, Maryland

INSTALLATION MISSION

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

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL (End of Year)	530	530	530
CONTRACTOR & OTHER PERSONNEL	209	227	223
TOTAL ALL PERSONNEL	739	757	753

INVENTORY

ITEM	ACRES	COST (Thous.)
LAND (Fee)	6,561.3	
LAND (Lease or Permit)	9.4	
PLANT VALUE (as of June 30, 19)		42,978,000
TOTAL	6,570.7	42,978,000

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING (Thousands of dollars) FY 1964 AND PRIOR YEARS	FY 1965 (Estimated)	FY 1966 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Assembly Shop	OSSA	10.0	16.5	443.0	-0-	469.5
Launch Control Building	OSSA	10.0	18.5	605.0	-0-	633.5
TOTAL FOR PROJECTS IN FY 19	ESTIMATE			1,048.0		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
NASA WALLOPS STATION	CONSTRUCTION OF FACILITIES	ASSEMBLY SHOP

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office Space Science & Applications

PROGRAM OFFICE FOR THE PROJECT: Office Space Science & Applications

AUTHORIZATION LINE ITEM: NASA Wallops Station

LOCATION OF PROJECT: Wallops Island, Accomack County, Virginia

COGNIZANT NASA INSTALLATION: NASA Wallops Station

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and prior years	$10,000
FY 1965 (Estimate)	16,500
FY 1966 (Estimate)	$443,000
Total Funding Thru FY 1966	$469,500

PROJECT COST ESTIMATE:

A. LAND ACQUISITION -0-

B. CONSTRUCTION

1. Grading and piling	$ 29,700
2. Water and Sewerage	18,100
3. Electrical distribution	15,800

CONTINUED

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
NASA WALLOPS STATION	CONSTRUCTION OF FACILITIES	ASSEMBLY SHOP

SUPPORTING DATA:

B. CONSTRUCTION, (CONTINUED)

4. Sub-station and	$ 21,200	
5. Roads and loading areas	13,200	
6. Assembly shop (6,500 sq. ft. @ 53.00)	345,000	
		$443,000
C. EQUIPMENT		-0-
D. DESIGN		-0-
E. FALLOUT SHELTER		-0-
	TOTAL	$443,000

PROJECT DESCRIPTION:

This project will provide a 3 bay assembly building in the north launch area of Wallops Island as indicated on the facility plan. The building will provide 6,500 square feet of environmentally controlled space for the assembly and checkout of solid fuel, multi-stage rocket systems and payloads. Door and crane clearances will accommodate the large payload-stage systems such as Wasp that require vertical assembly. The building will be constructed of structural steel, translucent panels, and 12 inch thick reinforced concrete bay separation walls. Floor plan is shown on the facility plan. Utility requirements will be met by interfacing with existing water, sewerage, and power systems.

PROJECT JUSTIFICATION:

The assembly shop is required to alleviate congestion that has been a serious problem for three years in the existing assembly areas, provide a controlled environment capability for temperature and humidity sensitive fuel grains and payloads, and to avoid exceeding the explosive safety rating of the area. The north assembly area supports such OSSA - OART programs as ionospheric physics, energetic particles, geoprobes, aeronomy, Trailblazer, meteor simulation, Wasp, Sert, etc. These experiments and associated vehicles dictate requirements for environment, safety, and space that cannot be met with existing facilities. Continued operation with the present facilities alone will have a detrimental effect on vehicles, payloads, personnel, and launch schedules.

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SUPPORTING DATA:

PROJECT JUSTIFICATION, (CONTINUED)

The proposed assembly shop will provide three isolated bays for separated build-up of individual stages, associated adaptors, and transition sections, and will provide a controlled environment as required. It will eliminate the highly dangerous practice of assembling multiple rocket stages and payload simultaneously in a single area. The existing assembly space is needed for pre-launcher installation checkout of the completed assembly, and storage of rocket handling and test equipment. Vehicles will flow from storage magazines to the proposed assembly bays for build-up of individual stages. The completed stages will then be transferred to either the large bay of the proposed shop or existing area depending on environmental requirements. At this point, the stages will be assembled into a completed vehicle and mated with the payload. Checkouts will be performed and the vehicle installed on the launcher or delivered to the ready storage facility to await launch window and subsequent launcher installation.

ESTIMATED FUTURE YEAR FUNDING:

-0-

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
NASA WALLOPS STATION	CONSTRUCTION OF FACILITIES	LAUNCH CONTROL BUILDING

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office Space Science & Applications

PROGRAM OFFICE FOR THE PROJECT: Office Space Science & Applications

AUTHORIZATION LINE ITEM: NASA Wallops Station

LOCATION OF PROJECT: Wallops Island, Accomack County, Virginia

COGNIZANT NASA INSTALLATION: NASA Wallops Station

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ 10,000
FY 1965 (Estimate)	18,500
FY 1966 (Estimate)	605,000
Total Funding Thru FY 1966	$633,500

PROJECT COST ESTIMATE:

A. LAND ACQUISITION -0-

B. CONSTRUCTION

1. Grading & Piling	$ 28,900
2. Water and Sewerage	3,000

CONTINUED

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
NASA WALLOPS STATION	CONSTRUCTION OF FACILITIES	LAUNCH CONTROL BUILDING

SUPPORTING DATA:

B. CONSTRUCTION, (CONTINUED)

3. Electrical Distribution	18,300	
4. Sub-station	12,400	
5. Roads and parking areas	19,700	
6. Launch Control Building (3,160 sq. ft. @ 58.40)	184,700	
		$ 267,000

C. EQUIPMENT

1. Cabling	115,000	
2. Trays	50,000	
3. Firing circuits	48,000	
4. Checkout consoles	85,000	
5. Control systems	30,000	
		$ 328,000

D. DESIGN

E. FALLOUT SHELTER 10,000

TOTAL $633,500

PROJECT DESCRIPTION:

This project will provide a launch control building in the north launch area of Wallops Island as indicated on the fac lity plan. The building will house the systems and personnel required to perform checkout and launch operations for those experiments launched from pads 4 and 5 The vehicles involved are aerodynamically stabilized unguided, multi-stage, solid-fuel systems utilizing various boosters including the Recruit-augmented Castor (135,000-pound thrust-13,500 pound weight). The facility will consist of a two-level, 3,160 square foot, reinforced concrete building with a stabilized sand surround. Cabling, firing circuits, vehicle-payload checkout consoles, control systems, and range interface equipment will be provided. Utility requirements will be met by interfacing with existing water, sewerage, and power systems.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
NASA WALLOPS STATION	CONSTRUCTION OF FACILITIES	LAUNCH CONTROL BUILDING

SUPPORTING DATA:

PROJECT JUSTIFICATION:

This project is required to relieve an overload condition that has existed for three years in this area. The north launch area supports OSSA and OART flight programs such as radio-attenuation measurements, Trailblazer reentry heat-transfer experiments, space nuclear auxiliary power system, solar-oriented control systems, meteor simulation, Vector solid-fuel rocket control systems, component and system development programs, sounding rockets, and probes. The existing launch control building, which serves four pads and five launchers, is overcrowded on the upper level with two Scout checkout systems, a universal console, RAM console, and associated range interface equipment. The lower level is densely packed with cable entrances, termination racks, trays, and launch programmer. Sufficient floor space is available for access to cable racks and the programmer operator station; however, this space is "shoulder width" and cannot be reduced to accommodate additional equipment. In order to reduce the detrimental operational conditions on the upper level, temporary partitions have been installed to separate operation functions. The partitions ease simultaneous operations cross-talk but contribute to the crowding. The increasing Scout schedule (8 to 12 per year) will require that this launch control building be in use constantly which will have a deleterious effect on other programs if this facility is not provided.

ESTIMATED FUTURE YEAR FUNDING:

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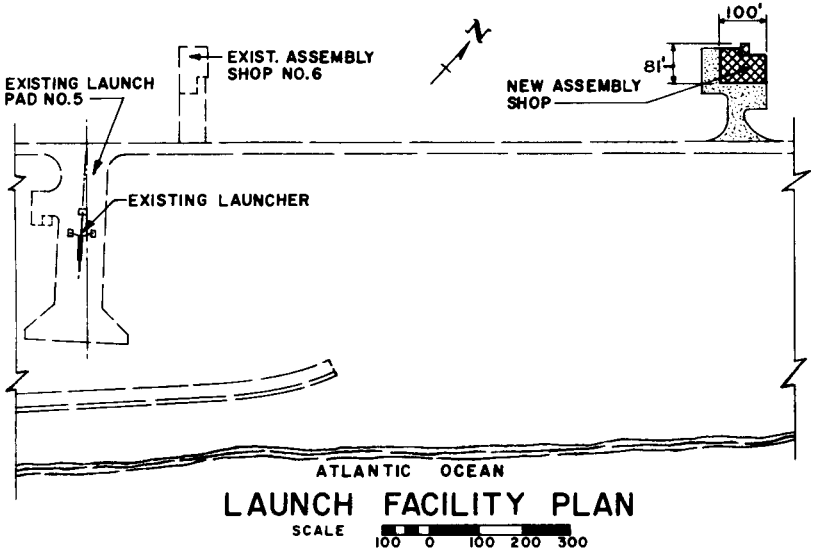
WALLOPS STATION

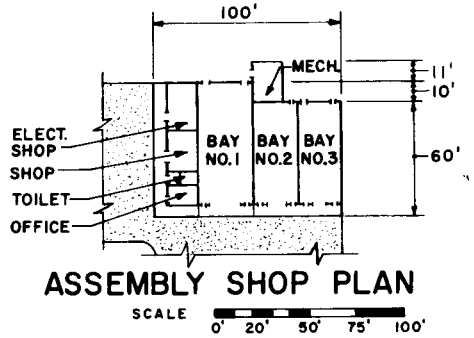
FISCAL YEAR 1966 ESTIMATES

ASSEMBLY SHOP



LAUNCH FACILITY PLAN

SCALE 100 0 100 200 300



ASSEMBLY SHOP PLAN

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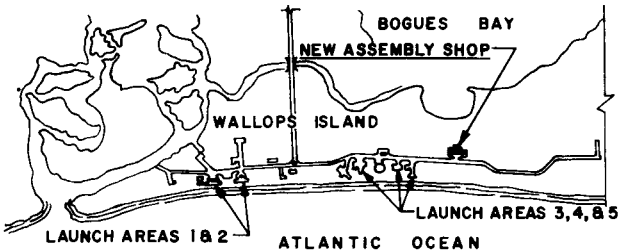
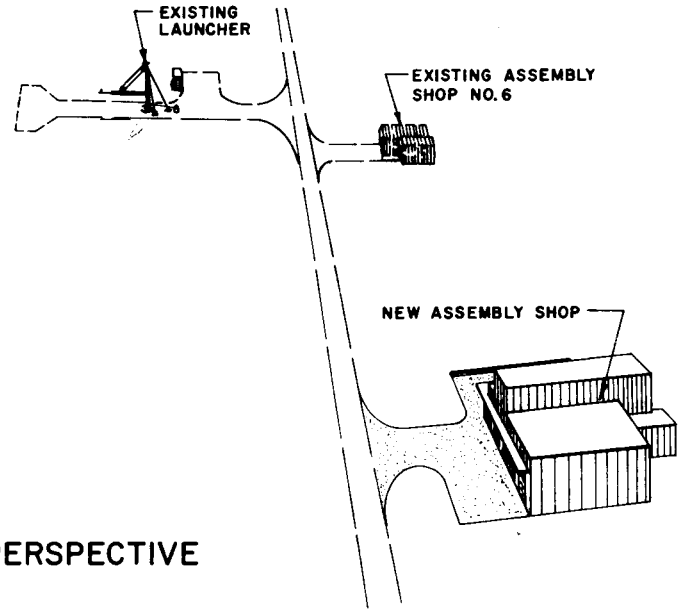


LOCATION PLAN

SCALE 0 1/2 1MI.

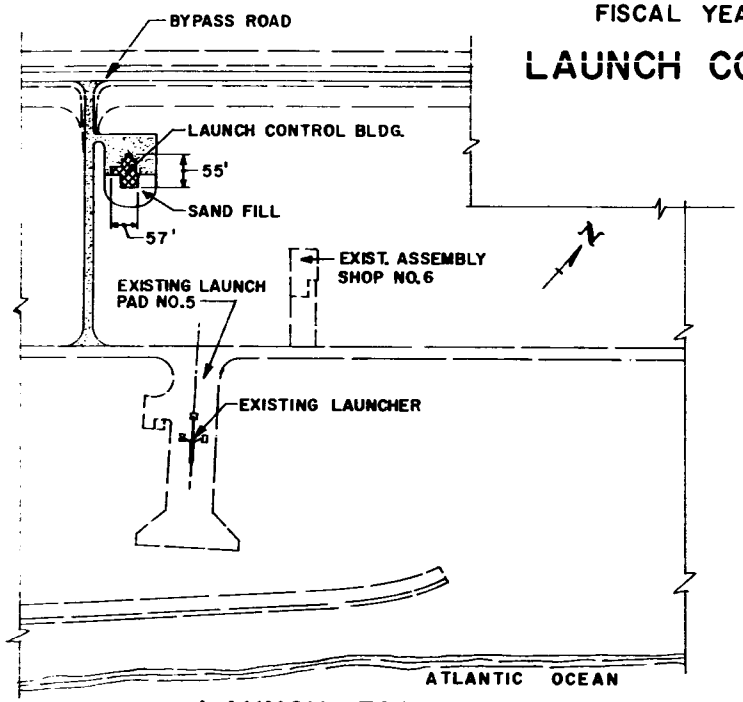


PERSPECTIVE

WALLOPS STATION

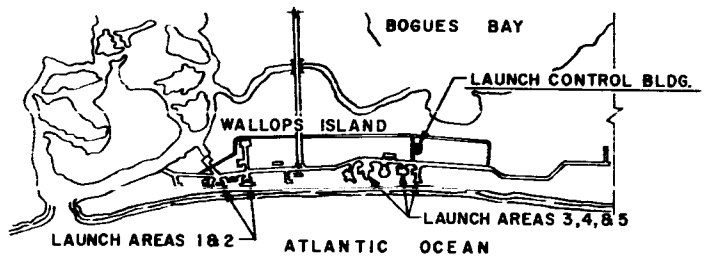
FISCAL YEAR 1966 ESTIMATES

LAUNCH CONTROL BUILDING



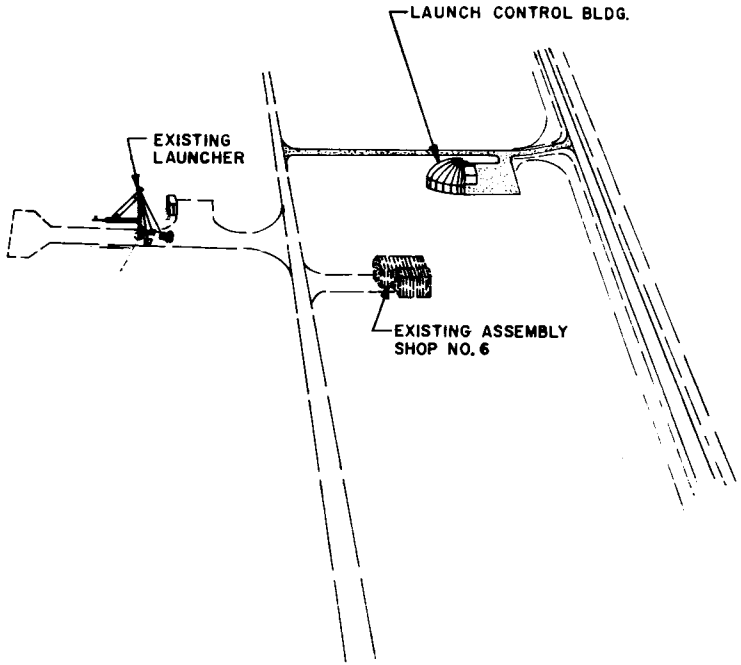
LAUNCH FACILITY PLAN

SCALE 100' 0' 100' 200' 300'



LOCATION PLAN

SCALE 0 1/2 1MI.



PERSPECTIVE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Ames Research Center	Advanced Research and Technology	Moffett Field, Calif.	Santa Clara	Mountain View

INSTALLATION MISSION

Laboratory research in aerodynamics, thermodynamics, materials, structures, guidance and control, space sciences, environmental biology, life detection, life synthesis, human factors, and fundamental physics and chemistry; project management of unmanned spaceflight projects (scientific probes and satellites); development of scientific-experiment payloads for spaceflight projects managed at Ames and elsewhere.

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL *(End of Year)*	2,204	2,205	2,205
CONTRACTOR & OTHER PERSONNEL	292	310	320
TOTAL ALL PERSONNEL	2,496	2,515	2,525

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	115	
LAND *(Lease or Permit)*	120	
PLANT VALUE *(as of June 30, 1964)*		$155,427
TOTAL	235	$155,427

FUNDING *(Thousands of dollars)*

PROJECT LINE ITEM	PROJECT SPONSOR	FY 1964 AND PRIOR YEARS	FY 1965 *(Estimated)*	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Systems Engineering Facility	OSSA	50	46	2,787	---	2,883
Spectroscopic-Measurements Laboratory	OART	20	42	2,078	---	2,140
Space Sciences Research Laboratory	OSSA	46	64	2,459	---	2,569
TOTAL FOR PROJECTS IN FY 1966 ESTIMATE				7,324		

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GPO 888-887

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIM.

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Ames Research Center	Construction of Facilities	Systems Engineering Facility

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Advanced Research and Technology.

PROGRAM OFFICE FOR THE PROJECT: Office of Space Sciences and Applications.

AUTHORIZATION LINE ITEM: Ames Research Center.

LOCATION OF PROJECT: Moffett Field, Santa Clara County, California.

COGNIZANT NASA INSTALLATION: Ames Research Center.

TYPE OF CONSTRUCTION PROJECT: New.

FUNDING:

FY 1964 and Prior Years	$ 50,000
FY 1965 (Estimate)	46,000
FY 1966 (Estimate)	2,787,000
Total Funding Through FY 1966	$2,883,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIM S

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Ames Research Center	Construction of Facilities	Systems Engineering Facility

SUPPORTING DATA:

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,894,200
Site improvement	LS	---	---	40,000
Roads, parking, walks	LS	---	---	75,900
Utilities	LS	---	---	96,300
Electrical distribution	LS	---	---	107,300
Building	SF	57,925	22.80	1,318,900
Special building construction features	LS	---	---	255,800
Equipment				844,800
Vibration, acceleration & shock equip.	LS	---	---	35,600
Solar concentrator	LS	---	---	51,700
Temperature, humidity & altit. chamber	LS	---	---	41,300
Spin table	LS	---	---	77,100
Optics equipment	LS	---	---	61,600
Reaction-control tester	LS	---	---	50,600
Analog computer	LS	---	---	103,000
Digital components	LS	---	---	258,800
Pulse-code-modul. telemetry equip.	LS	---	---	113,400
Magnetic and RF screen room	LS	---	---	51,700

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIM. 8

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Ames Research Center	Construction of Facilities	Systems Engineering Facility

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Design				---
		SUBTOTAL		$2,739,000
Fallout Shelter and Equipment	LS	---	---	48,200
		TOTAL		$2,787,200

PURPOSE:

The proposed facility is intended to provide the required in-house capability to directly support all of Ames' flight projects and, less directly, to support advanced hardware research and development. The Systems Engineering Division has been established primarily through new hires, as a functional group of high technical competence that is responsive to the needs of the Projects. To maintain this competence it is necessary to provide new equipment and test areas that are unique and are unavailable at the Center. The proposed facility will provide significant gains in the effective utilization of staff and in technology transfer between project groups through a close association of corresponding specialists from each flight project and from the Systems Engineering Division.

PROJECT DESCRIPTION:

A multi-purpose facility is proposed to provide for spacecraft-systems research and development to advance the technology required for future spacecraft, and in direct support of space projects managed at Ames Research Center. The facility will be located as shown in figure 1, on real property available to

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SUPPORTING DATA:

NASA through a use license from the U. S. Navy. The new concrete structure, schematically shown in figure 2, includes a two-story test area of 9,100 square feet and a laboratory wing with two stories and a basement. The total floor area will be 57,925 square feet and will provide the special needs of up to 105 engineers and technicians. The external features such as parking areas and walks do not deviate from standards established for the Center. No major simulators or test chambers are proposed, but equipment adequate for components or small-systems test, research and development will be provided. The technical collateral equipment available at no cost includes a magnetic-flux tank (about 6 feet in diameter) and RF shielding panels to form a box 10 by 20 feet (does not provide magnetic shielding). Suitable non-technical collateral equipment is presently not available.

The major items of equipment required in the laboratories and test areas are listed under the "Equipment" section in the attached Project Cost Estimate. The equipment will be used for two major purposes: First, for systems work done under the supporting research and technology programs conducted in support of advanced programs, and, secondly, for the development, evaluation and flight qualification of spacecraft components and subsystems related to active programs. The equipment in the more numerous, smaller laboratories will be designed around the advanced technology work, whereas the large-bay test-type equipment will be oriented toward actual spacecraft hardware development and test programs.

Specific laboratories will be designed for spacecraft technological work in the areas of data and communication systems, orientation control systems, electrical power systems, thermal control systems, and high-reliability parts.

A clean room will be provided for the preparation of spacecraft hardware and precision developmental equipment. The vibration system, small centrifuge, and shock tester will simulate transportation, launch, and flight loads on the flight equipment and advanced development models. Heat fluxes corresponding to solar constants from 10 to 100 times that at earth (for solar probe experiments to 0.1 AU of the sun) will be obtained through the use of a solar collector. This collector will be used for advanced technology work

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on sensors, materials, solar cells, thermal coatings, and similar problem areas of a solar probe. The temperature, humidity, and altitude chambers will simulate spacecraft environments for flight articles.

The optical equipment will be used for developmental work on guidance and attitude control systems and components.

Telemetry test equipment, command and ranging simulation equipment, as well as computer equipment, will be used for the testing and evaluation of spacecraft data systems and for development of data coding methods, on-board data processors, encoders and decoders, and data storage systems.

PROJECT JUSTIFICATION:

Ames Research Center now has management responsibility for the Pioneer and Biosatellite Projects, and will have biological packages on early Gemini flights. A requirement thus exists to support the development, design, construction and qualification of experiments and components of these spacecraft as well as follow-on biological, solar and planetary projects. The requirement is for component or small-systems work with large-systems testing being done by contract or at other Centers. These functions are conducted largely by the new Systems Engineering Division in close cooperation with each flight project.

Staff members of this division, as well as of the various flight projects, are now widely dispersed throughout the Center in substandard and temporary quarters. There are a number of project clerical and management functions such as PERT/Companion Cost which are directly sharable between two or more projects so that improved utilization of manpower could be achieved by centralization in a single facility. In addition there are the less tangible benefits of communication of technical and management experience between staff members which can be realized by consolidation of these staffs. The severe complement limitations placed upon NASA and thus upon Ames dictate the exploitation of every conceivable means of increasing the efficiency of operation of assigned staff. Thus the proposed facility must provide for the

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combination of all these related activities at one location.

An additional Center function is work in system-technology research related to real hardware systems on board Ames space packages. The proposed facility must provide the laboratories and equipment required to perform this work with advanced hardware techniques. The supporting technology work is directed toward solving potential technical roadblocks to future spacecraft missions. For example, the Systems Engineering Division is presently doing work on bi-phase modulator/demodulator communication equipment and on error-coding data-handling techniques for Pioneer and de-orbit attitude-control hardware for Biosatellite.

It is necessary that new systems concepts, either developed at Ames or proposed by contractors, be functionally tested and evaluated. For example, typical tests of this type will be made with electronic components, thermal-control systems, attitude-control systems, and on-board power systems being developed for a solar probe going to 0.1 AU from the sun.

Equipment is required for reliability and quality assurance programs to assure that all contractor- and Ames-supplied components and systems will function as required. To meet this objective it is necessary to review the application, selection, and manufacture of components; test items under the environmental conditions experienced during flight; and conduct post-flight operational and failure analyses.

The Center's ability to fulfill its newly-assigned responsibilities for management of spaceflight projects is essentially dependent upon achieving the capabilities represented by this proposal. Deferment of this facility could result in delays in flight schedules and increased risks of project failures. Non-participation by project staffs in the checkout and evaluation of contractor-developed components will, in addition, inhibit the buildup of adequate levels of competence at Ames to meet technical management responsibilities.

ESTIMATED FUTURE YEAR FUNDING: None.

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AMES RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

SYSTEMS ENGINEERING FACILITY

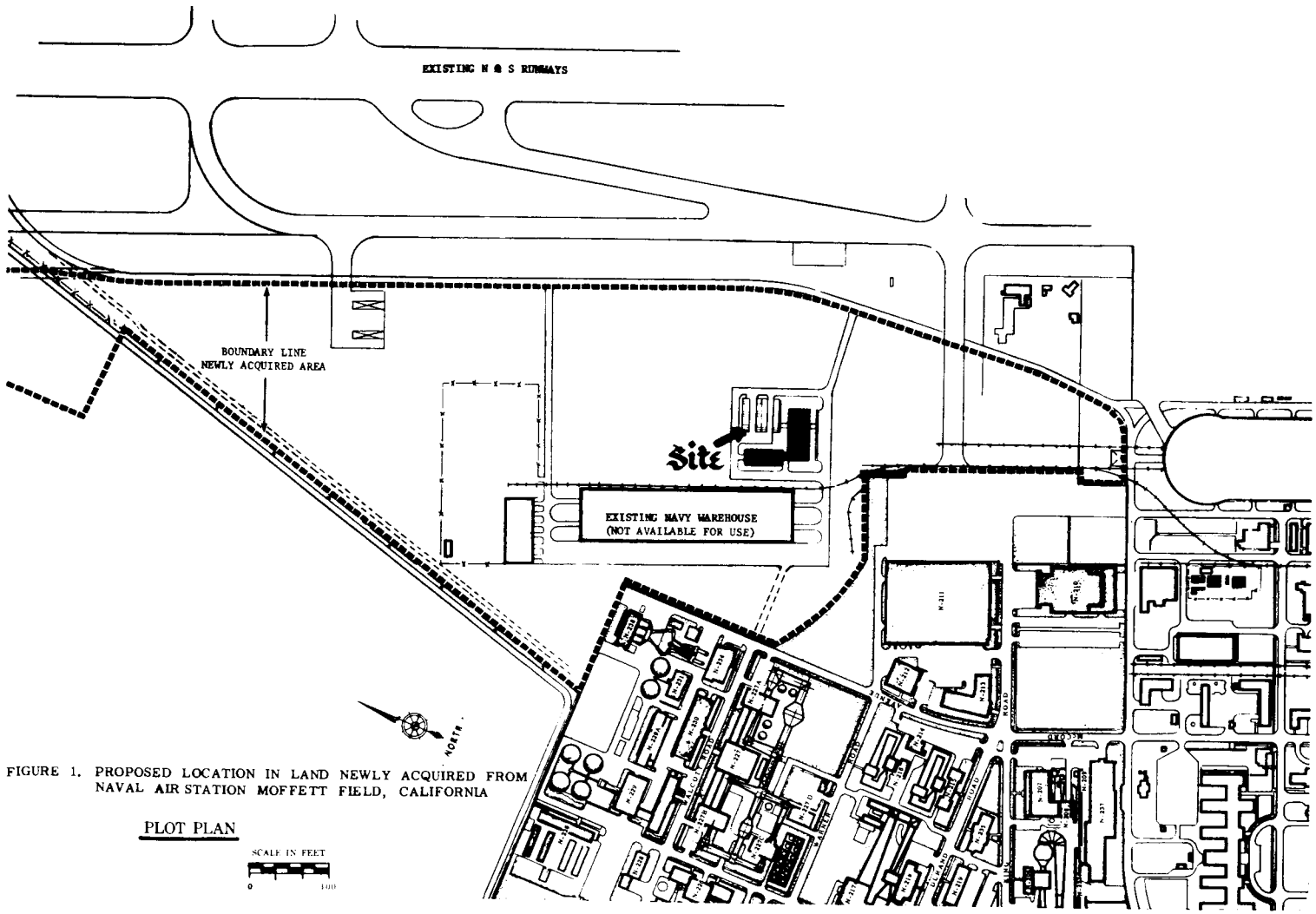

FIGURE 1. PROPOSED LOCATION IN LAND NEWLY ACQUIRED FROM NAVAL AIR STATION MOFFETT FIELD, CALIFORNIA

AMES RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

SYSTEMS ENGINEERING FACILITY

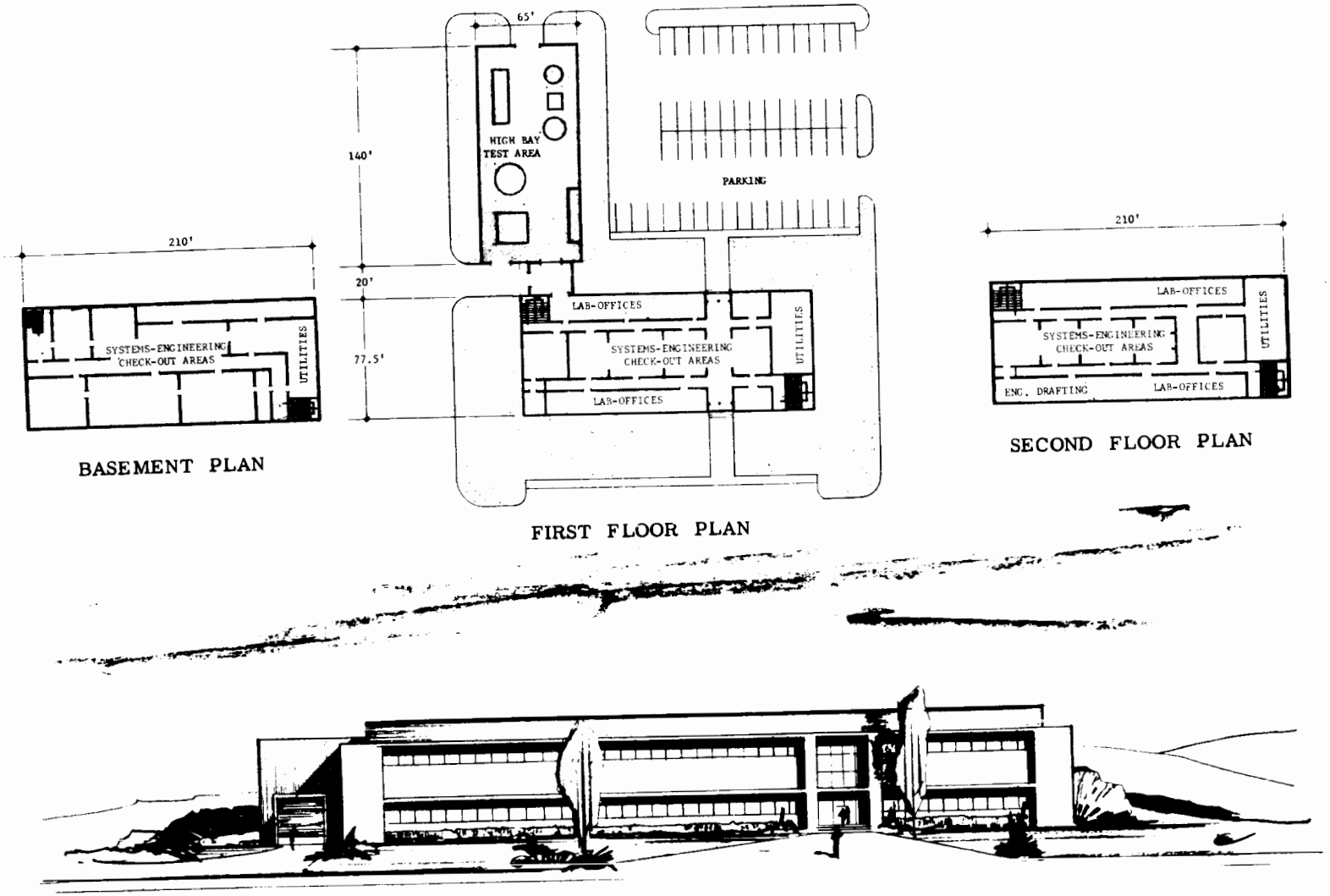

FIGURE 2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Ames Research Center	Construction of Facilities	Spectroscopic-Measurements Laborato

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Advanced Research and Technology.

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

AUTHORIZATION LINE ITEM: Ames Research Center.

LOCATION OF PROJECT: Moffett Field, Santa Clara County, California.

COGNIZANT NASA INSTALLATION: Ames Research Center.

TYPE OF CONSTRUCTION PROJECT: New.

FUNDING:

FY 1964 and Prior Years	$ 20,000
FY 1965 (Estimate)	42,000
FY 1966 (Estimate)	2,077,700
Total Funding Through FY 1966	$2,139,700

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION: Ames Research Center

APPROPRIATION: Construction of Facilities

PROGRAM OR PROJECT: Spectroscopic-Measurements Laborator

SUPPORTING DATA:

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition				---
Construction				$1,105,100
Site improvement	LS	--	--	41,100
Roads, parking, walks	LS	---	---	92,000
Utilities	LS	--	---	84,800
Electrical distribution	LS	---	---	42,200
Building	SF	28,500	$20.65	588,500
Special building construction features	LS	---	---	256,500
Equipment				957,900
High resolution spectrometers and sources	LS	--	--	551,000
Vacuum equipment	LS	---	---	77,300
Support optical and electrical equipment	LS	---	---	262,700
Special electrical and magnetic shielding	LS	---	---	66,900
Design				-0-

		Subtotal		$2,063,000
Fallout Shelter and Equipment	LS	-	--	14,700
		Total		$2,077,700

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PURPOSE:

The purpose of the proposed facility is to provide the capability for supporting and extending the Center's research program in basic atomic and molecular physics. This program is largely oriented toward the identification and quantitative description of chemical species, particularly in the vacuum-ultraviolet region of the electromagnetic spectrum. The planned research would provide the basic information, i.e., laboratory measurements of atomic and molecular spectra, urgently needed for interpretation of a large amount of observational data now being accumulated by the NASA on solar, stellar, and planetary spectra in the vacuum ultraviolet. It will also lead to an understanding of complex high-temperature physical-chemical processes occurring in the gas cap of atmosphere entry bodies, which is a necessary prelude to the design of entry vehicles for future planetary missions.

PROJECT DESCRIPTION:

A spectroscopic laboratory, providing a capability for measurement of atomic parameters in the vacuum ultraviolet (wavelengths less than 2000 A) with accuracy and sensitivity unsurpassed in any other facility in this country, together with complementary ion and molecular beam facilities for lifetime and cross-section studies, and an optical testing facility, is proposed to support and extend basic research now underway in the Ames Physics Branch and Space Sciences Division. The facility will consist of a laboratory building of approximately 28,500 square feet, located on a vibration-free site, housing a large grazing-incidence vacuum-ultraviolet spectrometer, for use at wavelengths shorter than 2000 A. The large spectrometer will be supplemented by a smaller 3-meter instrument for use in the same wavelength range, several smaller spectrographs (covering other wavelength ranges) with auxiliary equipment including several ion or molecular beam equipments, as well as other vibration-sensitive equipment. A high spectral dispersion, required for accurate measurement of closely-spaced lines in the vacuum ultraviolet, will be achieved by use of a grating radius of about 35 feet, which necessitates the elimination of virtually all background vibrations in the vicinity of the spectroscopic instruments. In addition, the long light path

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inherent with a large instrument results in a marked decrease in signal received as compared to that of smaller instruments. Hence, it is particularly important that appreciable magnetic fields, which interfere with photo-electric detector systems, be absent. A separate, isolated building is thus a key element in the proposal. A site located on Ames land but sufficiently remote from all heavy rotating machinery, traffic, magnetic sources, etc., has tentatively been selected from among several sites found in preliminary seismologic surveys to be potentially suitable. The tentative site and laboratory arrangement are shown in the accompanying drawing.

PROJECT JUSTIFICATION:

NASA space programs are resulting in a rapid accumulation of much observational data on solar, stellar and planetary spectra. These data are essential to an understanding of the structure and dynamics of stellar and planetary atmospheres. However, interpretation of these spectra requires both qualitative and quantitative laboratory understanding of the energy states, lifetimes, and excitation and decay modes of the radiating and absorbing chemical species. This basic information is particularly lacking in the vacuum ultraviolet region. At Goddard Space Flight Center much solar spectra data in the vacuum ultraviolet region have been obtained by means of rockets and the orbiting solar observatory. The Naval Research Laboratory also has many spectra in the vacuum ultraviolet from the solar corona. However, many of these spectra cannot be identified because the lines have never been observed in the laboratory. Information is also very scanty on the more highly ionized species of the first long period of the periodic chart, which ions are abundant in the solar corona. Qualitative work in this area which is planned for the laboratory will include analyses of unknown ions to aid in identification of solar spectra. In addition, quantitative experiments are planned to determine oscillator strengths or transition probabilities of these highly ionized atoms; these laboratory measurements are essential for the calculation of concentrations of these ions in the sun from the existing measurements of the intensities of solar lines.

An investigation of mixtures of hydrogen and helium is underway in the Physics Branch, motivated

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by sounding rocket results, which suggest that hydrogen and helium are both present at altitudes of 1000 to 1225 km. It has been postulated that lower than expected intensities were observed in ultraviolet spectra of B-stars near 2000 A, obtained by means of rockets, because of an outer absorbing layer of helium and hydrogen, possibly by the helium hydride ion. Therefore, the spectra of hydrogen and helium mixtures are being investigated in this laboratory to determine the effect of these possible absorbing layers on intensities of observed rocket spectra. Preliminary experimental results indicate that a more energetic source than presently available is required in order to observe the helium hydride molecular ion spectroscopically. Such a source is under development at Ames. It has also become clear that a complete experimental understanding of the helium hydride problem will require the spectral resolution and attending facilities as proposed for the Spectroscopic-Measurements Laboratory. In addition, studies are underway to investigate the helium hydride molecular ion theoretically.

In another important area, the identification and analysis of species in the hot gas cap behind the bow shock wave of entry bodies at speeds from escape to twice escape speed is an essential requirement for research in support of vehicles designed for interplanetary missions. At the higher entry speeds radiation becomes increasingly important to the design of entry vehicles, and there is theoretical evidence that much of this radiation occurs in the vacuum ultraviolet region. Identification of chemical species is thus the keystone of both quantitative solar and hot-gas physics. More progress in this direction is badly needed, and one of the most urgent needs is in the vacuum ultraviolet, which has been very little explored because the needed techniques have been developed only recently.

The facility proposed here will provide a capability for obtaining much of the important spectroscopic data. Emphasis will first be placed on a quantitative study of atomic and molecular spectra in the vacuum ultraviolet. Measurements will be made of absolute radiation intensities (from which absorption coefficients and transition probabilities are calculated) and, using the molecular and ion beam apparatus, the reaction, scattering and charge-exchange cross sections of various chemical elements will be investigated. These parameters are basic to the identification and analysis of chemical constituents in the hot gases surrounding an entry vehicle, and in the gases constituting atmospheres of the planets, the sun, and the stars.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Ames Research Center	Construction of Facilities	Spectroscopic-Measurements Laboratory

SUPPORTING DATA:

One of the most essential features of the laboratory will be its vibration-free environment. The resolution of the 35-foot spectrometer will be about 0.01 A. Calculations show that if this resolution is not to be seriously degraded, the relative vibration amplitude at the grating must be less than 1 microinch per inch of grating length. In practice, this sets a maximum vibration amplitude transmitted to the instrument of 1 microinch, which at overtone vibrational frequencies characteristic of the grating, the maximum amplitude must be much less. Another external factor requiring extremely close control is the temperature, since differential expansion of materials can result in decreases in resolution which can be as serious as those caused by vibration, particularly for exposures of long duration. It is worth noting that attempts by others to install similar equipment in existing facilities (not originally designed with these requirements in mind) have so far been unsuccessful.

The Ames Spectroscopic-Measurements Laboratory, together with the existing Physics Branch and Space Sciences Division facilities, will provide NASA with unmatched in-house capability in atomic and molecular physics. It will provide the means for understanding complex high-temperature gas physics, which is vital to the solution of the entry phases of future interplanetary missions, and will result in a leading role for NASA in the fields of solar dynamics and planetary and stellar atmospheres in which Ames has well-established on-going research programs.

ESTIMATED FUTURE YEAR FUNDING: None.

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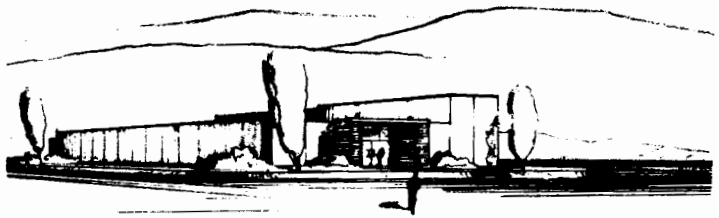
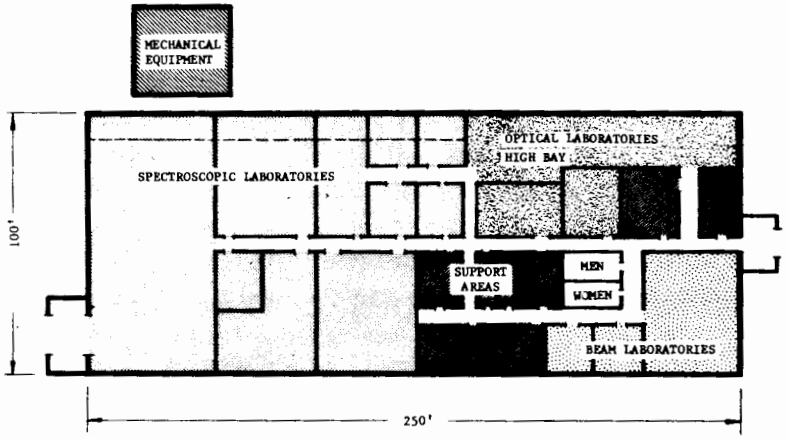
AMES RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

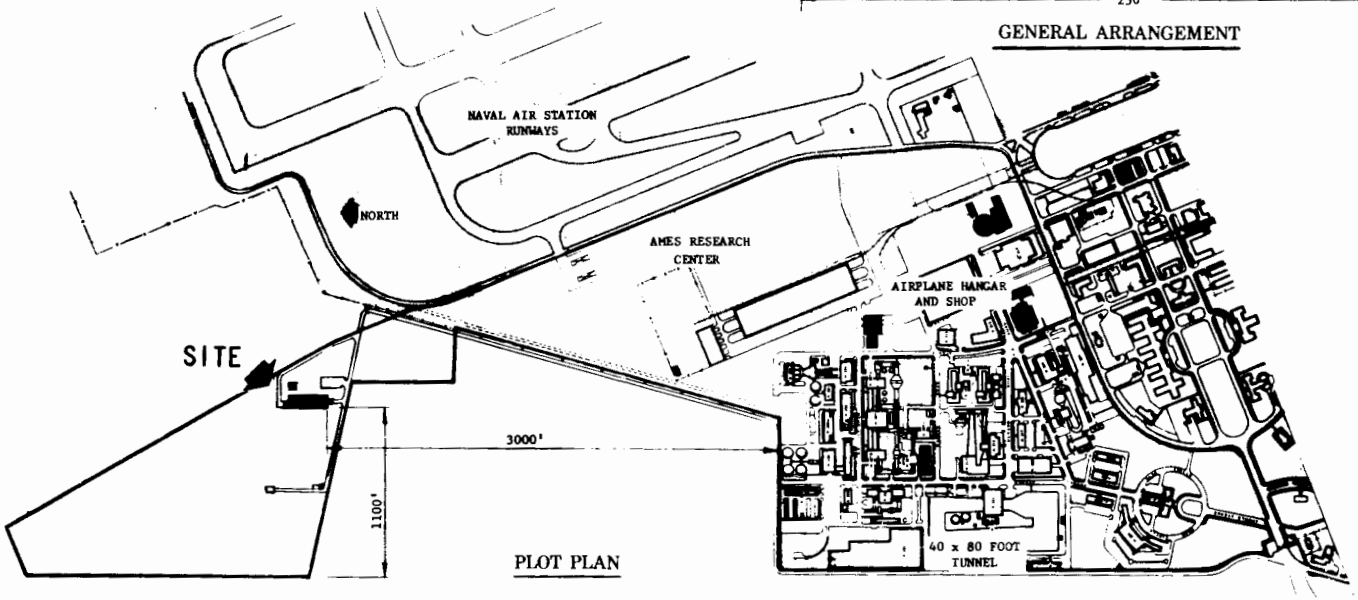
SPECTROSCOPIC - MEASUREMENTS LABORATORY



PERSPECTIVE



GENERAL ARRANGEMENT



PLOT PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Ames Research Center	Construction of Facilities	Space Sciences Research Laboratory

GENERAL DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Advanced Research and Technology.

PROGRAM OFFICE FOR THE PROJECT: Office of Space Sciences and Applications.

AUTHORIZATION LINE ITEM: Ames Research Center.

LOCATION OF PROJECT: Moffett Field, Santa Clara County, California.

COGNIZANT NASA INSTALLATION: Ames Research Center.

TYPE OF CONSTRUCTION PROJECT: New.

FUNDING:

FY 1964 and Prior Years	$ 46,000
FY 1965 (Estimate)	64,000
FY 1966 (Estimate)	2,459,000
Total Funding Through FY 1966	$2,569,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Ames Research Center	Construction of Facilities	Space Sciences Research Laboratory

SUPPORTING DATA:

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition				---
Construction				$1,671,700
Site development	LS	---	---	28,500
Roads, parking, walks	LS	---	---	50,600
Utilities	LS	---	---	25,900
Electrical distribution	LS	---	---	82,200
Building construction	SF	63,800	$20.25	1,289,800
Special building construction features	LS	---	---	194,700
Equipment				728,300
Astrophysics & Planetary Atmospheres Research Equipment:				
Installation and alterations	LS	---	---	97,400
Space-chemistry equipment	LS	---	---	21,100
Electron & nuclear magnetic-resonance equip.	LS	---	---	47,100
Aeronomy lab. equipment & roof test stand	LS	---	---	51,400
Planetology Research Equipment:				
Low-level-counting lab shielding & instruments	LS	---	---	87,400

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Ames Research Center	Construction of Facilities	Space Sciences Research Laboratory

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment (Cont.)				
Geophysical Research Equipment:				
Ion probe	Ea	1	---	$ 102,800
Ultraclean room	LS	---	---	87,400
Space Technology Equipment:				
FM/FM/telemetry & data handling equipment	LS	---	---	102,800
Flight-systems integration & calibration equip.	LS	---	---	130,900
Design				
Construction	LS	---	---	- 0 -
Equipment	---	---	---	- 0 -
	SUBTOTAL			$2,400,000
Fallout Shelter and Equipment				59,000
	TOTAL			$2,459,000

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9/16/64 (c)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Ames Research Center	Construction of Facilities	Space Sciences Research Laboratory

SUPPORTING DATA:

PURPOSE:

The proposed facility is needed to provide the Space Sciences Division at Ames Research Center with the means to fulfill its programmatic responsibilities and heavy commitments to flight experiments and to research destined to contribute to the interpretation of flight data and the development of new experiments. The successful conduct of such research is necessary to the design of future space vehicles and experiments as well as to a basic understanding of natural phenomena. The required capability is presently severely restricted by lack of equipment and provisions for the integration and checkout of spacecraft experiments and sounding rocket payloads, by lack of laboratory space for housing equipment already purchased and that required for current and planned research programs, by a widely dispersed staff which makes it virtually impossible to achieve efficiency of operation, and by lack of provision for inevitable growth in the non-permanent segment which complements the permanent staff, i.e., NAS Postdoctoral Residents, detached duty military officers, consultants, and visiting personnel. Failure to provide a new facility specially designed for space science needs will inevitably result in severe curtailment of initiated programs, in an inability to achieve desirable timetables on scientific projects, and in inefficient performance in the conduct of research programs.

PROJECT DESCRIPTION:

The proposed laboratory will provide facilities, equipment, and office space necessary to conduct theoretical and experimental research in the discipline areas of astrophysics, aeronomy, plasma physics, exosphere physics, planetary atmospheres, planetology, and cosmic electrodynamics, as well as provide for the development of highly specialized instrumentation systems to carry out experimental research in the above fields. Facilities and equipment necessary to integrate such experiments into rocket and spacecraft systems are included, together with a checkout facility for sounding rockets and instrumentation packages. The proposed laboratory building, shown in the accompanying drawing, will have two stories, a basement, and a penthouse, with a total floor area of 54,000 square feet, including 10,900 square feet of office-laboratory area to accommodate research personnel. It will house small specialized equipment, and will include physics and chemistry laboratories, an ultraclean room, a refrigerated room, a data processing room, shops, an elevator, and a loading dock. An adjoining test

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bay of 9,800 square feet will provide for the calibration and checkout of flight experiments and sounding rocket payloads and will house certain experimental apparatus (e.g., the long-path optical gas cell and the high velocity guns used for impact studies) which, because of their size and shape, would be impractical to house in the main laboratory building. The major capabilities of the proposed laboratory are outlined in the following paragraphs.

A long-path optical gas cell, now housed in a temporary location, will be used in conjunction with proposed spectroscopic instruments to study the absorptivity of various gases in the far infrared regions of the spectrum at temperatures ranging from 77°K to 600°K and at pressures of 10^{-4} mm Hg to 10 atmospheres. Path lengths in the gas cell of up to one kilometer will be available through the use of multiple-reflection optics. These studies, in combination with observational spectroscopic studies of planetary atmospheres, will provide important knowledge of the characteristics of such atmospheres. Additional uses for the equipment are planned in the field of photolysis of short-lived chemical compounds, for ultraviolet spectroscopy, and in support of infrared-astronomy flight experiments. Space chemistry equipment will be used to study the deposition and condensation of chemical complexes and free radicals at the low temperatures that exist in space. Electron and nuclear magnetic-resonance equipment will be used to identify and determine the number density of some species of the free radicals.

A low-level-counting laboratory containing a gamma ray spectrometer will include shields to remove cosmic-ray background and thus permit high sensitivity radioactivity studies of extraterrestrial materials and, in fact, geological material from earth. Cratering and ejecta throwout associated with meteoric impact in rock, ices, and unbonded dusts will be studied with the aid of an available vertical light-gas gun primarily for the purpose of simulating impact of meteoric material upon the lunar surface. A microparticle accelerator and a hypervelocity light-gas gun will be used to aid in the study of the characteristics of naturally occurring materials, rocks and minerals, at extreme shock pressures - up to 30 million pounds per square inch.

Determinations of the chemical, mineralogical, and isotopic compositions of extraterrestrial and model materials will be made with the aid of an electron microprobe, X-ray diffractometer, mass spectrometer, ion probe, and an ultraclean room. The ultraclean room will be used to avoid terrestrial contamination of collector

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devices prior to, and subsequent to, recovering meteoric or other space materials. A laser microprobe is being planned for, to extend the capability for analysis of the constituents in extraterrestrial matter made available with the electron microprobe and the ion probe.

Laboratory and shop space will be devoted to development, test, and calibration of plasma probes and magnetometers for experiments on various satellites and space probes. Such provision will include a radio-frequency screen room for tests requiring the absence of all external radio interference, and FM/FM telemetry and data handling equipment for checking and calibrating telemetry for sounding rockets or other experiments. Also included will be flight systems integration and calibration equipment, and magnetic flux tanks for testing and improving the characteristics of magnetic field sensors. Of special interest will be studies of the properties of plasmas of cosmic scale, i.e., those in which gas kinetic collisional processes are unimportant and are replaced primarily by magnetic fields which provide the mechanical connection between charged particles. Provisions are made for processing the large quantities of data expected from these experiments. As space experiments presently under development succeed, an increasing emphasis will be placed on data processing and scientific evaluation of experimental results.

PROJECT JUSTIFICATION:

The Space Sciences Division at Ames has been assigned responsibilities for research in the space sciences, encompassing both spaceflight and ground-based laboratory activities. The scope of these activities is divided basically into scientific research in the fields of planetary atmospheres, planetary geology, astrophysics, and interplanetary particles and magnetic fields. The Division is now heavily involved in flight experiments, and facilities to breadboard such experiments and to check, integrate, and calibrate components prior to final assembly are necessary for the programs underway. The present direct flight and post flight commitments include plasma probe experiments on Explorer XIV, IMP A, B, and C, EGO A and B, and Pioneer A and B; magnetometer experiments for IMP D and E; and the LUSTER sounding rocket program for the collection of lunar and other extraterrestrial material. Expected commitments include plasma probe and magnetometer experiments on Pioneer C and D. A galactic hydrogen experiment is under development, and numerous other experiments

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involving infrared telescopes, resonance probes, lasers, fast neutron detectors, and ion mass analyzers are being planned as part of the on-going research work. Experiments involving surface properties of the moon and of particles and fields in space will be carried out on the Apollo spacecraft. Associated with these current or projected flight experiments is a coordinated supporting ground-based research program. The interaction between the flight experimentation and the ground-based research activities, and their relation to the NASA space program, are outlined in the following paragraphs.

Studies of planetary atmospheres, planetology, and collision processes are necessary both to the design of future space vehicles and experiments and to the determination of the origin and evolution of the solar system. Detailed knowledge of planetary atmospheres is necessary before either manned or unmanned spacecraft can properly be designed to enter these atmospheres and land for the purpose of scientific studies of planetary surfaces. For example, experimental studies of space vehicle entry heating being conducted at Ames show that radiative heating is significantly affected by the chemical composition of the gas. Other current studies here show that with the present knowledge of the Mars atmospheric structure, the ballistic parameter of soft-landing vehicles is uncertain by an order of magnitude. Thus, there is a strong coupling between the atmospheric properties and the design of an entry vehicle, and it follows that major advances in entry vehicle design technology would result from a more definitive knowledge of the atmospheres in question. Studies to be conducted in the proposed facility will support flight experiments which will use infrared telescopes above the earth's atmosphere for planetary and stellar observations. Laboratory tests of absorption coefficients and line profiles will be used to construct detailed absorption spectra for families of models of planetary atmospheres, which will greatly aid in the definition of the atmospheres of the various planets. The laboratory data will then be used in the interpretation of observational data obtained from sounding rocket, satellite, and deep space probe experiments.

Study of the effects of impact of interplanetary debris on planetary bodies will aid in the determination of the surface characteristics of planets and of the moon and will further our understanding of the significance of collision events as an evolutionary process in the solar system. These investigations will be performed with the aid of light-gas guns and electrostatic particle accelerators which will be used to accelerate simulated interplanetary debris to hypervelocities. These devices will, in addition, provide the capability for measuring, under

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SUPPORTING DATA:

controlled conditions, the physical effects of shock waves on minerals and rocks and the physical properties of these materials at high pressures. These latter measurements will have application to the study of planetary interiors to the identification of shocked material in meteorites and at the sites of meteorite craters, and will be significant for the analysis of samples of rocks from the lunar surface.

The research program on interplanetary debris will be of direct interest to spacecraft designers as well as to planetologists in that it will include studies of the origin, distribution, and composition of such debris. Samples of meteoric debris obtained, for example, with sounding rockets, will be analyzed along with similar terrestrial materials with the proposed geophysical research equipment. The research directed at obtaining the distribution and composition of interplanetary particles will supply the fundamental knowledge required for an assessment of the meteoroid environment that will be encountered by spacecraft. Such knowledge is absolutely essential to the space vehicle designer who must understand the hazards of this environment in order to prevent destruction of the vehicle resulting from micrometeoroid impact.

Many of the fundamental studies that will be conducted in this facility will provide valuable information to the field of lunar technology particularly in the areas relating to the chemistry and physics of the lunar surface. For example, research in the areas of infrared radiation properties of materials, microparticle impact in rocks and dust, and collection and study of materials of lunar origin in the vicinity of the earth are indicative of the type of study that will be emphasized. Formulation and completion of this type of ground-based research is prerequisite to the establishment of a meaningful lunar technology program.

A number of new programs now in the planning stage and which relate to current research activity will require new capabilities and are worthy of mention here. Laser radar appears very attractive for studies of extraterrestrial dust at altitudes between 100 and 150 kilometers, thereby providing support for the LUSTER sounding rocket experiments. The laser as a light source is planned for use in atmospheric studies of density and temperature at high altitudes, a technique which may be important in future studies of planetary atmospheres. Studies of plasma and cyclotron resonance effects which were detected by the Alouette topside sounder satellite, are planned as an extension of the current studies of electron density in the earth's lower exosphere. Application of these effects include measurements of electron density, magnetic fields and ion species in space. Related

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Ames Research Center	Construction of Facilities	Space Sciences Research Laboratory

SUPPORTING DATA:

studies of antennas immersed in a plasma [illegible] in this connection laboratory experiments are planned in which an RF signal is injected [illegible] in the presence of a variable static magnetic field. Extension of these experiments involve the use of [illegible] pulses and excitation of ion cyclotron resonances, which may aid in the development of resonance probes. An ancillary rocket program is planned to examine the problems involved in investigating plasmas in space using resonance techniques.

ESTIMATED FUTURE YEAR FUNDING:

None.

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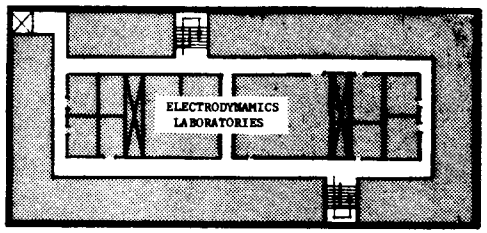
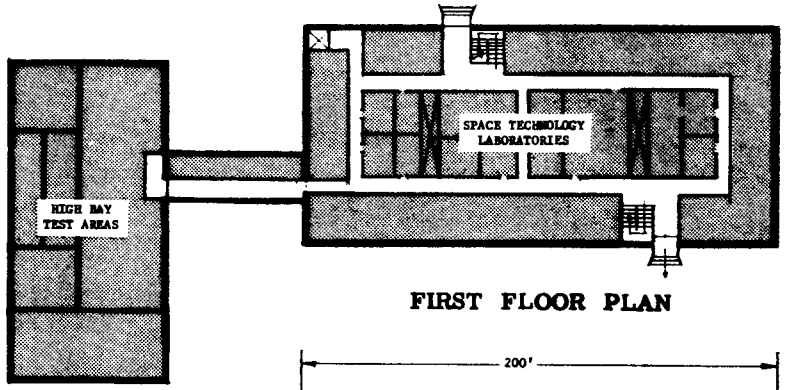
AMES RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

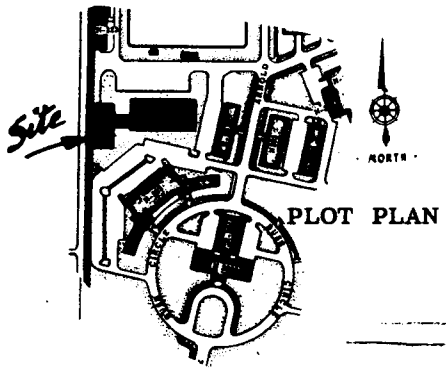
SPACE SCIENCES RESEARCH LABORATORY



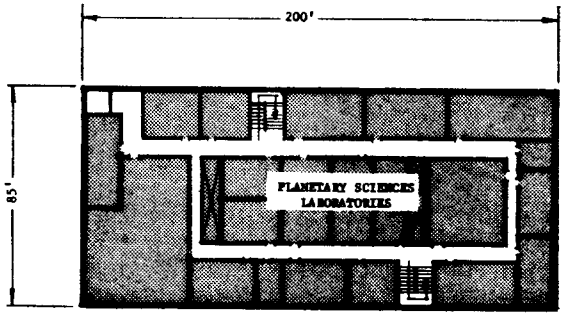
SECOND FLOOR PLAN



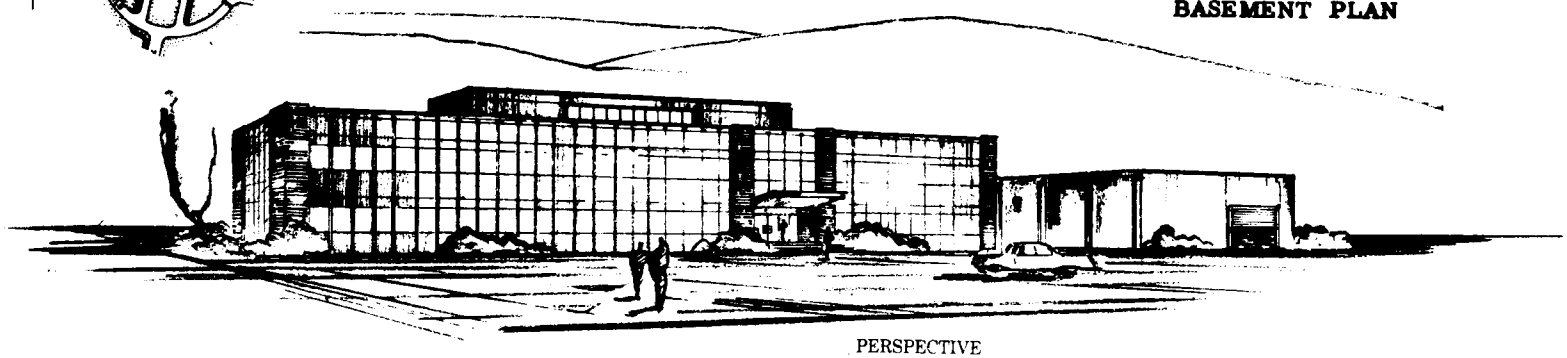
FIRST FLOOR PLAN



PLOT PLAN



BASEMENT PLAN



PERSPECTIVE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

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

INSTALLATION MISSION The mission of the Electronics Research Center is to increase the agency's capability in space electronics by providing the knowledge and advanced technology needed to overcome deficiencies in electronic systems and components. The Center organizes, manages, and conducts a comprehensive program of basic and applied space electronics research. It also provides a focal point for national space electronics research, coordinating nationwide research efforts and sponsoring electronics research conducted by industry, universities, and private institutions.

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL (End of Year)	25	250	550
CONTRACTOR & OTHER PERSONNEL	-0-	-0-	-0-
TOTAL ALL PERSONNEL	25	250	550

INVENTORY		
ITEM	ACRES	COST (Thous.)
LAND (Fee)	-0-	
LAND (Lease or Permit)	-0-	
PLANT VALUE (as of June 30, 19)		-0-
TOTAL		-0-

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING (Thousands of dollars) FY 1964 AND PRIOR YEARS	FY 1965 (Estimated)	FY 1966 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Space Guidance Laboratory	OART	33	77	3,938	-0-	4,048
Optical Communications Laboratory	OART	29	69	2,102	-0-	2,200
Microwave Radiation Laboratory	OART	-0-	100	3,800	-0-	3,900
Computer Research Laboratory	OART	-0-	68	2,432	-0-	2,500
	OART					
	OART					
Center Support Facilities, Second Phase	OART	33	77	1,419	-0-	1,529
TOTAL FOR PROJECTS IN FY 19 ESTIMATE				13,691		

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GPO 870-099

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Electronics Research Center	Construction of Facilities	Space Guidance Laboratory

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Advanced Research & Technology

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

AUTHORIZATION LINE ITEM: Electronics Research Center

LOCATION OF PROJECT: Cambridge, Massachusetts (conditional)

COGNIZANT NASA INSTALLATION: Electronics Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	33,000
FY 1965 Estimate	77,000
FY 1966 Estimate	3,938,000
Total Funding Through 1966	$4,048,000

PROJECT COST ESTIMATES: **Cost Estimate breakdown to be submitted later.**

PROJECT DESCRIPTION: The laboratory will consist of a two-story building providing laboratory office space, major equipment and special purpose testing space with a total of 46,400 square feet of floor area. A total of 30,000 square feet on the first and second floors will be devoted to laboratory facilities and related office space, and 5,000 square feet of basement area will be used for utilities, maintenance requirements and limited storage. The remaining 11,400 square feet will contain air-bearing test tables, precision centrifuges and exotic calibration and alignment equipment. Special building provisions as required to maintain the environment essential to the operation of the research equipment in this laboratory will be provided. A total of 148 parking spaces will be provided as a part of the site

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SUPPORTING DATA:

development. Building utilities will be connected to the central systems for heating, chilled water, water distribution, electric power, sanitary sewers, communications, and drainage provided at the Center.

Space Guidance Laboratory equipment provides the capability necessary to analyze, test, simulate and generate concepts, techniques and elements for future space navigation and guidance systems. Specialized test and simulation equipment which can sense and generate velocities, accelerations, angular rates, gravity forces and inertial references together with a variety of analog and digital data collection and reduction equipment provide a unique analyzation facility for guidance systems and components. Exotic instrumentation coupled with cryogenics, vacuum and magnetic field control equipment allow for future research on novel types of inertial sensors as well as providing a design capability for specialized instrumentation.

PROJECT JUSTIFICATION:

The Space Guidance Laboratory is required for the conduct of research in the areas of guidance and navigation techniques and concepts and new guidance instrumentation. The building will be occupied by 190 ~~185~~ scientists and engineers, research assistants and clerical support personnel who will develop and conduct a research program covering all aspects of space guidance. Theoretical studies, investigations, experimentation and tests in trajectory analysis, inertial reference and sensory techniques, navigation and guidance components and techniques as well as the testing of electromagnetic and optical guidance devices on a component and sub-system basis will be undertaken.

Present day space guidance systems were originally developed for aircraft and ballistic missiles which required very high accuracy for short duration flights. This missile guidance technology has been extended and applied to present NASA space missions. For example, the Saturn guidance system is an extension of Redstone and Pershing technology, while the Apollo guidance system is a direct outgrowth of developments for Polaris. While the extended performance of these missile-guidance systems is satisfactory for present near-earth and lunar missions, there is a pressing need to do research in guidance techniques optimized for long duration planetary flights.

These new techniques must yield very reliable, lightweight systems capable of operating for extremely long periods without serious degradation in performance.

SUPPORTING DATA:

In order to achieve this high level of reliability, future guidance systems must incorporate long-life gyros with few moving parts, negligible drift rates, and low power requirements. Basic research toward securing these objectives is already underway; e. g., the use of coherent light beams in laser gyros has been explored; the gyroscopic properties of atomic nuclei and rotating fluids have been studied; and, the characteristic motion of a vibrating piezoelectric cylinder, acted upon by external forces, has been analyzed. The chief aim of research of this nature is to contribute to the Center mission by discovering advanced concepts leading to more reliable, less complex, and cheaper guidance systems.

The Space Guidance Laboratory research program will be divided between analytical studies and experimental investigations. Although considerable information can be gathered from other sources, the laboratory will need to generate mathematical mission models, to modify existing computer programs in order to accommodate different initial conditions, to investigate parameter change effects, and to compute a family of reference trajectories. Analytical investigations will be closely coordinated with equipment research in order to identify optimum guidance techniques for future space missions. This equipment research will include work on all portions of space missions. This equipment research will include all aspects of space guidance systems including gyros, accelerometers, sensors, computer programs, and component integration. Research on inertial platforms, or strapdown assemblies with suitable pick-off capability for all classes of space missions, will be pursued.

The basic objective of guidance research is to sustain high performance through the long mission durations inherent to most advanced space flight projects. Initial guidance analysis activity will seek to generate:

--A compendium of future guidance requirements for each class of planned NASA space mission, which will serve as a basis for evaluating the adequacy of existing guidance and navigation concepts.

--Research programs to advance technology in those areas where existing concepts and systems are inadequate to meet the needs of future missions.

The principal guidance components research objective lies in making progress toward new guidance components suitable for advanced space missions. A supplemental goal of these investigations will be an accumulation of knowledge and experience on space guidance component performance.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Electronics Research Center	Construction of Facilities	Space Guidance Laboratory

SUPPORTING DATA:

Research in guidance techniques seeks to reduce the complexity of present space navigation and guidance methods. At the very minimum, research of this nature could make a major contribution by leading to:

(1) optimization of the number of mid-course corrections required per class of space mission, and (2) development of improved time standards for use aboard spacecraft.

The space guidance research program to be conducted by this laboratory is an essential component of the activities of the Electronics Research Center. Research in new concepts and techniques of guidance will provide the experimental background and design guides for the development of more reliable guidance systems to be used in future generations of manned and unmanned spacecraft.

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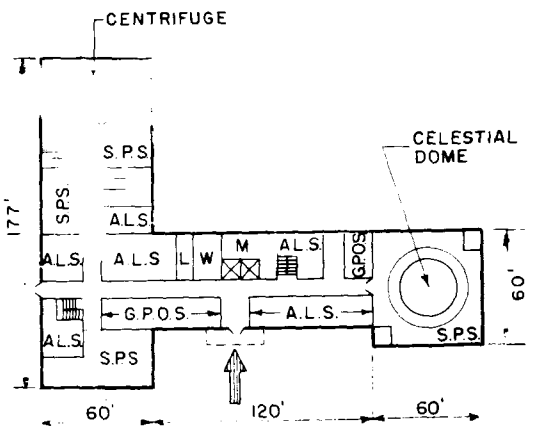
ELECTRONICS RESEARCH CENTER

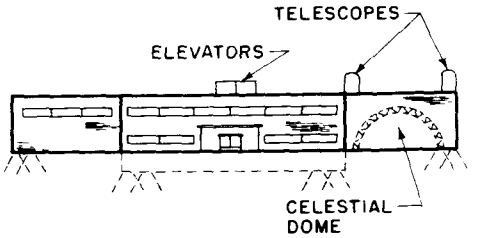
FISCAL YEAR 1966 ESTIMATES

SPACE GUIDANCE LABORATORY

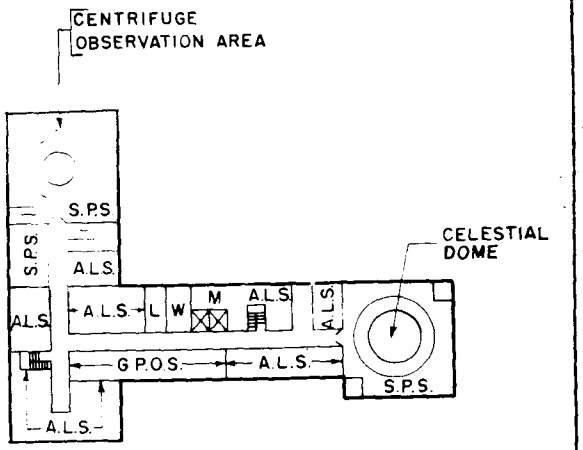
SCALE IN FEET
0 10' 25' 50' 75' 100'



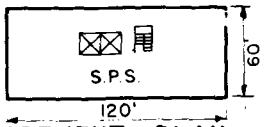
FIRST FLOOR PLAN



FRONT ELEVATION



SECOND FLOOR PLAN



BASEMENT PLAN

LEGEND

- ELEVATORS
- STAIRWAY
- G.P.O.S. GENERAL PURPOSE OFFICE SPACE
- A.L.S. ANALYSIS-LABORATORY SPACE
- S.P.S. SPECIAL PURPOSE SPACE
- M MEN'S LAVATORY
- W WOMEN'S LAVATORY
- L WOMEN'S LOUNGE
- MAIN ENTRANCE
- PILE FOUNDATION

SEPT 8, 1964

REV	DATE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Electronics Research Center	Construction of Facilities	Optical Communications Laboratory

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Advanced Research & Technology

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

AUTHORIZATION LINE ITEM: Electronics Research Center

LOCATION OF PROJECT: Cambridge, Massachusetts (conditional)

COGNIZANT NASA INSTALLATION: Electronics Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	29,000
FY 1965 Estimate	69,000
FY 1966 Estimate	$ 2,102,000
Total Funding Through FY 1966	$ 2,200,000

PROJECT COST ESTIMATES:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$ 809,000
Laboratory	S.F.	32,000	$23.75	760,000
Site Preparation & Fdns.	L.S.	---	$17,350	17,350

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Electronics Research Center	Construction of Facilities	Optical Communications Laboratory

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Roads & Parking	L.S.	---	17,000	17,000
Utilities	L.S.	---	14,650	14,650
Equipment				1,293,000
Optical Transmission Equip.	L.S.	---	207,200	207,200
Optical Reception Equip.	L.S.	---	514,300	514,300
Optical Analyzation Equip.	L.S.	---	328,000	328,000
Optics Preparation & Material Equipment	L.S.	---	243,500	243,500
Design				---
For Construction	---	---	---	
			Subtotal	2,102,000
Fallout Shelter	---	---	---	---
Air & Water Pollution Control	---	---	---	---
			TOTAL	$ 2,102,000

PROJECT DESCRIPTION:

This laboratory will consist of a single story building, rectangular in shape, with full basement providing a total of 32,000 square feet of floor area. The entire ground floor and 10,000 square feet of the basement area will be used for laboratory and ancilliary office space. The remaining 6,000 square feet of basement area will be used to house utility items and for storage purposes.

The laboratory will provide special areas for dark rooms and shielded rooms for protection of personnel from high intensity light radiation sources as well as eliminating undesired optical interferences

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SUPPORTING DATA:

from natural and man-made sources. In addition a portion of the facility will contain optical test chambers and a spectrographic analysis facility. Special building provisions as required to maintain the environment essential to the operation of the research equipment in this laboratory will be provided. Site development shall include a total of 96 parking spaces. The interior utilities will be connected to the heating and chilled water, water supply, electric power and communications, central alarm, storm, and sanitary sewer systems.

The Optical Communications Laboratory will contain equipment for the measurement, analysis, generation and reception of light energy in the 100 Angstroms to 100 microns wave length spectral region. An analog computer in addition to other data collection and reduction equipment is required for extracting, restoring and analyzing information from laser-pulsed sources. Standard laboratory optical equipment such as spectrographs, optical benches and interferometers will be complemented by high intensity light sources, sensors, and special detectors for analyzing and generating the complete range of ultra-violet, infra-red and visible emissions.

PROJECT JUSTIFICATION:

This laboratory is required to provide the space for the conduct of research on optical radiation sources, optical components, optical data transmission and recovery techniques, and devices and propagation phenomena. The building will be occupied by approximately 125 scientists and engineers, research assistants and clerical support personnel who will develop and carry out a broad research program in optical communications and propagation phenomena. Theoretical studies, new techniques in optical transmission and reception as well as optical component technology will be undertaken in this laboratory.

The recent revival of interest in optical techniques, together with the emergence of the laser in 1960, indicates that the wavelength band between about 100 Angstroms and 100 microns offers an impressive, and still largely untapped, potential for the solution of a great number of problems related to space flight and space exploration. Possible applications of modern optical concepts include such important areas as optical communication, guidance and control, computers and displays, power transmission, and workshop technology. It is important to note, however, that few of these concepts have progressed beyond the basic research, or exploratory development phase; in most cases their utility for space flight remains to be proved. The need for a better understanding of underlying natural laws and processes has become evident, even in those cases where new optical devices have indeed been employed.

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SUPPORTING DATA:

In hardly any field have the theoretical capability limits of the optical method been realized. For example, tracking and pointing accuracies of 0.1 seconds of arc at system sensitivities of 0.01 seconds of arc are theoretically possible with interferometric techniques, compared with the corresponding figures of minutes of arc which are typical for existing, large, earthbased, astronomical antennas. As another example, ranging with a pulse rise time of 10^{-8} seconds may become feasible over considerable distances with accuracies of a few meters, thereby affording a potential capability for conducting topological soundings of the moon, or planets, from orbiting spacecraft. Lasers - used in conjunction with birefringence scanners, image converters and image orthicons - may also prove useful for reconnaissance functions on the dark side of the planets.

The vertical distribution of radiation in the vicinity of the earth, as well as the extraterrestrial spectrum of the sun and stars are still largely unknown, with the result that determinations of the solar constant during the period 1940-1956 yielded values differing by as much as 8%. Such unknowns have occasionally caused discomforting malfunctions of infrared horizon seekers; they also threaten to affect the performance of passive optical communication devices and relay equipment, and to introduce highly undesirable complications into the critical beam orientation procedures for optical communication functions. In another area, it has been found that optical instruments do not operate reliably in space when pointed within a few degrees of the sun. This deficiency results from the fact that the intensity and spectrum of background radiation and stray light caused by the solar corona was not known with sufficient accuracy to be considered in the design of the seekers. These data once established will help to promote progress on many problems of space flight and space exploration.

Multiple-channel communication techniques are an obvious solution to the problem of transmission at low data rates. However, the number of channels available for space data transmissions in the R-F band is inherently limited; also, the danger of interference and crosstalk is severe. In comparison, the laser and associated concepts for optical communication provide access to a high-privacy, frequency band that is at least three orders of magnitude wider than the entire R-F band. Space optics can make this region accessible for space uses by obtaining the basic data required for a thorough understanding of the laws and processes involved by exploring the potentialities of the region for space application, and by initiating development of the technology required to exploit this potential.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT	BUDGET ESTIMATES
Electronics Research Center	Construction of Facilities	Optical Communications Laboratory	FY 1966

SUPPORTING DATA:

Research and development of the laser, in general, as well as the investigation of optical communication concepts using the laser, will be given high priority in the initial space optics program. Other research will be concerned with passive optical techniques, radiation detectors, and information theory.

The research program to be conducted in the Optical Communications Laboratory is an important part of the Electronics Research Center space electronics program. The potential space applications of optical emissions are of great interest to the engineers and scientists designing space systems. The possible precision and light weight of optical communications systems will enable future space vehicles to operate for long periods of time at great distances. The program of the Optical Communications Laboratory will provide the research base for the development of optical systems.

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ELECTRONICS RESEARCH CENTER

FISCAL YEAR 1966 ESTIMATES

OPTICAL COMMUNICATIONS LABORATORY

SCALE IN FEET

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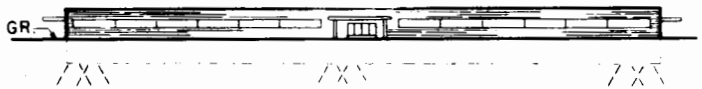
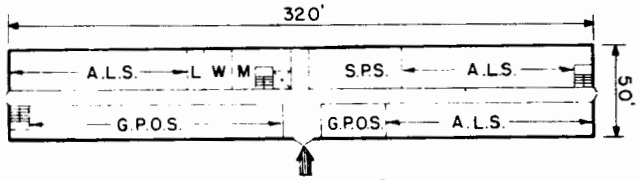
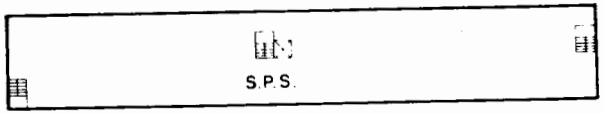


FRONT ELEVATION



FIRST FLOOR PLAN

ROOF PLAN



BASEMENT PLAN

LEGEND

⊠	ELEVATOR
	STAIRWAY
G.P.O.S.	GENERAL PURPOSE OFFICE SPACE
A.L.S	ANALYSIS - LABORATORY SPACE
S.P.S.	SPECIAL PURPOSE SPACE
M	MEN'S LAVATORY
W	WOMEN'S LAVATORY
L	WOMEN'S LOUNGE
⇨	MAIN ENTRANCE
	PILE FOUNDATION

SEPT. 8, 1964

REV.	DATE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Electronics Research Center	Construction of Facilities	Microwave Radiation Laboratory

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Advanced Research & Technology

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

AUTHORIZATION LINE ITEM: Electronics Research Center

LOCATION OF PROJECT: Cambridge, Massachusetts (conditional)

COGNIZANT NASA INSTALLATION: Electronics Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	---
FY 1965 Estimate	100,000
FY 1966 Estimate	3,800,000
Total Funding Thru FY 1966	$3,900,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,168,000
Laboratory	S.F.	43,600	$26.10	1,138,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Electronics Research Center	Construction of Facilities	Microwave Radiation Laboratory

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Site Preparation	L.S.	---	8,000	8,000
Roads and Parking	L.S.	---	10,000	10,000
Utilities	L.S.	---	12,000	12,000
Equipment				2,632,000
Microwave Meas. & Anal. Equip.	L.S.	---	961,000	961,000
Microwave Transmission Equip.	L.S.	---	157,800	157,800
Microwave Reception Equip.	L.S.	---	460,000	460,000
Data Collection & Reduction	L.S.	---	756,900	756,900
Microwave Materials & Prep. Equip.	L.S.	---	296,300	296,300
Design				---
			SUBTOTAL	**3,800,000**
Fallout Shelter	---	---	---	---
Air & Water Pollution Control	---	---	---	---
			TOTAL	**$3,800,000**

PROJECT DESCRIPTION:

This laboratory will be a two-story building with a partial basement providing laboratory space, auxiliary office space, major equipment and special-purpose testing spaces in 43,600 square feet of floor area. An area of 24,000 square feet on the first and second floors will be devoted to laboratory facilities, an area

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SUPPORTING DATA:

of 10,000 square feet to related office spaces, with the basement area of 9,600 square feet divided in half for laboratory space, and utility and limited storage space.

The building will provide special purpose areas such as screened rooms and anechoic chambers for protection against undesirable electromagnetic interferences. This facility will be used to conduct both transmission and reception experiments. Temperature control, humidity control, filtered air and special cooling facilities will be provided to maintain the proper environment required for equipment to conduct the various research experiments and tests. The building utilities will be connected to the central heating, chilled water, water supply, electric power, sanitary sewers and communications systems. As part of site development, the necessary access roads, walks, and parking area for 100 cars will be provided.

The Microwave Radiation Laboratory includes integral equipment for the measurement, analysis, generation and reception of electromagnetic energy over the frequency range of centimeter, submillimeter, and pseudo-optic wavelengths. Unique date collection and reduction equipment for extracting, restoring, and analyzing intelligence from complex electro-magnetic propagation is complemented by special computer simulation equipment, both digital and analog. Standard correlation computers, cyrogenic handling equipment, and standard microwave test equipment are required to fully support laboratory experiments and tests. A precision machine shop and electronic shop provides an in-house capability for building, assembling, packaging and checkout of special microwave components and circuits.

PROJECT JUSTIFICATION:

This laboratory will provide necessary facilities for conducting research in the areas of microwave radiation sources, microwave components, data transmission and recovery techniques and devices, propagation phenomena and communication-information systems. The facility will be occupied by ~~125~~ 180 scientists, engineers, research assistants and clerical support personnel who will develop and execute a broad research program designed to advance the state of the microwave art. Theoretical studies and practical demonstrations of feasibility models utilizing new techniques in microwave propagation, signal processing and microwave component technology will be undertaken.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Electronics Research Center	Construction of Facilities	Microwave Radiation Laboratory

SUPPORTING DATA:

Present day microwave technology, exemplified by current tracking and data systems, has evolved mainly from the needs of systems operating in the immediate terrestrial environment. Several fundamental problem areas have been generated by the aerospace environment. The plasma-shielding effect, during the high temperature phase of reentry into the earth's atmosphere, is an excellent example relating to the microwave field.

The primary research objective of the Microwave Radiation Laboratory will be to develop new techniques for providing highly reliable microwave links within the solar system. Present day technology falls far short of future space program objectives, as illustrated in the following example. A 3-watt S-band transmission (typical present day solid state spaceborne transmitter performance rating) from the moon at the rate of 5×10^7 bits/sec (commercial TV quality pictures) can be received in real time on the earth by a 210 ft. diameter dish, operating in conjunction with a low noise receiver. By comparison, a single frame of the same quality data, transmitted at the above power and frequency from the vicinity of Mars, would require 1.5 days of transmission time to the same terrestrial receiving system. From this example it is clear that considerable greater "on-board" transmitter power capability, ultimately approaching 1000 watts for minimum transmission delay time from Mars, will have to be attained, with energy conversion efficiencies well beyond the present 20% figure. Methods for achieving large, effective antenna apertures (comparable to dish diameters in excess of 1000 ft) will have to be explored as part of the total micro-wave radiation research program objectives. Significantly increased antenna apertures will help considerable in overcoming the present power and gain limitations of present day microwave communication links. New lightweight antenna materials, capable of withstanding high temperatures and long periods in a space environment, are required. At a distance of 0.3 AU from the sun, surface temperatures as high as 3000°K may be expected in direct sunlight. Space antenna structures also must exhibit a high degree of dimensional stability over long periods of time, survive micro-meteoroid bombardment, be impervious to radiation and fit into compact high-density payload packages. Accordingly, advanced radiation handling techniques will form a major part of the microwave radiation research program.

Further areas of investigation will include techniques for minimizing multipath spurious response arising during lander-orbiter microwave relay link operation, methods for preventing the occurrence of ionic breakdown phenomenon in antennas, measurements and refinement of theoretical models of R-F attenuation resulting from dust storms and meteorological effects arising from planetary atmosphere turbulence, techniques for minimizing the effect of occultation arising during the course of planetary exploration, and the prevention of plasma blackout during lander entry phases.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT	BUDGET ESTIMATES
Electronics Research Center	Construction of Facilities	Microwave Radiation Laboratory	FY 1966

SUPPORTING DATA:

This laboratory is required to carry out the research program in microwaves involving both theoretical studies and practical demonstration of prototype hardware; establishing new techniques in microwave propagation, signal processing, and microwave component technology. The research program of the Microwave Radiation Laboratory constitutes a highly significant part of the space electronics program to be conducted by the Electronics Research Center. Microwave radiation research conducted by this laboratory will directly contribute to the design and development of ground-based and space-borne electronic systems used for communication, tracking, navigation and other similar applications.

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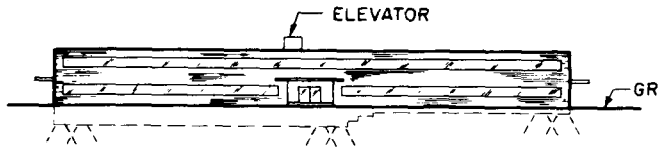
ELECTRONICS RESEARCH CENTER

FISCAL YEAR 1966 ESTIMATES

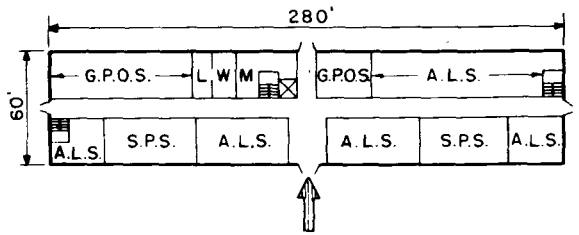
MICROWAVE RADIATION LABORATORY

SCALE IN FEET

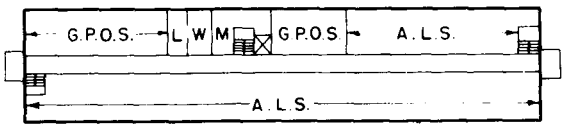
0 10' 25' 50' 75' 100'



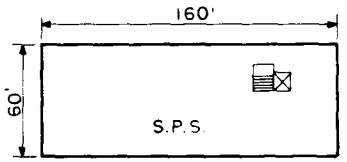
FRONT ELEVATION



FIRST FLOOR PLAN



SECOND FLOOR PLAN



BASEMENT PLAN

LEGEND

⊠	ELEVATORS
▥	STAIRWAY
G.P.O.S.	GENERAL PURPOSE OFFICE SPACE
A.L.S.	ANALYSIS–LABORATORY SPACE
S.P.S.	SPECIAL PURPOSE SPACE
M	MEN'S LAVATORY
W	WOMEN'S LAVATORY
L	WOMEN'S LOUNGE
⇨	MAIN ENTRANCE
⅄⅄⅄	PILE FOUNDATION

SEPT. 8, 1964

REV.	DATE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Electronics Research Center	Construction of Facilities	Computer Research Laboratory

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Advanced Research & Technology

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

AUTHORIZATION LINE ITEM: Electronics Research Center

LOCATION OF PROJECT: Cambridge, Massachusetts (conditional)

COGNIZANT NASA INSTALLATION: Electronics Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	---
FY 1965 Estimate	68,000
FY 1966 Estimate	$2,432,000
Total Funding Thru FY 1966	$2,500,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$ 523,000
Laboratory	S. F.	21,000	$23.52	494,000
Site Preparation	L. S.	---	7,250	7,250

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Electronics Research Center	Construction of Facilities	Computer Research Laboratory

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Roads & Parking	L. S.	---	6,300	6,300
Utilities	L. S.	---	15,450	15,450
Equipment				1,909,000
Central Computer	L. S.	---	1,078,640	1,078,640
Electronic Computer	L. S.	---	293,740	293,740
Optical Computer	L. S.	---	249,500	249,500
Gas Fluid Computer	L. S.	---	110,400	110,400
Checkout Monitor Eq.	L. S.	---	162,300	162,300
Shop Support Equipment	L. S.	---	14,420	14,420
Design				---
			SUBTOTAL	**2,432,000**
Fallout Shelter	---	---	---	---
Air & Water Pollution Control	---	---	---	---
			TOTAL	**$2,432,000**

PROJECT DESCRIPTION:

This laboratory will be a two-story building providing central computer facilities, laboratory research space, major equipment and special purpose testing spaces for the Electronics Research Center. A total of 8,000 square feet of space on the first and second floors will be utilized for laboratory facilities and central computer facilities, the balance of 7,000 square feet will be used as related office space. In the computer installation areas a raised floor will be used to permit utility connections to computer

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SUPPORTING DATA:

units. The 6,000 square feet of basement area will be equally divided for laboratory space, utilities and limited storage. Environmental utilities for temperature and humidity control and filtered air and cooling will be provided to equipment with high heat emission characteristics. As a part of site development for this facility, access roads, walks, and parking area for 50 autos will be provided. The interior utility systems will be connected to the central heat and chilled water distribution, water supply, electric power, communications, sanitary sewers, and alarm systems. To accomplish the research, equipment for conducting experiments in new computer logic and memory design, data handling and process techniques; improvement in performance of speed, reliability, and development of low-power consumption components for aerospace computers are included in this facility. Tools and instruments will be provided for research in development of fluid computers. Checkout equipment in the form of hybrid-type active and passive monitors as well as simulators of electronic systems will be located in the laboratory. Also included are small precision bench machines to support the research work in development and fabrication of small parts.

PROJECT JUSTIFICATION:

The Computer Research Laboratory is required to house the scientific and engineering personnel, with their equipment, who will conduct the Electronics Research Center's research program in computer technology and data processing and provide computer services for other laboratories at the Center. A total of 85 scientists and engineers, research assistants and clerical assistants will be housed in this facility.

Research to be conducted in this laboratory is a vital part of the overall electronics research of the Center. Future space missions require on-board computers which exhibit the characteristics of great reliability, fast computing speed, expanded storage, decreased access time and enhanced data handling capability. All of these features must be achieved in systems which are smaller, lighter and draw less power than present-day computers. For example, contemplated future planetary missions require on-board computers capable of operating, without error, for a period of many months. Known techniques for achieving this degree of reliability entail the use of triple or quadruple redundant components in computer circuits. However, this approach has two principal disadvantages: (1) the multiplicity of added components results in a several-fold increase in weight, and, more importantly, (2) the large increase in number of interconnections with its accompanying circuit complexity causes a substantial decrease in reliability which defeats the original purpose of the redundancy. Techniques must be sought which yield a substantial increase in reliability with a minimum penalty in weight and complexity. In

SUPPORTING DATA:

particular, advanced computer designs must incorporate the capability to detect and correct errors, and to repair or replace damaged circuits.

The processing of video data from deep space probes presents a host of problems which can only be solved by advancing the state of the art in computer technology. Present techniques for processing picture data from lunar probes are so slow and inefficient that two hours of modern computer time are required to process a single TV picture, of which 3,000 are taken on a typical mission. Future planetary exploring vehicles will carry cameras capable of generating substantially larger amounts of video data. The requirements for calibrating, removing distortions, rectifying, and mosaicking the resulting data will far exceed the capability of any commercial digital computer now existing or in prospect. In order to adequately support such future missions an increase of two orders of magnitude in ground-based video data processing capability is required.

The Electronics Research Center program in data processing is concerned with two areas, computer technology and computer applications. Research in technology is directed towards the development of improved computing equipment compatible with the requirements of future space missions. The effort in computer applications will seek improved methods for utilizing computers both in space and on the ground. The overall research approach will entail both theoretical studies aimed at resolving basic questions in information technology, and experiments designed to develop data processing devices and techniques. In many cases, theoretical results, such as probabilistic determinations of computer reliability, will be tested experimentally with breadboard hardware. The reverse process is also envisioned, wherein experimental findings are investigated theoretically with the aim of deducing general principles. Cooperative undertakings are contemplated with the qualifications and standards, electronic components, and instrumentation programs. Problems involving data compaction, bandwidth compression, and optical devices will be coordinated with the space optics and microwave radiation programs.

The Computer Research Laboratory will also provide central computer services to the other Center Laboratories. Although specialized computer equipment will be located in other laboratories of the Center, it is planned to tie these laboratories into the Computer Research Laboratory for general computation services. As basic working tools for Center scientists and engineers, the computers in this laboratory are required for the conduct of the Center research program.

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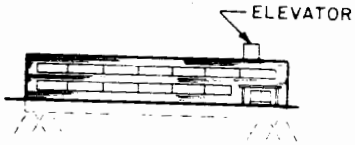
ELECTRONICS RESEARCH CENTER

FISCAL YEAR 1966 ESTIMATES

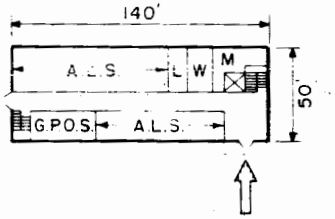
COMPUTER RESEARCH LABORATORY

SCALE IN FEET

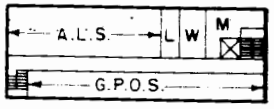
0 10' 25' 50' 75' 100'



FRONT ELEVATION



FIRST FLOOR PLAN



SECOND FLOOR PLAN

BASEMENT PLAN

LEGEND

- ELEVATORS
- STAIRWAY
- G.P.O.S. GENERAL PURPOSE OFFICE SPACE
- A.L.S. ANALYSIS-LABORATORY SPACE
- S.P.S. SPECIAL PURPOSE SPACE
- M MEN'S LAVATORY
- W WOMEN'S LAVATORY
- L WOMEN'S LOUNGE
- MAIN ENTRANCE
- PILE FOUNDATION

SEPT. 8, 1964

REV.	DATE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Electronics Research Center	Construction of Facilities	Center Support Facilities, Second Phase

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Advanced Research & Technology

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

AUTHORIZATION LINE ITEM: Electronics Research Center

LOCATION OF PROJECT: Cambridge, Massachusetts (Conditional)

COGNIZANT NASA INSTALLATION: Electronics Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	33,000
FY 1965 Estimates	77,000
FY 1966 Estimates	1,418,700
Total Funding thru FY 1966	$1,528,700

PROJECT COST ESTIMATES: Detailed cost breakdown to be submitted at a later date.

PROJECT DESCRIPTION: This project is the second phase of the site development and provision of support facilities for the Electronics Research Center located on an urban tract in Cambridge, Massachusetts. The site development and utility construction and installation covered in this project relate to the FY 1966 construction projects of the Center.

Site development includes additional site clearing, grading, top soil and seeding, security fencing, storm drainage, utility tunnels, roads, walkways and street lighting, required to support the additional laboratories requested in FY 1966.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Electronics Research Center	Construction of Facilities	Center Support Facilities, Second Phase

SUPPORTING DATA:

The utility support facilities consist of the addition to the Center heating and refrigeration plant, warehouse-maintenance building, additions to the underground heat and chilled water distribution systems, sewage collection and disposal, underground electrical distribution systems, transformers, communication systems, and water systems. As in the case of the utilities previously provided for the Center, the heat, chilled water, electrical and water distribution systems will be constructed in utilidors to facilitate operation and maintenance of Center utilities.

PROJECT JUSTIFICATION:

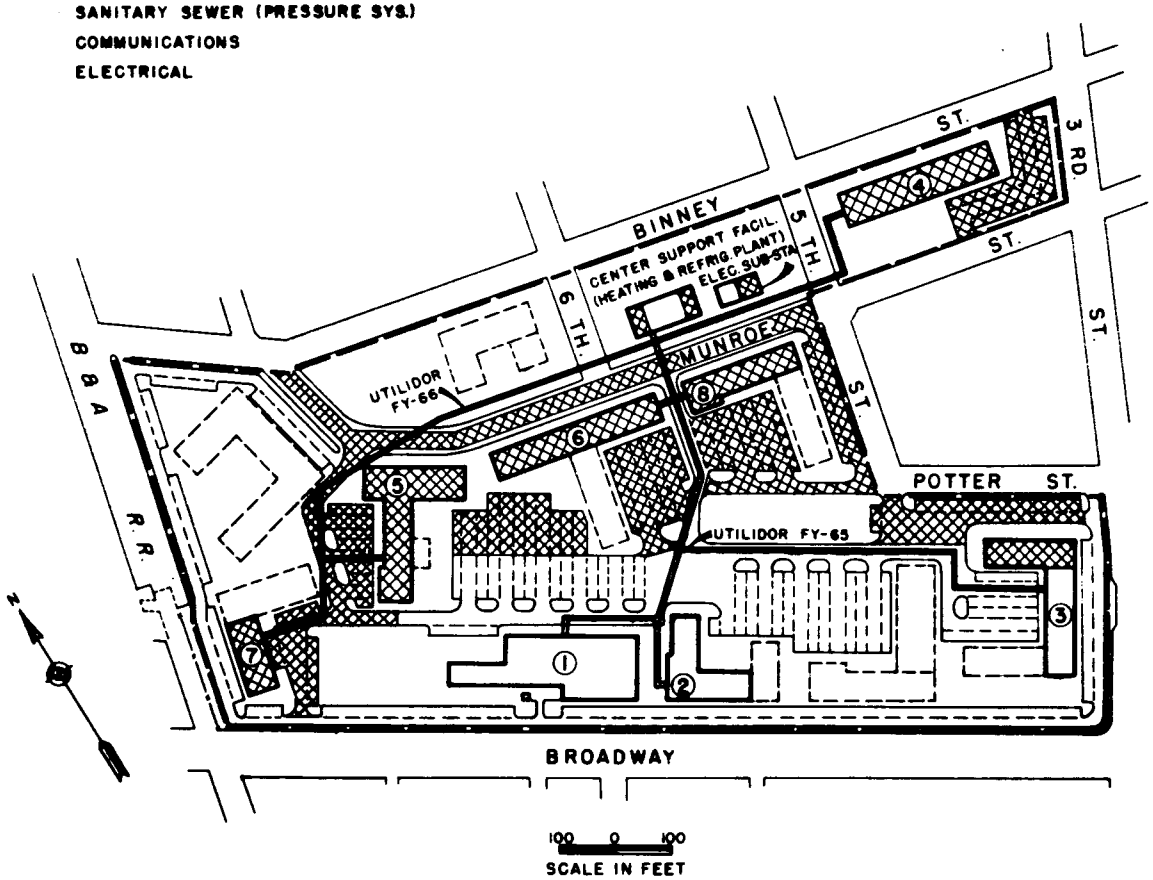
The Center Support Facilities, Second Phase, are required in order to operate the individual laboratories of the Electronics Research Center requested in the FY 1966 Budget. Without these necessary site-developments and utility support, the laboratories requested cannot function.

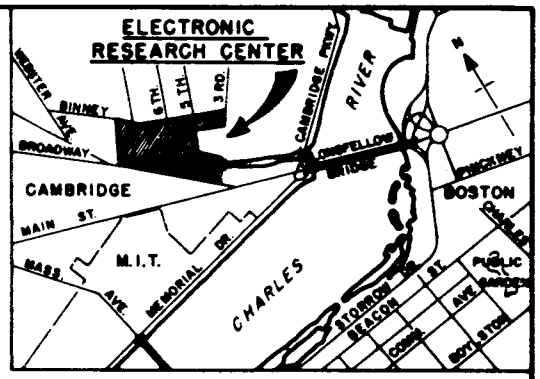
ELECTRONIC RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

CENTER SUPPORT FACILITIES
SECOND PHASE

UTILITY SERVICES IN UTILIDOR

- HEAT LINES
- COOLING LINES
- WATER SUPPLY
- COMPRESSED AIR
- INDUSTRIAL WASTE
- SANITARY SEWER (PRESSURE SYS.)
- COMMUNICATIONS
- ELECTRICAL





0 0.1 0.2 0.3 0.4 0.5
SCALE IN MILES

1. ENGINEERING & ADMINISTRATION BUILDING
2. ELECTRONIC COMPONENTS LABORATORY
3. QUALIFICATIONS & STANDARDS LABORATORY
4. MICROWAVE RADIATION LABORATORY
5. SPACE GUIDANCE LABORATORY
6. OPTICAL COMMUNICATIONS LABORATORY
7. COMPUTER RESEARCH LABORATORY
8. SYSTEMS LABORATORY

LEGEND

- FY-65 FACILITIES
- FACILITIES PROPOSED IN 1966 ESTIMATES
- FUTURE FACILITIES
- PROJECT BOUNDARY

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Langley Research Center	Office of Advanced Research and Technology	Langley AFB Hampton, Virginia		Hampton, Virginia

INSTALLATION MISSION

LRC Mission-Undertake 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; plan, develop and operate necessary facilities; generate new and advanced concepts; provide research advice and assistance to other branches of the Government; disseminate scientific and technical information; search for and identify potential industrial applications involved in the course of research.

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL *(End of Year)*	4,330	4,396	4,396
CONTRACTOR & OTHER PERSONNEL	482	502	566
TOTAL ALL PERSONNEL	4,812	4,898	4,962

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	540	
LAND *(Lease or Permit)*	3,690	
PLANT VALUE *(as of June 30, 1964)*		249,774*
TOTAL	4,230	249,774

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1964 AND PRIOR YEARS	FY 1965 *(Estimated)*	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Flight Control Research Facility	OART	---	182	5,320	---	5,502
Life Support Technology Laboratory	OART	27	254	4,514	---	4,795
V/STOL Research Laboratory	OART	4	41	673	---	718
Magazine and Test Area for Highly Reactive Chemical Materials	OART	15	110	2,312	---	2,437
Increase Research Capabilities of M-6 and 8.5 Tunnels	OART		50	682	---	732
(*Includes 30,227 work in progress)						
TOTAL FOR PROJECTS IN FY 1966 ESTIMATE				13,501		

NASA FORM 1029 DEC 63

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Flight Control Research Facility

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Langley Research Center

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT NASA INSTALLATION: Langley Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	---
FY 1965 Estimate	182,000
FY 1966 Estimate	5,319,500
Total Funding Thru FY 1966	5,501,500

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction:	---	---	---	2,836,300
Building	SF	87,360	21.46	1,875,700
Raised Floor	LS	---	141,600	141,600
Projection Spheres	LS	---	183,000	183,000

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NATIONAL AERONAUTICS AND SPACE AD TRATION

JUSTIFICATION DATA

BUDGET ESTIMAT

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Flight Control Research Facility

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Air Conditioning	LS	---	305,100	305,100
Elevator	LS	---	40,000	40,000
Site Work and Paving	LS	---	72,900	72,900
Mechanical Utilities	LS	---	30,400	30,400
Electrical Utilities	LS	---	187,600	187,600
Equipment	---	---	---	2,451,700
Motion Visual Simulator	LS	---	593,000	593,000
Fixed Base Study Stations	LS	---	217,000	217,000
Visual Cue Generation	LS	---	928,000	928,000
Signal Distribution and Recording	LS	---	627,000	627,000
Building Furnishing and Equipment	LS	---	86,700	86,700
Design	---	---	---	-0-
SUBTOTAL				5,288,000
Fallout Shelter	LS	---	31,500	31,500
TOTAL				5,319,500

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Flight Control Research Facility

SUPPORTING DATA:

PURPOSE:

An immediate requirement exists at the Langley Research Center for a facility specifically designed to support (a) research studies in the guidance and control aspects of future manned flight missions and (b) fundamental investigations leading to the optimization of man's performance in aerospace systems. In the design of the facility and its research equipment, primary emphasis must be placed on flexibility to accomodate a large number of widely varied studies, and features to permit rapid test setup and configuration changes. The functional grouping of scientific personnel engaged in these studies with the research equipment and the allied computer and simulator development staff must also be considered a basic requirement.

DESCRIPTION:

This project will provide a flight control research facility to be located at the Langley Research Center. Research equipment included in the project will consist only of devices which can be used in a variety of experimental studies - visual cue generation, projection and display subsystems; a signal conditioning and transmission network to connect the centralized equipment with the various study stations in the facility and special purpose simulators at other Langley sites; modularly designed, quick change cockpits for use at the study stations; and a motion/visual simulator for studying human performance when influenced by angular and linear motions.

The facility will be housed in an addition to the Data Reduction Center (Building 1268). This addition will provide space for:

A high ceiling area for visual cue projection spheres and the motion/visual simulator.

The visual cue generation and simulation control equipment, fixed base crew stations and supporting cockpit assembly, checkout and program preparation areas.

A human performance laboratory for the study of such problems as information sensing, display, interpretation and decision making, and human response characteristics in man-machine systems.

The effective integration of existing computing equipment into the simulation complex, together with programmed new equipment.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Flight Control Research Facility

SUPPORTING DATA:

The personnel to conduct the manned flight control and human performance research as well as the allied research and development ork in computing techniques and advanced simulator equipment.

This facility will not have a requirement for water and air pollution control systems.

JUSTIFICATION:

The effective integration of the astronauts into the spacecraft system will be a major factor in the reliability, safety and achievement of the research objectives of future space flight missions. Major technical advances must be made to meet the requirements of multi-spacecraft missions, manned orbiting laboratories, entry into planetary atmospheres, and interplanetary flight. Extensive research ill be required to determine the automatic controls to be used, to determine man's capability and function in the control system, to develop techniques for both man and machine, and to determine the effect of guidance and control on the design of spacecraft and missions. The development of this technological base is required to solve the problems involved in a particular mission, and in addition, to provide the information needed for administrative decisions regarding the feasibility, desirability, and approach.

Future space missions, including the Apollo and post Apollo programs, involve many more complicated operations than those attempted previously. Utilization of the capabilities of the astronauts requires proper integration of the mission plan, spacecraft propulsion and controls, guidance and navigation equipment, and pilot displays and instrumentation. A systematic procedure involving a coordinated program of analytical and experimental research is required to determine solutions to these problems.

The need for studies which will establish the proper role to be played by man in these more complex missions has been emphasized by the experience gained in the Mercury program. As a result, the Langley Research Center management has regrouped its staff to focus its specialized talent in the field of piloted vehicles on this problem.

The experimental studies carried out by this group require laboratory facilites which provide an accurate and realistic representation of the pertinent flight environment. The use of simulators offers the only means for providing this environment short of actual flight testing of operational prototypes. The risk to human life and the cost of launch vehicles and spacecraft require that as many uncertainties as possible be eliminated from the manned mission before actual flight operations are undertaken.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Flight Control Research Facility

SUPPORTING DATA:

The advantage of using simulators for pilot and astronaut training is well recognized. More important, these same concepts have been utilized at Langley for a number of years in R and D programs to establish design criteria for new modes of flight. For example, manual control of the Mercury capsule during retrofire and of the X-15 during simulated reentry missions was investigated in detail in programs conducted at Langley. The techniques developed were later required both as flight emergency procedures and for flight investigation of varied control modes and vehicle dynamic characteristics. More recently, simulator investigation of space rendezvous has contributed to the adoption of the lunar orbit rendezvous technique for the Apollo mission. Studies of rendezvous and docking are also playing an important part in perfecting the techniques and equipment for the Gemini Mission.

The primary effort at Langley during the past few years in this area has been concerned with the implementation of special purpose, mission-oriented facilities such as the Rendezvous Docking Simulator, LOLA, the Lunar Landing Research Facility and the 4-man Supersonic Transport Simulator which will be connected by a data link to the Federal Aviation Agency Air Traffic Control Simulator in Atlantic City, for studies of terminal area operations of the Supersonic Transport. Although well suited to the specialized studies for which they were designed, these facilities do not provide the flexibility and accessibility required to support the numerous studies required for the verification of advanced control concepts. The equipment available for these studies has generally been improvised from surplus military equipment, or hardware designed for other purposes. By its nature this equipment is difficult to modify, calibrate and maintain in reliable operating condition. In many cases useful results have been obtained only by breaking problems into undesirably small segments and by making short runs to maintain accuracy. The growing number of increasingly complex studies cannot be carried out by using this approach.

The proposed facility will provide the basic tools for conducting advanced research for missions of the post Apollo period. It will be designed to incorporate existing and programmed special purpose simulators and computing equipment into a well integrated flexible complex capable of handling studies with an accuracy, detail and completeness consistent with these advanced requirements. As such, it will fit into a coordinated plan to provide the technological base needed to define and carry out the new NASA programs.

ESTIMATED FUTURE YEAR FUNDING:

NONE

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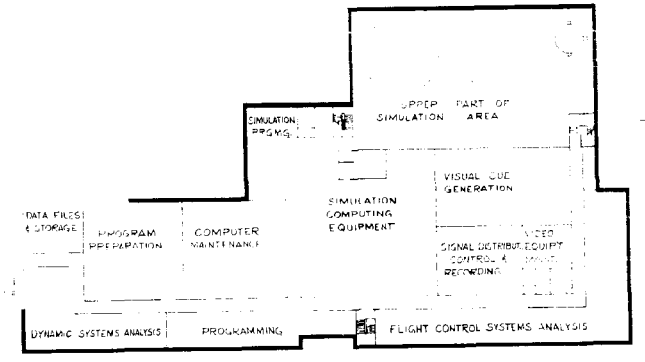
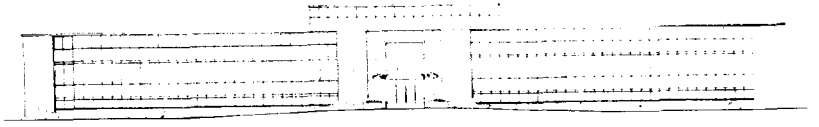
LANGLEY RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

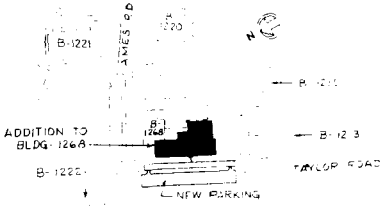
FLIGHT CONTROL RESEARCH FACILITY



SECOND FLOOR PLAN

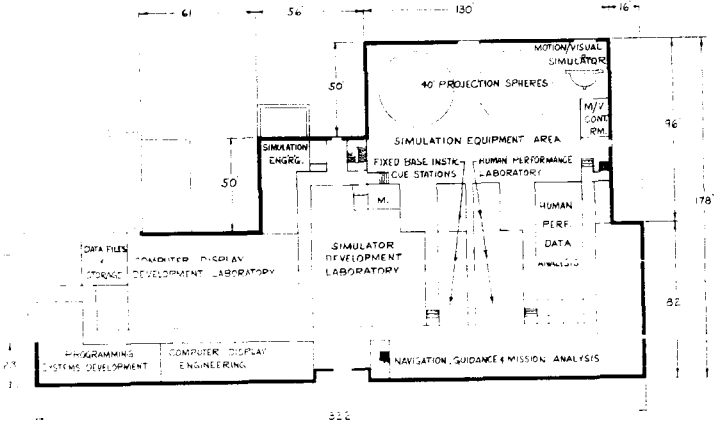


FRONT ELEVATION



PLOT PLAN

0 200' 400'



FIRST FLOOR PLAN

0 20 40

LEGEND

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Life Support Technology Laboratory

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Langley Research Center

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT NASA INSTALLATION: Langley Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ 27,000
FY 1965 Estimate	254,000
FY 1966 Estimate	4,514,300
Total Funding Thru FY 1966	$4,795,300

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$3,233,700
Building	SF	117,000	21.89	2,562,200

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATE FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Life Support Technology Laboratory

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Special Building Equipment	LS	---	132,100	132,100
Grading, Paving, Landscaping	LS	---	136,800	136,800
Mechanical Utilities	LS	---	168,700	168,700
Electrical Utilities	LS	---	233,900	233,900
Equipment	---	---	---	1,136,600
Environmental Simulators	LS	---	875,400	875,400
Laboratory Equipment	LS	---	154,800	154,800
Laboratory Mechanical Systems	LS	---	53,400	53,400
Building Furnishings and non-Technical Equipment	LS	---	53,000	53,000
Design	---	---	----	-0-
SUBTOTAL				4,370,300
Fallout Shelter	---	---	---	144,000
TOTAL				$4,514,300

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Life Support Technology Laboratory

SUPPORTING DATA:

PURPOSE:

This project will consist of a Life Support Technology Laboratory at the Langley Research Center to provide NASA with the research capability to obtain and apply the technology necessary to equip future manned space vehicles of extended duration with optimum life support systems. In addition, this facility will bring into close proximity the research scientists, technicians, and specialized engineering personnel who provide direct support for the Langley research effort in the life support area, and allow consolidation of related Langley support functions at one central location.

DESCRIPTION:

This project will consist of a Life Support Technology Laboratory at the Langley Research Center. This proposed laboratory will contain approximately 117,000 square feet of laboratory and engineering space. Included in this facility will be:

a. An advanced systems experimental laboratory to initiate and develop promising concepts for life support processes, components, and subsystems,

b. A laboratory for the conception and initial evaluation of instrumentation to monitor and control advanced life support subsystems and integrated systems,

c. Laboratories for the evaluation and testing of advanced concepts concerned with water reclamation from biological wastes, humidity control, and wash facilities,

d. A laboratory for making test setups, and instrumenting systems and subsystems for evaluation,

e. An environmental component and systems laboratory for the testing and evaluation of advanced components and subsystems for the control of the environment within the spacecraft,

f. A full scale integrated systems test area which will contain a large test chamber required for the evaluation and subsequent modification of complete and integrated manned life support systems including environmental control, water recovery, food provision, and waste management,

g. A major subsystems test area for the checkout and evaluation of vehicle structures, airlocks, erectable and deployable structures, and functional mockups of various projected missions as well as for dynamics and stability studies associated with manned vehicles,

h. A temperature control laboratory for the research and scale testing associated with both passive and active thermal control concepts for manned space vehicles,

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SUPPORTING DATA:

i. A test laboratory to determine the physical, mechanical, and degradation characteristics of candidate materials for manned spacecraft and to evaluate their toxic characteristics,

j. A food and waste management systems laboratory for research on optimum methods of preparing and dispensing food and processing the associated refuse and biological wastes,

k. A contaminant control and biological test laboratory for research on detection, analysis, and control of gas, vapor, biological and particulate toxic substances occurring in spacecraft environments,

l. Work area for direct engineering support of life support effort,

m. Work area for related Langley engineering support functions.

This project has no requirement for water and air pollution control systems.

JUSTIFICATION:

In future years man will engage in space explorations of extended duration and to points which are increasingly distant from the earth. Planning for such missions as lunar colonies, enlarged and expanded space stations, and manned planetary fly-bys and explorations will be undertaken in the near future. A new technology must be established in order to provide these missions with optimum life support systems. Present life support systems used on the Mercury vehicle and planned for Gemini and Apollo are relatively simple containing chemical absorbers, high-pressure gas storage, and simple humidity controls. This type of system is inadequate for longer space missions. For space missions beyond about 30 days, life support must be made regenerative in order to avoid excessive weight penalties. Generally speaking, the longer the mission duration, the more use must be made of regenerative and reclamation type systems in order to conserve weight. At the same time, however, the mission durations demand that these systems which have become increasingly complex, also be more reliable due to increased time of use.

The primary effort within NASA for life support technology has been concentrated for the most part at the Langley Research Center. However, this effort has been considerably hampered because of the lack of adequate laboratory space and equipment to sufficiently accomplish the planned objectives in this area. This project will provide the needed laboratory space to provide NASA with the capability to adequately undertake a concentrated research program in the life support area. Research to be accomplished in this laboratory will include the development of promising concepts into tested prototype hardware, the integration of these subsystems into working systems which will be capable of fulfilling all the requirements of life support, the investigation of the effects within these systems, the sensing and control of contaminents, the investigation of the pertinent aspects of repair

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SUPPORTING DATA:

and maintenance, and the knowledge of how to apply these systems to the actual mission to achieve economical and reliable life support. In addition to these investigations, coordination and integration of these experiments and systems must be carried out with other systems necessary to fulfill all other aspects of manned spacecraft; the instrumentation, the structures, control systems and others which may modify the final configuration of these life support systems. The inverse is also equally important: that is, the aspects of the vehicle which will be affected by the operation of the life support systems. By the exercise of this preplanning during the time that the systems are being conceived and evaluated, many of the problems of system-vehicle integration will be minimized and the efficient design of total spacecraft configuration can be achieved.

There is also a need at Langley to bring into close proximity the research scientists, technicians, and specialized engineering personnel who provide direct support for the Langley research effort in the life support area. At the same time, a basic need exists at Langley to consolidate related engineering support functions at one central location. These functions are currently scattered in several locations throughout Langley Research Center and in spaces formerly utilized as shop and laboratory areas. The engineering space provided by this project will meet both of these Langley needs.

ESTIMATED FUTURE YEAR FUNDING:

NONE

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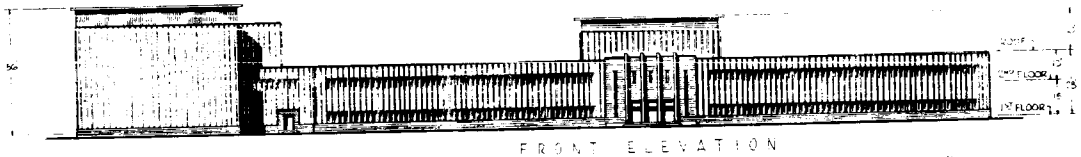
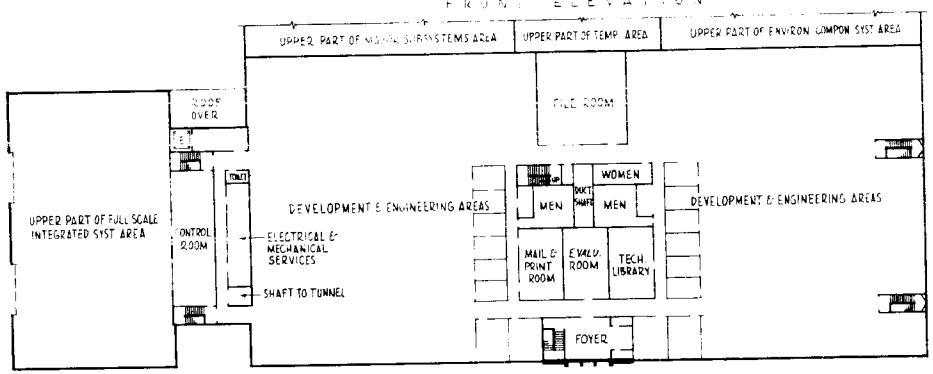
LANGLEY RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

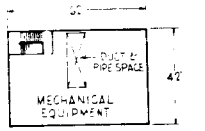
LIFE SUPPORT TECHNOLOGY LABORATORY



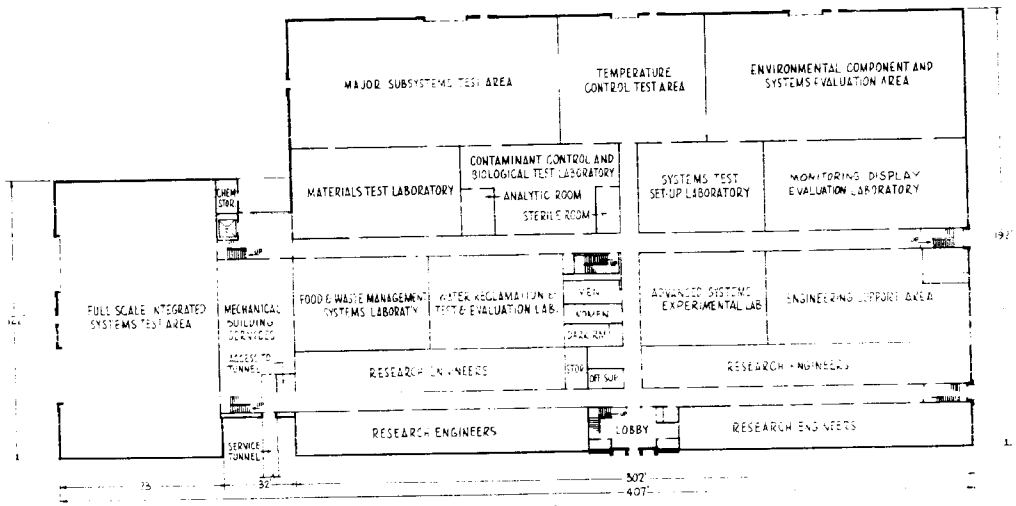
FRONT ELEVATION



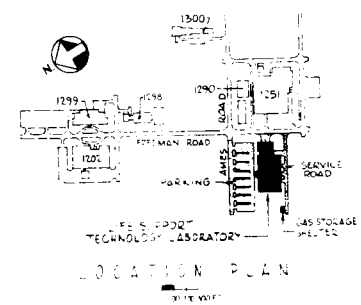
SECOND FLOOR PLAN



PENTHOUSE PLAN



FIRST FLOOR PLAN



LOCATION PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	V/STOL Research Laboratory

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Langley Research Center

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT NASA INSTALLATION: Langley Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	4,000
FY 1965 Estimate	41,000
FY 1966 Estimate	673,000
Total Funding Thru FY 1966	718,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	441,800
Building	SF	6,675	2,459	164,200

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	V/STOL Research Laboratory

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Special Electrical Power	LS	---	75,700	75,700
Special Equipment	LS	---	56,400	56,400
High Pressure Air System	LS	---	105,100	105,100
Mechanical Utilities	LS	---	900	900
Electrical Utilities	LS	---	31,800	31,800
Site work and Paving	LS	---	7,700	7,700
Equipment	---	---	---	231,200
Mechanized Test Stands	LS	---	113,900	113,900
Instrumentation	LS	---	117,300	117,300
Design	---	---	---	---
Construction	LS	---	---	---
Equipment	LS	---	---	---
Fallout Shelter	---	---	---	---
	TOTAL			673,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	V/STOL Research Laboratory

SUPPORTING DATA:

PURPOSE:

This project will consist of a V/STOL Research Laboratory for V/STOL model testing at the Langley Research Center The prime purpose of this facility will be to study the performance of V/STOL aircraft in hovering flight under both wind and no wind conditions.

DESCRIPTION:

Construction of the V/STOL Research Laboratory will be prefabricated metal frame and shell and will be approximately 60 by 100 feet with a minimum ceiling height of 20 feet at the eaves. Four test stands will be provided. Two will be simple tie-down stations in the floor and two will be equipped with sting-type model supports and groundboards and mechanized so that the attitude and height of the model above the groundboard can be varied. One stand will be equipped with a system of blowers to produce a variable wind velocity up to 30 to 40 feet per second for the investigations of wind effects in hovering. A test booth about 10 by 20 feet to house instrumentation and test personnel will be located centrally within the building. Covered trenches in the floor will radiate from the test booth to the various test stands as conduits for air, water, power, and instrumentation leads, controls, to be used in conjunction with an existing primary readout system which will be utilized for this facility. Monitoring equipment and utility services will be provided. Also included in this project will be air lines to the Central High Pressure Air System capable of providing this facility with an available air usage rate of up to 10 pounds per second on an intermittent basis.

This project has no requirement for water and air pollution control systems.

JUSTIFICATION:

Quantitive research information on the factors affecting stability, control, and performance of V/STOL aircraft in hovering flight under both wind and no wind conditions is badly needed in order to provide the necessary technology for the development of successful V/STOL aircraft. Model research on the hovering problem requires an enclosure sufficiently large such that the walls and ceiling do not distort the recirculating flow which passes over the aircraft and through the powered lifting elements. Furthermore, blowers are required to provide controlled recirculation of surface winds.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	V/STOL Research Laboratory

SUPPORTING DATA:

At the present time, many problems associated with hovering flight have been given only limited attention because of the lack of a suitable facility. Attempts have been made to utilize a small storage room for hovering studies in the no wind condition. The proximity of the walls and ceiling, however, raise certain questions as to the validity of the results obtained. The size of the proposed facility is judged to be the minimum compatible with the technical requirement of avoiding undesirable distortions in the recirculating flow. The proposed facility will therefore provide Langley with a unique capability for studying hovering flight of V/STOL aircraft.

ESTIMATED FUTURE YEAR-FUNDING:

None

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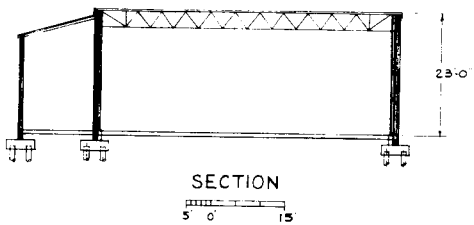
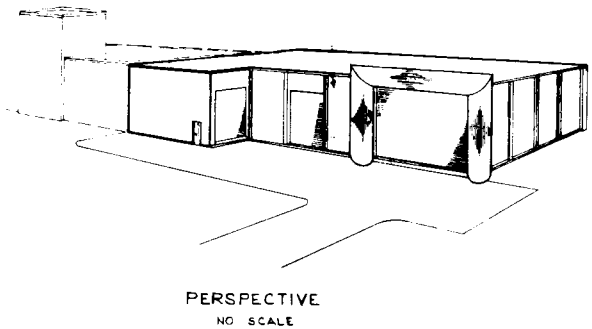
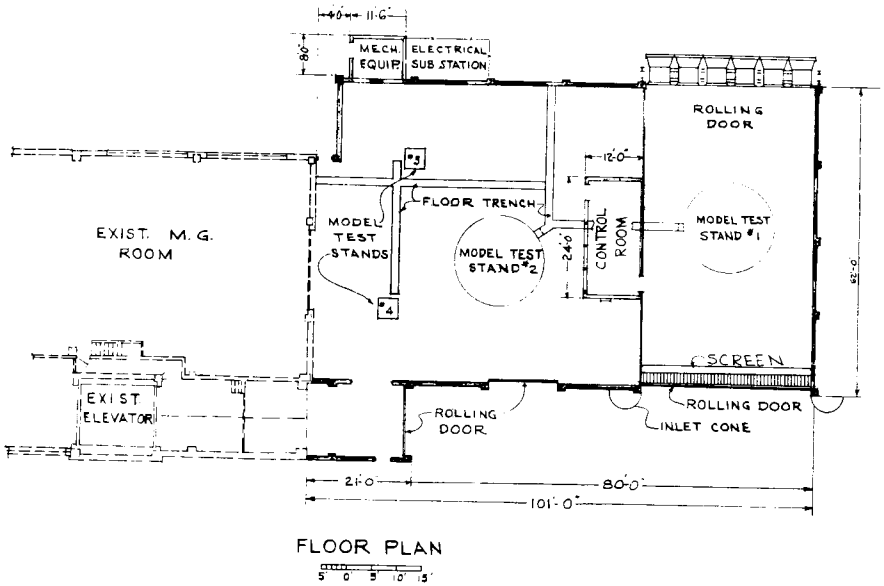
LANGLEY RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

V/STOL RESEARCH LABORATORY

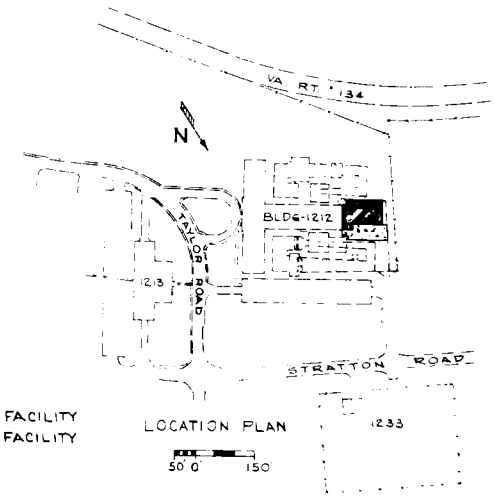






FLOOR PLAN
5' 0' 5' 10' 15'

LEGEND
PROPOSED FACILITY
EXISTING FACILITY



LOCATION PLAN
50' 0' 150

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Magazine and Test Area for Highly Reactive Chemical Materials

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Langley Research Center

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT NASA INSTALLATION: Langley Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	15,000
FY 1965 Estimate	110,000
FY 1966 Estimate	2,311,600
Total Funding Thru FY 1966	2,436,600

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	2,120,700
Rocket Magazine	LS	---	122,400	122,400

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION: Langley Research Center

APPROPRIATION: Construction of Facilities

PROGRAM OR PROJECT: Magazine and Test Area for Highly Reactive Chemical Materials

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Rocket Test Facilities	LS	---	$337,200	$337,200
Rocket Assembly Building	LS	---	245,000	245,000
Liquid Propellant Magazine-Hydrazine	LS	---	142,400	142,400
Liquid Propellant Magazine-Nitrogen Tetroxide	LS	---	114,600	114,600
Liquid Propellant Magazine-Hydrogen Peroxide	LS	---	197,200	197,200
Chemical Magazine	LS	---	216,500	216,500
Site Development	LS	---	745,400	745,400
Equipment	---	---	---	$190,900
Laboratory Equipment	LS	---	190,900	190,900
Design	---	---	---	---
Fallout Shelter	---	---	---	---
		TOTAL		$2,311,600

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1965

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Magazine and Test Area for Highly Reactive Chemical Materials

SUPPORTING DATA:

PURPOSE:

This project provides for the construction of permanent type test and magazine facilities to supplement the existing hypersonic physics test area at the Langley Research Center. Buildings will be provided in this proposed area which have larger physical capacity and accompanying safety features to meet Langley's increasing needs in solid rocketry and handling of varied reactive chemicals.

DESCRIPTION:

This project will consist of a magazine and test area for highly reactive chemical materials at the Langley Research Center. Eight buildings will be constructed in this proposed area along with necessary fencing, roads, utilities and earth barricades. The buildings to be provided include:

a. A rocket magazine for holding of large and small solid rocket motors awaiting tests.

b. Rocket test facilities to provide test stands, control room, instrumentation and shop space required for static test firing of Class A solid propellant rocket motors of up to 3000 pounds in weight.

c. Rocket assembly building to provide space required for operations on solid rocket motors containing up to 3000 pounds of Class A propellant in preparation for static test firings or for build-up into launch vehicle stages for free flight use.

d. Liquid propellant magazine (hydrazine) to provide both heated and unheated areas for up to 50,000 pounds of Group III type liquid propellant fuels, including hydrazine, hydrazine based derivatives, and hydrazine-metallic additive slurries.

e. Liquid propellant magazine (Nitrogen Tetroxide) to provide an unheated area for up to 50,000 pounds of nitrogen tetroxide liquid propellant oxidizer, Group I.

f. Liquid propellant magazine (Hydrogen Peroxide) to provide an unheated area for up to 200,000 pounds of 90 percent hydrogen peroxide, Group II.

g. Chemical magazine to provide segmented areas for conventional and exotic chemicals now employed in Langley's varied research activities.

h. Combination heating plant and gate house to provide heat and security services for the entire magazine and test area.

Planning for this project calls for infrequent discharges of dilute solutions of hydrogen peroxide into Wythe Creek located adjacent to the Magazine and Test Area. After consultation with local authorities, water pollution controls have been incorporated into this project.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Magazine and Test Area for Highly Reactive Chemical Materials

JUSTIFICATION:

The Langley Research Center has need for a magazine and test area for highly reactive chemical materials to supplement the existing hypersonic physics test area. The hypersonic physics test area was constructed in the Langley F.Y. 1958 construction of facilities program and was intended to serve the Center high-temperature research programs in the fields of materials, structures, and aerodynamics, and to a lesser degree was intended to support Langley Research Center needs for small solid rockets used in wind-tunnel test programs. A high level of effort is continuing at the hypersonic physics test area in high-temperature research on materials and structures.

However, in the past 6 years, Langley has experienced a large increase in the amount of research and development required in the area of solid rocketry. At the same time, the amount of effort required for support of Langley and other NASA flight projects has also greatly increased. For instance, in the area of solid rocketry, Langley is investigating new rocket concepts such as a high mass fraction rocket, conducting propellant irradiation studies. studying effects of spin on rocket motor ballistic performance, investigating integral mandrel concepts, and conductive film ignition, and has developed the 15-inch spherical rocket used in the Trailblazer II vehicle. In the area of flight project support, extensive effort has been supplied in spin and development tests for Scout, and a number of static test firings have been conducted for Langley flight projects such as RAM and FIRE. In addition, considerable effort has been directed toward the establishment of acceptance rejection criteria for solid rocket motors of the types presently used in Langley flight vehicles.

Concurrently with these efforts, the use of varied reactive chemicals has greatly incrased with resultant quantity increases in the amounts of chemicals which must be handled at any one time. This increased use of reactive chemicals imposes drastic safety compromises on those limited facilities in the hypersonic physics test area which are considered equipped to handle these types of materials.

The magazine and test area for highly reactive chemical materials will provide safe and proper conditions for handling, operational use, and testing of all reactive chemicals now employed in Langley's programs and will provide Langley with capabilities to conduct research in the area of solid propulsion which is beyond the capacity of the hypersonic physics test area.

The hypersonic physics test area will continue to be utilized for those programs calling for less physical capacity and with less stringent safety requirements. Both facilities in conjunction will meet the anticipated program needs in this area of research.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Magazine and Test Area for Highly Reactive Chemical Materials

SUPPORTING DATA:

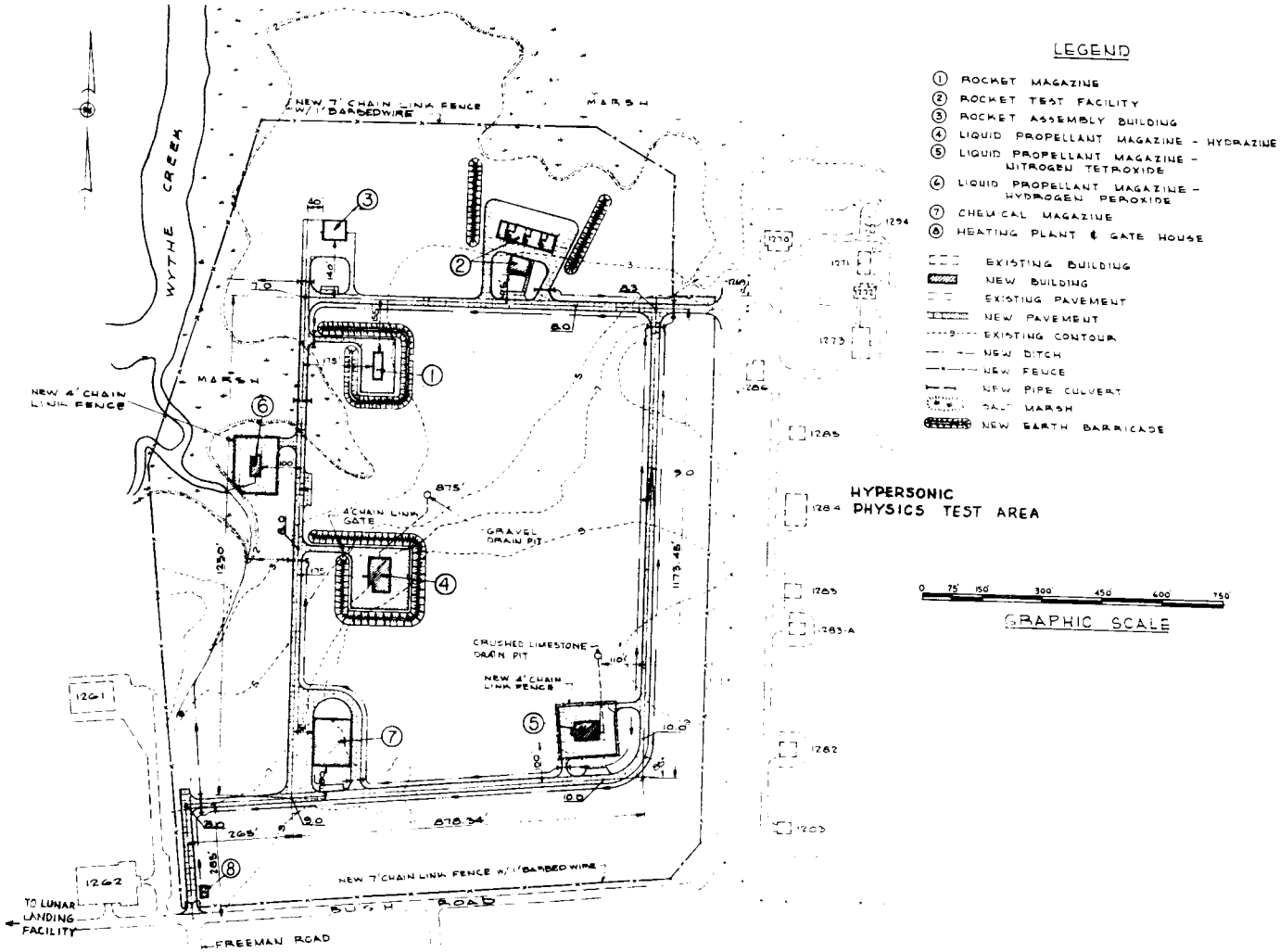
ESTIMATED FUTURE YEAR FUNDING:

None

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

MAGAZINE AND TEST AREA FOR HIGHLY REACTIVE CHEMICAL MATERIALS



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Increase Research Capabilities of 20-Inch Mach 6 and Mach 8.5 Tunnels

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Langley Research Center

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT NASA INSTALLATION: Langley Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	---
FY 1965 Estimate	50,000
FY 1966 Estimate	682,000
Total Funding Thru FY 1966	732,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$223,070
Building	SF	2,488	30.36	75,550

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Increase Research Capabilities of 20-Inch Mach 6 and Mach 8.5 Tunnels

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Foundations and Exhaust Tube Support	LS	---	27,870	27,870
Site Work and Paving	LS	---	8,880	8,880
Electrical Utilities	LS	---	67,630	67,630
Mechanical Utilities	LS	---	43,140	43,140
Equipment	---	---	---	458,930
Vacuum Storage Sphere	LS	---	154,500	154,500
Air Coolers	LS	---	128,750	128,750
Vacuum System	LS	---	134,280	134,280
Equipment Installation	LS	---	41,400	41,400
Design	---	---	---	
Fallout Shelter	---	---	---	---
TOTAL				$682,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Increase Research Capabilities of 20-Inch Mach 6 and Mach 8.5 Tunnels

SUPPORTING DATA

PURPOSE:

The purpose of this project will be to increase the research capabilities of the 20-inch Mach = 6 and 8.5 tunnels at the Langley Research Center. These increased capabilities will accomplish the following two specific objectives:

Reduce starting and stopping loads such that winged hypersonic vehicles may be studied.
Provide an order of magnitude increase in available Reynolds number range.

DESCRIPTION:

This project will consist of a 60-foot diameter vacuum sphere at Langley Research Center to increase the research capabilities of the 20-inch Mach 6 and Mach 8.5 tunnels. An existing 41-foot diameter sphere, which does not presently serve these facilities, will be connected to the proposed 60-foot sphere, through a valve, to allow combined use of the two spheres. A pumping system utilizing existing pumps and motors will be used to evacuate the sphere. A weathertight shelter will be provided the pumps, associated equipment, and for coolers which will be required for each tunnel because of extreme high temperature exhaust air.

This project has no requirement for air and water pollution control systems.

JUSTIFICATION:

The use of hypersonic winged vehicles for high speed transportation between widely separated routes on the earth's surface, and as elements of earth to orbit ferry systems, appears attractive and is receiving increased attention. Experimental aerodynamic study is required to provide the information necessary to properly assess the potential of such vehicles.

At the present time, Langley has no tunnels suitable for obtaining the required information in the Mach number range of approximately 5.5 to 8.5. The 20-inch Mach 6.0 and 8.5 Tunnels are of the correct size and operate in this Mach number range. The method by which these intermittent type tunnels operate, however, imposes such severe starting and stopping aerodynamic loads that experiments with winged vehicles are not possible. Furthermore, the range of Reynolds number obtainable with the present mode of operation is undesirabley restricted.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Langley Research Center	Construction of Facilities	Increase Research Capabilites of 20-Inch Mach 6 and Mach 8.5 Tunnels

SUPPORTING DATA:

A reduction in back pressure at the downstream end of the tunnels will overcome these difficulties. This reduction can be accomplished by providing a 60-foot vacuum sphere and utilizing existing pumps and motors now in storage at Langley.

ESTIMATED FUTURE YEAR FUNDING:

None

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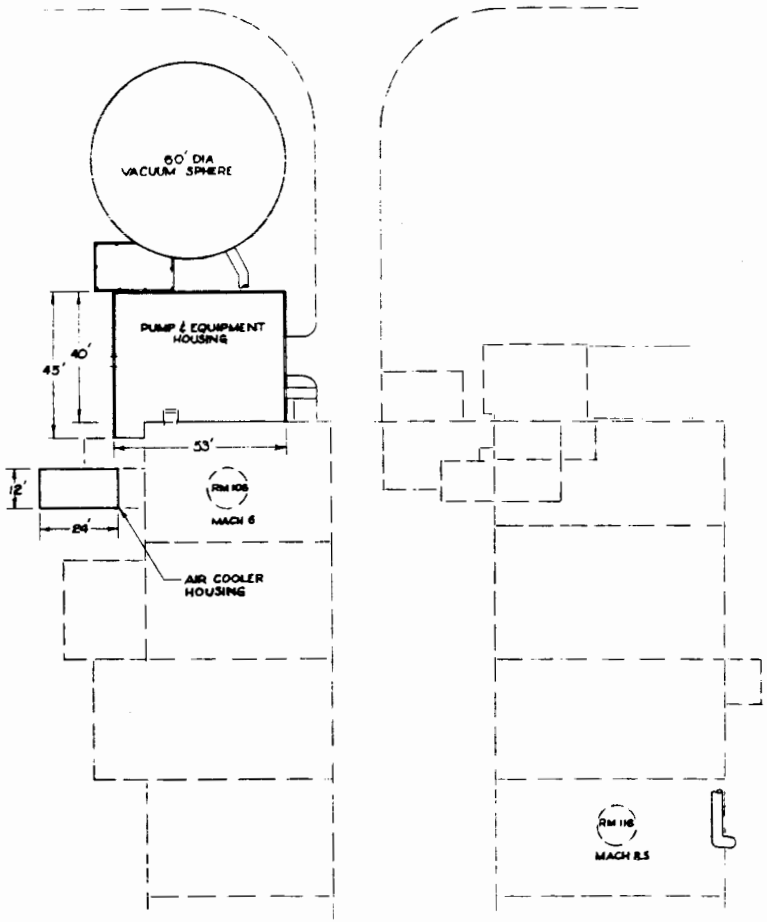
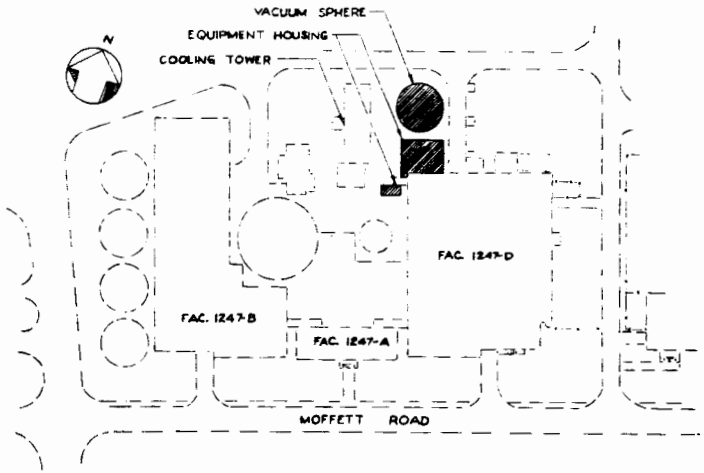
LANGLEY RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

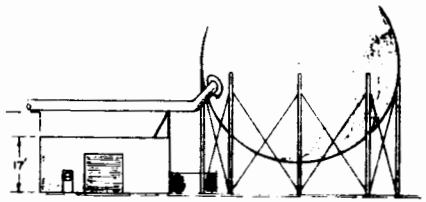
INCREASE RESEARCH CAPABILITY OF 20-INCH MACH 6 AND MACH 8.5 TUNNELS



FACILITY PLAN
0 25 FT.



PLOT PLAN
0 100 FT.



EAST ELEVATION

LEGEND
EXISTING CONSTRUCTION
NEW CONSTRUCTION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Lewis Research Center (Cleveland Facilities)	Advanced Research and Technology	Cleveland, Ohio	Cuyahoga	Cleveland, Ohio

INSTALLATION MISSION Research and development in the areas of advanced propulsion and space power generation. Basic and applied research is conducted in-house on materials and metallurgy; cryogenic and liquid-metal heat-transfer fluids; pumps and turbines; combustion processes, propellants, tankage, injectors, chambers, and nozzles; system control dynamics; plasmas and magnetohydrodynamics; space meteoroid damage and zero-gravity effects.

The Lewis Research Center maintains technical management of NASA contracts on chemical and electric propulsion and on nuclear and solar space power systems, including the Centaur, Agena and M-1 engine programs.

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL (End of Year)	4,244	4,246	4,574
CONTRACTOR & OTHER PERSONNEL	300	251	254
TOTAL ALL PERSONNEL	4,544	4,497	4,828

INVENTORY		
ITEM	ACRES	COST (Thous.)
LAND (Fee)	342	
LAND (Lease or Permit)	15	
PLANT VALUE (as of June 30, 1964)		185,030
TOTAL	364	185,030

FUNDING (Thousands of dollars)

PROJECT LINE ITEM	PROJECT SPONSOR	FY 1964 AND PRIOR YEARS	FY 1965 (Estimated)	FY 1966 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Modernization of the Propulsion Systems Laboratory for Supersonic Transport Engine Research	OART	----	500	13,000	----	13,500
Building Addition to 10 by 10-foot Supersonic Wind Tunnel for Data Processing	OART	8	15	407	----	430
Space Power Research Laboratory	OART	7	20	460	----	487
TOTAL FOR PROJECTS IN FY 1966 ESTIMATE				13,867		

NASA FORM 1029 DEC 63

GPO 870-089

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Lewis Research Center (Plum Brook Station)	Advanced Research and Technology	Sandusky, Ohio	Erie	Sandusky, Ohio

INSTALLATION MISSION

Under the technical direction of personnel located at the Cleveland facilities, research and development programs are conducted in the areas of advanced chemical and nuclear powered rocket engines and their accessories.

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL *(End of Year)*	561	569	744
CONTRACTOR & OTHER PERSONNEL		85	105
TOTAL ALL PERSONNEL	561	654	849

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	6,031	
LAND *(Lease or Permit)*	-	
PLANT VALUE *(as of June 30, 1964)*		54,968
TOTAL	6,031	54,968

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1964 AND PRIOR YEARS	FY 1965 *(Estimated)*	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Solar Simulator for Space Propulsion Facility	OART	126	750	3,450	-	4,326
TOTAL FOR PROJECTS IN FY 1966 ESTIMATE				3,450		

A FORM 1029 DEC 63 GPO 870-000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Modernization of the Propulsion Systems Laboratory for Supersonic Transport Engine Research

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Lewis Research Center

LOCATION OF PROJECT: Cleveland, Cuyahoga County, Ohio

COGNIZANT NASA INSTALLATION: Lewis Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ ---
FY 1965 Estimate	500,000
FY 1966 Estimate	13,000,000
Total Funding Thru FY 1966	$13,500,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$ 1,603,570
Test cell complex	Sq. Ft.	68,000	16.42	1,117,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Modernization of the Propulsion Systems Laboratory for Supersonic Transport Engine Research

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Fuels pump building	Sq. Ft.	1,536	13.50	20,770
Cooling tower pump house	Sq. Ft.	2,632	16.00	52,152
Site development and utility costs	LS	1 Lot	LS	173,310
Foundations, basins and pads for equipment items	LS	1 Lot	240,338	240,338
				$11,396,430
Equipment				
Combustion air system and heaters		1 Lot	2,424,000	2,424,000
Altitude exhaust system and coolers		1 Lot	3,883,000	3,883,000
Test chambers		1 Lot	1,310,000	1,310,000
Dynamometers, gear boxes, hydraulic system		1 Lot	1,397,000	1,397,000
Cranes and safety systems		1 Lot	242,000	242,000
Cooling towers and piping		1 Lot	502,000	502,000
Fuels systems and piping		1 Lot	331,000	331,000
Electrical controls systems		1 Lot	511,000	511,000
Data acquisition systems		1 Lot	706,430	706,430
Process electric power and communications systems		1 Lot	90,000	90,000
Design				-0-
Fallout Shelter				---
				$13,000,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Modernization of the Propulsion Systems Laboratory for Supersonic Transport Engine Research

SUPPORTING DATA:

PROJECT PURPOSE:

The purpose of this project is to provide a facility for full scale development of engines to power supersonic transport airplanes.

PROJECT DESCRIPTION:

The project consists of three large test chambers for full scale development of turbines under cold flow and operating conditions, and for testing entire engine configurations. Test chambers will be connected to combustion air and exhaust systems of the existing Propulsion Systems Laboratory. Additional air heaters and exhaust gas coolers will provide the test conditions of 380 lbs. of air per second at 165 psia, 1200°F, and to reduce 3500°F exhaust gas to 170°F. Research runs of one hour st 100% power or seven hours at 40% power will be possible. Fuels will be delivered at 150 gpm, 500 psi, and at 500°F, with existing storage of 100,000 gallons.

Remote control operation of the system will be provided with monitoring of engine function and data acquisition. Data will be taken with two hundred channels each of high and low speed digital recording wired directly to the existing central data system, in building 86. System will provide instant readback to operations plus hard records. Safety systems will provide detection and CO_2 control. TV monitoring and surveillance will be provided for chambers and facility. Air intakes and exhausts will be treated to provide acceptable noise level.

Industrial type structures will house the cells and control areas and will contain normal services for shops and personnel comfort. The facility occupies 2.8 acres at the Lewis Research Center and the site selection is determined by economics of connections to the existing Propulsion Systems Laboratory. Modifications are involved in additions to the cooling tower, basins and water pump house. Structures will be of concrete foundations, steel frame and painted metal siding, accoustically treated, all compatible in design with existing PSL structures.

PROJECT JUSTIFICATION:

Intensive research and development and extensive testing of engines and engine components must be done in

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Modernization of the Propulsion Systems Laboratory for Supersonic Transport Engine Research

SUPPORTING DATA:

order to provide econimically feasible and thoroughly reliable engines for supersonic transport service. Such testing and research must be performed under simulated flight conditions. Facilities for such research do not now exist. The Propulsion Systems Laboratory at Lewis Research Center is now able to provide exhauster and compressor capacity for the simulation required and is singularly equipped with other equipment such as central data systems, basic heating capacity, and basic water cooling capacity so as to provide a strong support for developing the ultimate needs of a test facility for supersonic engine research. This research is urgently required and the proposal herein offers the most expeditious and economical method of providing facilities for the task.

ESTIMATED FUTURE FUNDING: None

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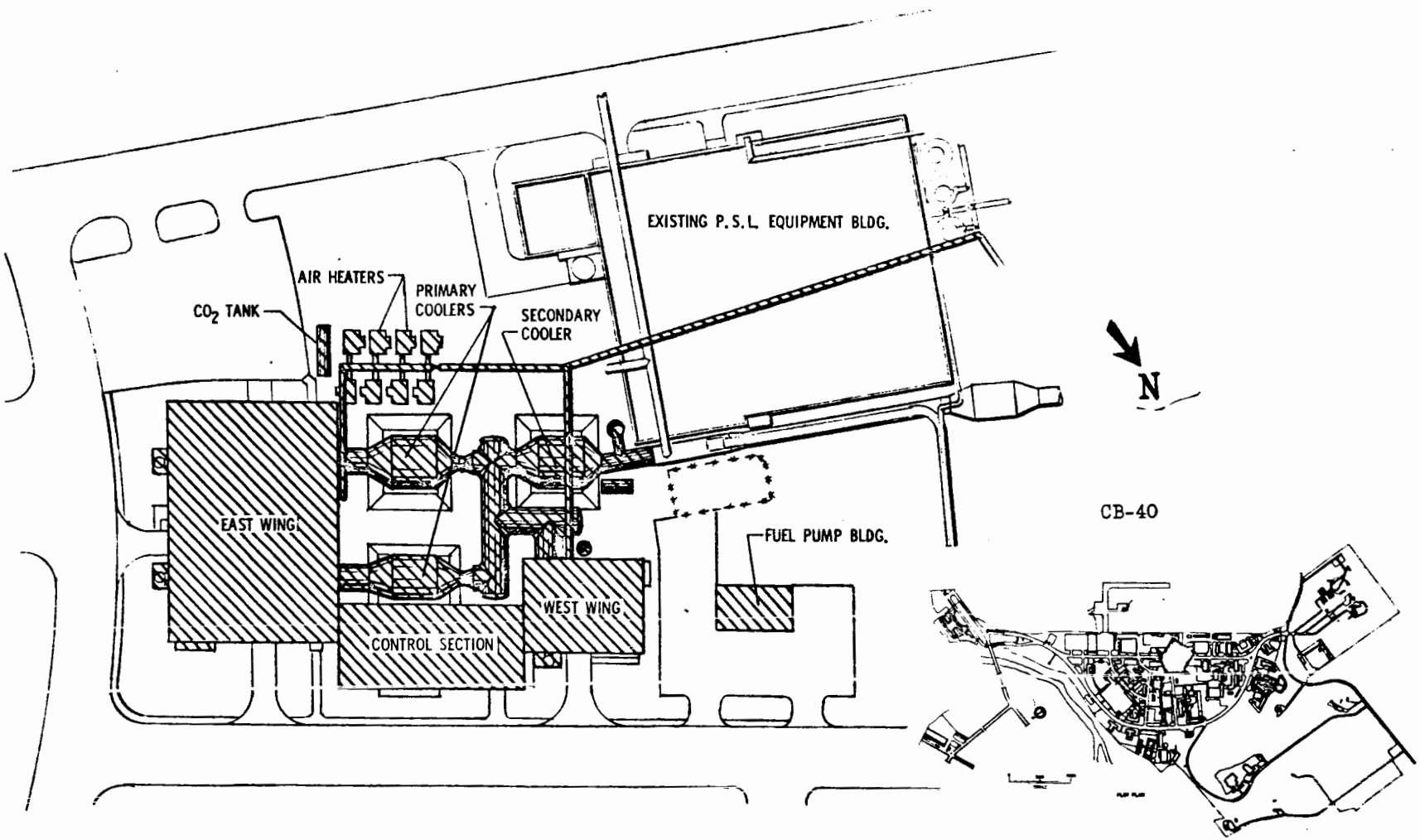
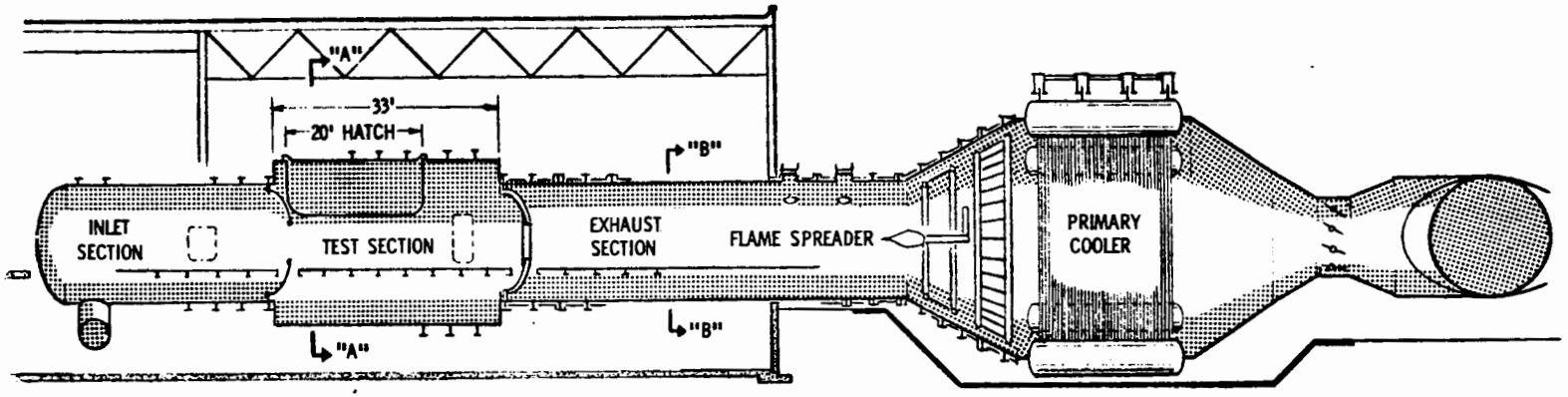
LEWIS RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

MODERNIZATION OF THE PROPULSION SYSTEMS LABORATORY FOR SUPERSONIC TRANSPORT ENGINE RESEARCH

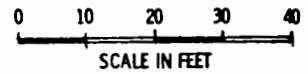


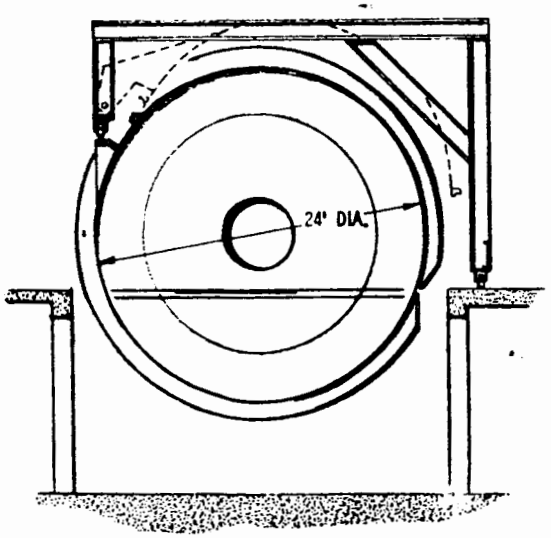
LEWIS RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

MODERNIZATION OF THE PROPULSION SYSTEMS LABORATORY FOR SUPERSONIC TRANSPORT ENGINE RESEARCH

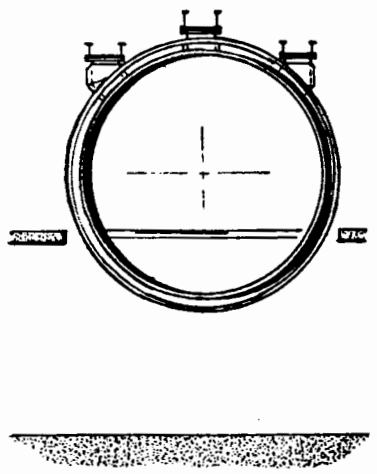


LONGITUDINAL SECTION THRU ENGINE TEST STAND





SECTION "A-A"

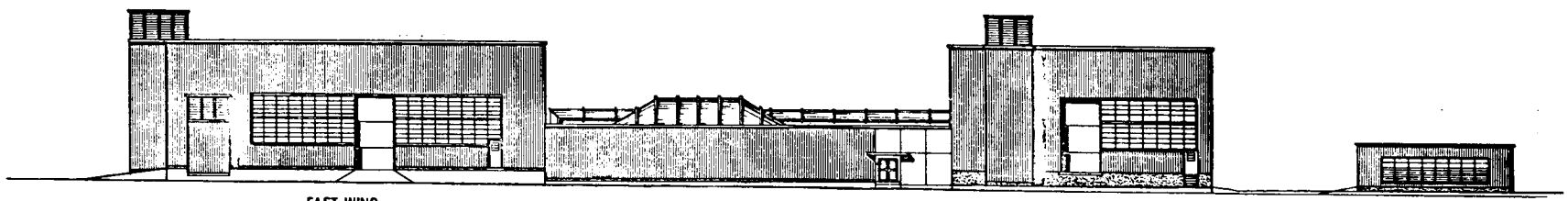


SECTION "B-B"

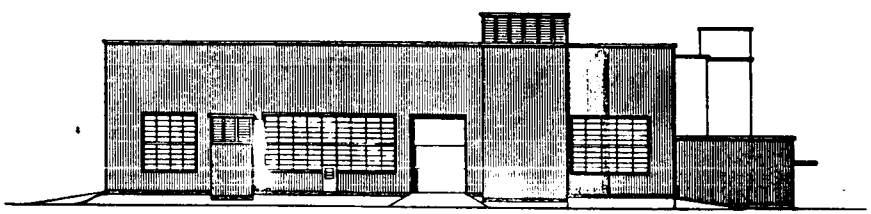
CB-41

LEWIS RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

MODERNIZATION OF THE PROPULSION SYSTEMS LABORATORY FOR SUPERSONIC TRANSPORT ENGINE RESEARCH



NORTH ELEVATION



EAST ELEVATION

CB-42

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Building Addition to the 10 by 10-foot Supersonic Wind Tunnel for Data Processing

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Lewis Research Center

LOCATION OF PROJECT: Cleveland, Cuyahoga County, Ohio

COGNIZANT NASA INSTALLATION: Lewis Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Year	$ 8,000
FY 1965 Estimate	15,000
FY 1966 Estimate	407,000
Total Funding Through FY 1966	$430,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Building Addition to the 10 by 10-foot Supersonic Wind Tunnel for Data Processing

SUPPORTING DATA:

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	-0-
Construction	---	---	---	$ 383,700
Building	SF	14,480	25.85	374,300
Site Preparation	LS	---	1,300	1,300
Roads and Parking	LS	---	---	---
Utilities	LS	---	8,100	8,100
Equipment	---	---	---	23,300
Card and Table Cabinets	LS	---	15,100	15,100
Office Furniture	LS	---	8,200	8,200
Design	---	---	---	---
Fallout Shelter	---	---	---	---
		TOTAL		$407,000

NASA FORM 340 (REV. 3-61) PREVIOUS EDITIONS ARE OBSOLETE.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center.	Construction of Facilities	Building Addition to the 10 by 10-foot Supersonic Wind Tunnel for Data Processing

SUPPORTING DATA:

PROJECT PURPOSE:

The data processing equipment being delivered to this Center in the next twelve months cannot be housed in the present area. A survey of the buildings at this Center reveals no area of adequate size to accept the complete computing installation in an efficient, coordinated arrangement. An alternate solution would be a new computer building, but its cost would greatly exceed the proposed addition.

The present building has three stories of offices; the top two floors are occupied by the computing branches of the Instrument and Computing Division. The proposed addition to the present computer rooms are required to provide an acceptable location for the equipment that is presently on order and most urgently needed to process the increased data load.

PROJECT DESCRIPTION:

This project consists of a proposed three-story (plus basement) addition to the 10 x 10 Supersonic Wind Tunnel Building. The structure will be a steel frame with masonry curtain walls. The first floor and basement will be reinforced concrete. Exterior dimensions will be 73'-7"long by 46'-6-1/2" wide.

The basement floor will be used for mechanical and electrical equipment; the first floor will contain office space, conference area and toilet facilities; the second and third floors will be similar, having space for the new computer and data processing equipment and office area.

The wall between the new and existing buildings will be removed on the second and third floors so that one large computer area will be obtained. The first floor wall will remain and access will be through one main door.

Special air-conditioning equipment will be used for the equipment with comfort conditioning being supplied for the building. A raised floor system will be used in the computer and data processing areas. The first, second and third floor will have suspended ceiling systems. The basement ceiling will be exposed concrete.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Building Addition to the 10 by 10-foot Supersonic Wind Tunnel for Data Processing

SUPPORTING DATA:

PROJECT JUSTIFICATION:

The present data collection systems located at the Lewis Research Center are incapable of processing the increased data load that is being generated in support of the following research programs: supersonic transport compressor and turbine components, injection tests, combustion instability, and simulated SNAP-8 loop tests. To meet this requirement, additional data systems are being purchased. They include a 30,000 sample per second data system and telemetry data reduction system that will be used to process raw data tapes of Centaur and Agena shots.

The large digital computers at Lewis are a modified 1103 and a 7094 Mod. II. Those, with their peripheral equipment and all of the digital and analog data systems, are presently housed in two rooms of the 10 x 10 SWT office building. This area is already so overcrowded that peripheral equipment for those systems is located in adjoining offices. The telemetry system will have to be remotely located and additional people will be required to operate our new data systems because the equipment cannot be centrally located. The output of all our digital data systems is accepted by a single computer and is formated for further data processing. If the systems become too scattered, an additional computer may even be required.

ESTIMATED FUTURE YEAR FUNDING:

None

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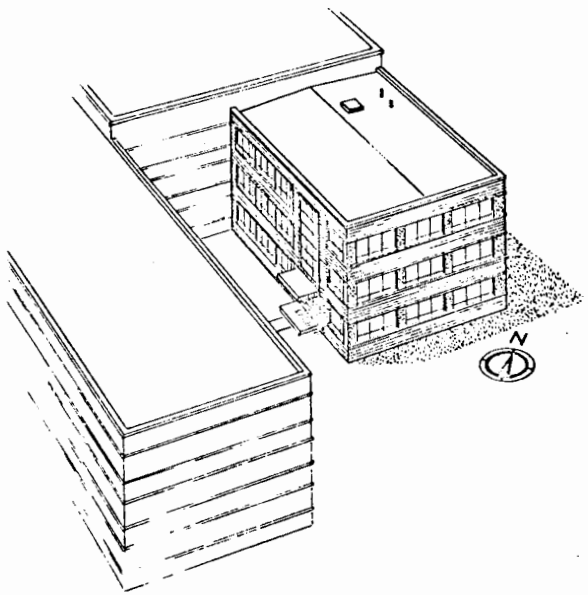
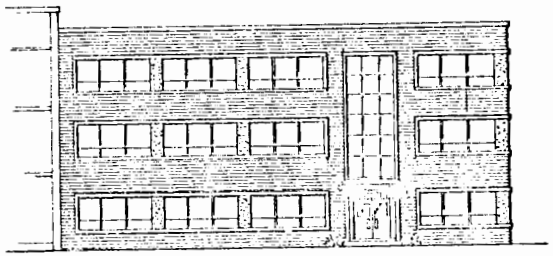
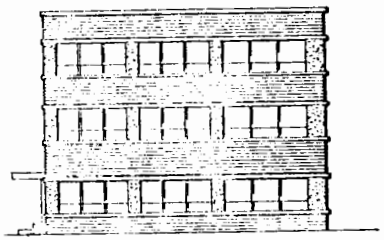
LEWIS RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

BUILDING ADDITION TO THE 10 X 10 FOOT SUPERSONIC WIND TUNNEL FOR DATA PROCESSING



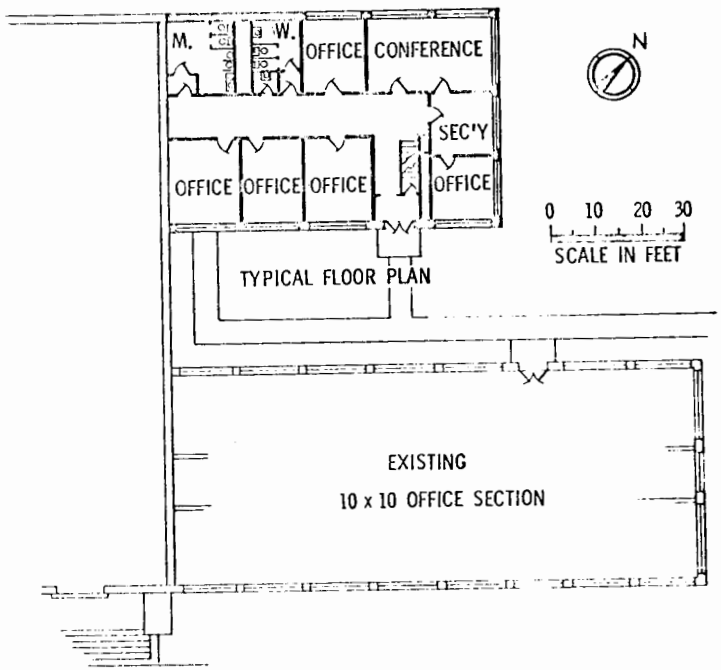


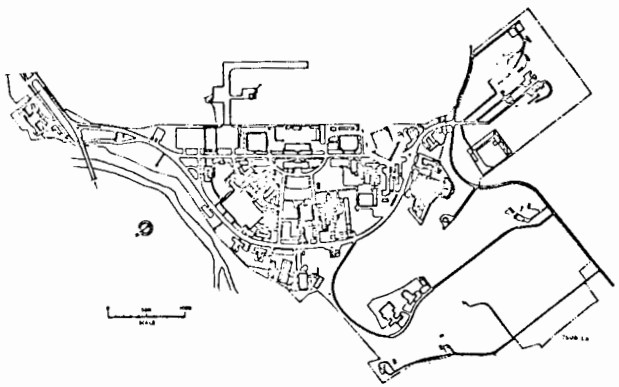
SOUTH ELEVATION



EAST ELEVATION

0 10 20 30
SCALE IN FEET





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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Space Power Research Laboratory

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Lewis Research Center

LOCATION OF PROJECT: Cleveland, Cuyahoga County, Ohio

COGNIZANT NASA INSTALLATION: Lewis Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ 7,000
FY 1965 Estimate	20,000
FY 1966	460,000
Total Funding Thru FY 1966	$ 487,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$ 333,500
Building	SF	13,300	$ 21.21	282,100
Site Development and Utilities	LS	---	51,400	51,400

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center.	Construction of Facilities	Space Power Research Laboratory

SUPPORTING DATA:

PROJECT COST ESTIMATE: continued

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment	---	---	---	$ 126,500
Laboratory Furniture	LS	---	$ 47,250	47,250
Mechanical Support Services	LS	---	48,550	48,550
Electrical Support Services	LS	---	30,700	30,700
Design	%	---	---	-0-
Fallout Shelter	---	---	---	---
			TOTAL	$ 460,000

PROJECT PURPOSE:

The purpose of this project is to expand and accelerate present in-house R & D effort of the Lewis Research Center aimed at fundamentals and development of potential space electric power systems, encompassing bench-scale experimentation in electrochemistry, fuel-cells, fused salt chemistry, secondary battery characteristics, and predevelopment studies of thin-film photovoltaic cell fabrication.

PROJECT DESCRIPTION:

This facility, essentially a new building, will be attached to the existing Energy Conversion Laboratory, located in the west area of the Lewis Research Center. Its architectural treatment will be similar to that of the Energy Conversion Laboratory and will be a basementless two-story building measuring in plan approximately seventy-two (72) feet by ninety-two (92) feet, containing a total of approximately 13,300 square feet of floor space. The first floor will provide four (4) laboratory areas and a mechanical area to house central heating and air-conditioning equipment. The second floor will provide six (6) laboratory areas with an electrical equipment room and two small offices.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Space Power Research Laboratory

SUPPORTING DATA:

PROJECT JUSTIFICATION:

Continued improvement in chemical rocket capability generates an ever increasing need for improved auxiliary electric power systems. Since satellites and space probes require about $\frac{1}{4}$ to $\frac{1}{2}$ unit of electricity for each pound of space vehicle weight, power systems developing 1-10 kilowatts will soon be needed to match the launch capabilities of Saturn class boosters. Advanced solar cell systems, possibly of the thin-film type, and electrochemical power systems will play an important part in filling this need for auxiliary power.

The Lewis Research Center is actively engaged in in-house research aimed at the fundamentals of many potential space electric power systems. Largely missing from this Center's R and D effort is the intermediate phase of developing and debugging prototype or bread-board devices and studies, at bench scale, of the unit processes required for future, high power systems. Also missing is a significant effort on the fundamentals of electrochemistry. This facility is proposed to fill these gaps.

The facility will provide the capability for:

1. An increased R and D effort on the fabrication and evaluation of thin-film solar cells.
2. Increased work on improving the performance of conventional solar cells, especially in regards to lowering specific weights and increasing resistance to radiation damage.
3. Research on new types of high energy-density batteries.
4. The development and evaluation of fuel cell components.
5. Research on fused-salt electrochemical systems.

ESTIMATED FUTURE YEAR FUNDING: None

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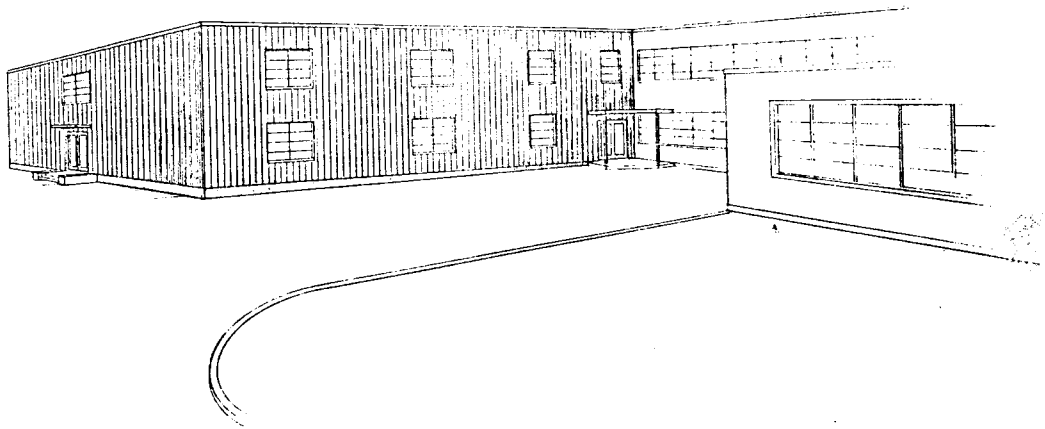
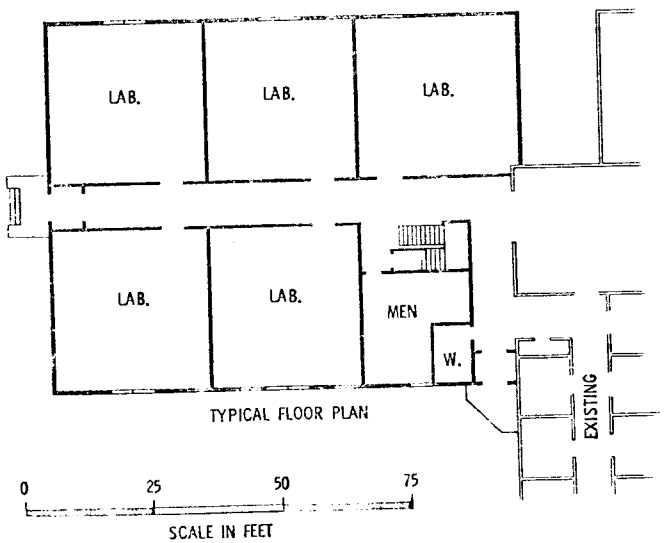
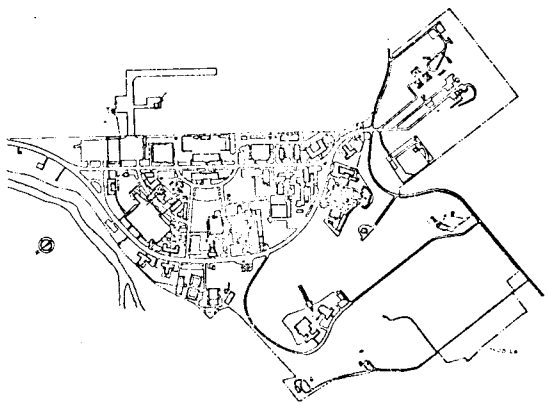
LEWIS RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

SPACE POWER RESEARCH LABORATORY





TYPICAL FLOOR PLAN



PLOT PLAN

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Solar Simulator for Space Propulsion Facility

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Lewis Research Center

LOCATION OF PROJECT: Plum Brook Station, Sandusky, Ohio

COGNIZANT NASA INSTALLATION: Lewis Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ 126,000
FY 1965 Estimate	750,000
FY 1966 Estimate	3,450,000
Total Funding Thru FY 1966	$ 4,326,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$6,300
Shelter	Sq. Ft.	400	$15.75	6,300

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Solar Simulator for Space Propulsion Facility

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment				$3,443,700
Mfg. Production Modules	LS	---	1,498,400	1,498,400
Mfg. Power Supplies and Control	LS	---	882,200	882,200
Mfg. Supporting Structures for Horizontal and Vertical Installation	LS	---	530,700	530,700
Install Modules and Associated Hardware	LS	---	222,000	222,000
Furnish and Install Diffusion Pumping System	LS	---	122,000	122,000
Furnish and Install Refrigeration System	LS	---	188,400	188,400
Design				-0-
Fallout Shelter				---
			TOTAL	$3,450,000

Note: The $750,000 requested for FY 1965 is for the manufacture of the prototype models and for design of power supplies and controls and of supporting structures for horizontal and vertical installation.

PROJECT PURPOSE:

The purpose of this project is to provide a simulated solar radiation source to be installed in the Space Propulsion Facility in order that thermal balance tests can be performed on spacecraft, spacecraft subsystems, rocket engines, power generation systems (e.g. SNAP-8), etc. to produce temperature distribution, heat reflec-

tions and thermal expansions similar to those which will be encountered in space flight. Solar radiation effects on other performance and reliability problems such as rocket engine start-up, fuel storage, and solar cell cluster development will also be investigated.

PROJECT DESCRIPTION:

The Space Propulsion Facility, now under construction at the Plum Brook Station, has a cylindrical test chamber 100 feet in diameter, a flat working floor, and is 122 feet high to the top of the hemispherical dome. It is to be used for development and validation tests of a wide variety of models, including the SNAP-8 space power generation system, chemical rocket start-up after soak in the space environment, vehicle vibration tests in the space environment, and other large space vehicle systems and satellite tests. Significant characteristics of the space environment are to be simulated in the facility so the combined effect of these characteristics on vehicle system performance can be determined. To achieve vehicle temperatures similar to those encountered on space flight missions, a solar simulator with accurate spectral distribution and intensity is required.

A modular type simulator is proposed, employing a number of small independent elements which can be assembled in "honeycomb" fashion to conform to the model shape (each module will irradiate approximately four square feet). The solar simulator will be located in the test chamber and the orientation and geometry of the modules will be tailored for each test model to satisfy the experimental requirements. A uniform collimated beam of light will be generated similar in spectral distribution to that of the sun, and equal in intensity to one earth solar constant over a total area of 450-500 square feet.

Each module will be enclosed in a vacuum-tight container, and will irradiate a small hexagonal shaped area. In addition to the light sources and optics, each module requires a power supply, container, power and cooling leads, support and alignment structure, measurement andcontrol instrumentation, refrigeration for cooling, and diffusion pumps for the module outgassing load.

PROJECT JUSTIFICATION:

The cost of space flight is so great that to insure success every effort must be made to check out each vehicle, power system, etc., in environments closely simulating the actual conditions of space prior to actual flight. The first Lewis programs to use the Space Propulsion Facility will include SNAP-8, the Solar Brayton power

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SUPPORTING DATA:

system and SERT 3.

The SNAP-8 programs requires a facility in the 1968 time period. A firm schedule does not exist at this time for the Solar Brayton or SERT 3 programs, however, it is anticipated that tests of these systems will be required in this same time period, although the Solar Brayton system may be ready earlier, in 1967.

It should be pointed out that the Space Propulsion Facility is the largest vacuum chamber available to NASA and it will be used for experiments too large to be conducted elsewhere even though these experiments are presently unforseen. The need for this solar simulator was recognized at the time the Space Propulsion Facility was authorized. The description of that project included the statement that its design would include the versatility required for adding, in the future, a radiant heat source to simulate the magnitude and spectrum of solar radiation.

ESTIMATED FUTURE YEAR FUNDING: None

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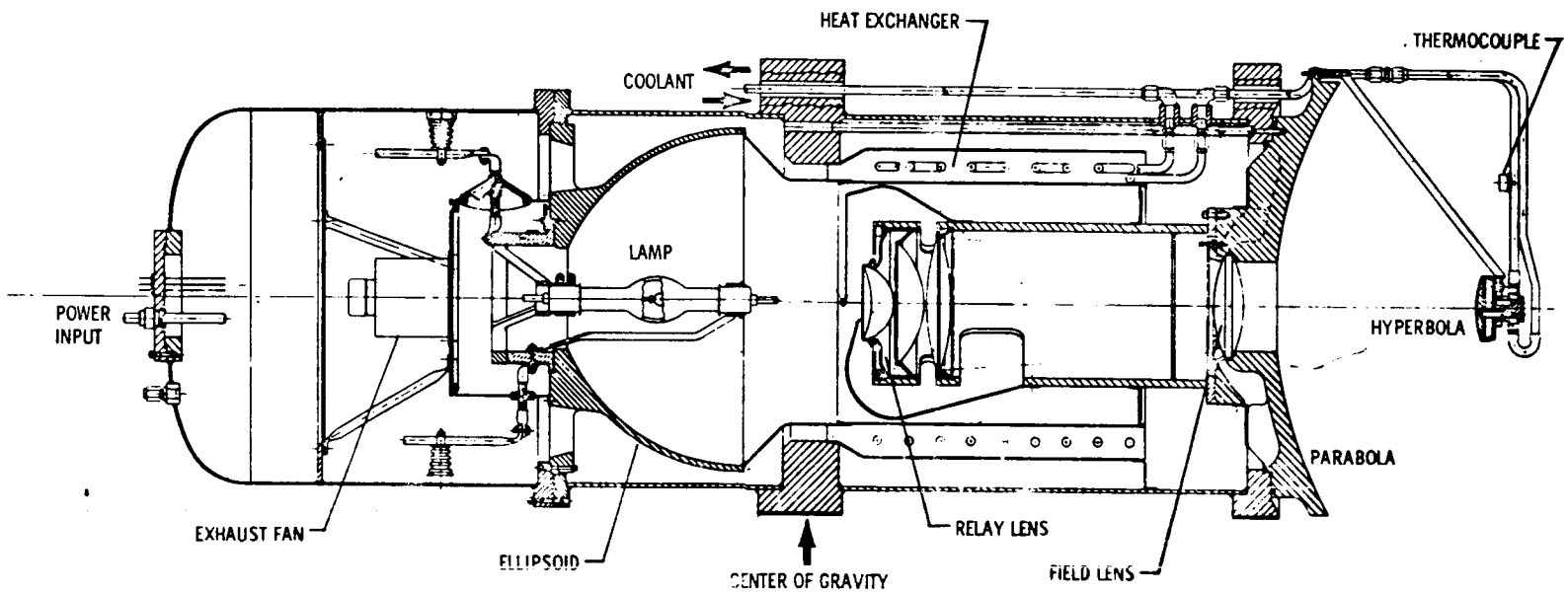
LEWIS RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

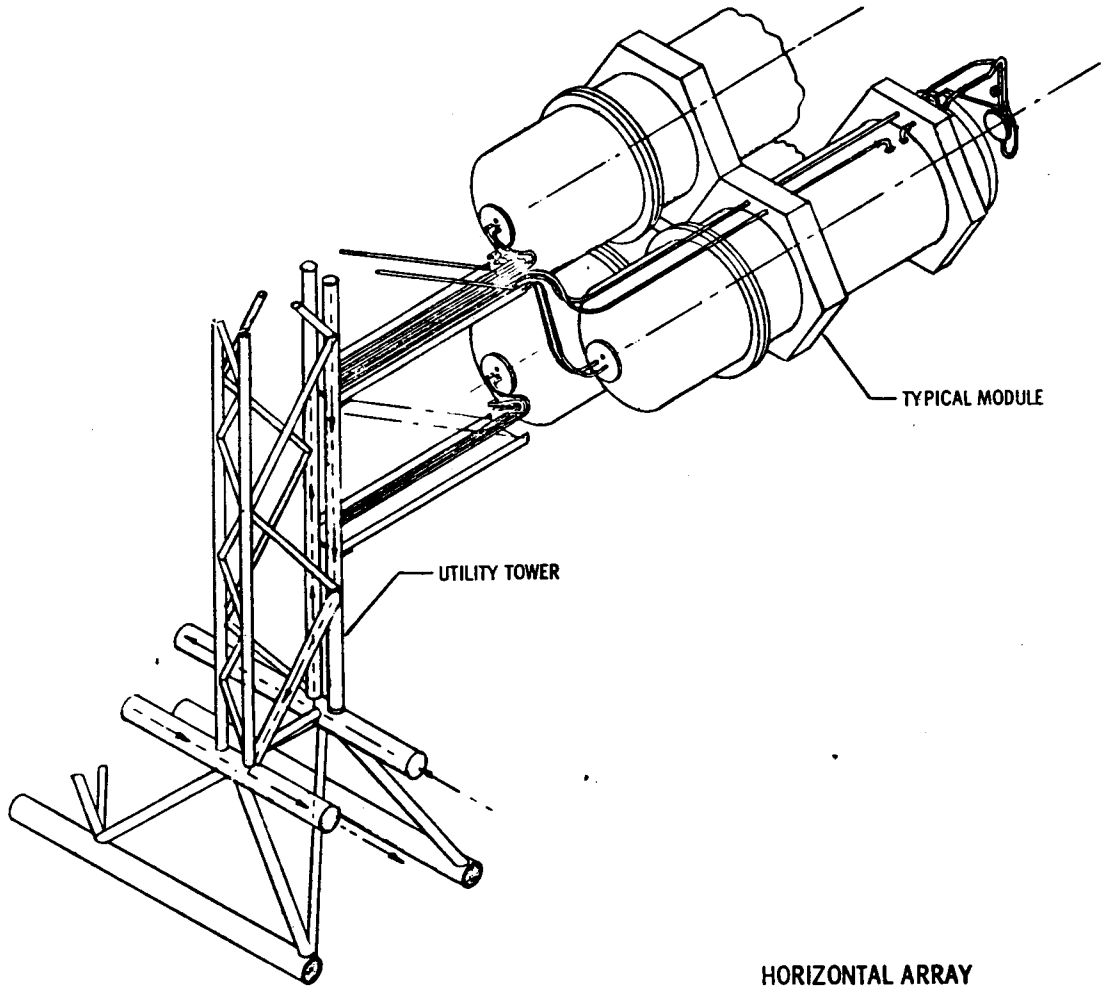
SOLAR SIMULATOR FOR SPACE PROPULSION FACILITY (PLUM BROOK STATION)



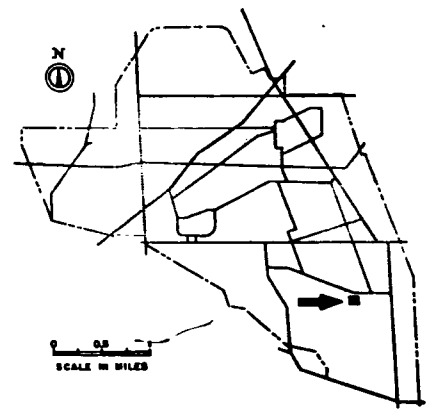
MODULE CROSS SECTION

LEWIS RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

SOLAR SIMULATOR FOR SPACE PROPULSION FACILITY (PLUM BROOK STATION)



HORIZONTAL ARRAY



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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Various Locations	Various	N/A	N/A	N/A

INSTALLATION MISSION

PERSONNEL STRENGTH	FY 19	FY 19	FY 19
NASA PERSONNEL *(End of Year)*			
CONTRACTOR & OTHER PERSONNEL			
TOTAL ALL PERSONNEL			

INVENTORY		
ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*		
LAND *(Lease or Permit)*		
PLANT VALUE *(as of June 30, 19)*		
TOTAL		

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1964 AND PRIOR YEARS	FY 1965 *(Estimated)*	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Facilities for F-1 Engine Program	MSF	59,368	2,845	2,158	---	64,371
Facilities for S-II Stage Program	MSF	737	2,174	2,350	---	5,261
Facilities for S-IVB Stage Program	MSF	5,929	9,489	1,900	---	17,318
Facilities for J-2 Engine Program	MSF	18,383	11,256	3,720	---	33,359
Modifications to Service Module Test Stand No. 1, WSMR	MSF	133	77	1,516	---	1,726
Facilities for M-1 Engine Program	OART	29,890	4,072	6,400	8,188	48,550
Radar Facility	OTDA	55	40	6,405	---	6,500
DSIF Facility Expansion, Goldstone, California	OTDA	5	32	236	---	273
Apollo Back-Up Wing, DSIF, Madrid, Spain	OTDA	8	65	472	---	545
Apollo Back-Up Wing, DSIF, Canberra, Australia	OTDA	8	70	510	---	588
Stadan Facility Expansion, Fairbanks, Alaska	OTDA	23	75	1,115	---	1,213
Apollo Network Ground Station, Antigua, WI	OTDA	162	---	2,700	---	2,862
Community Support, Antigua, WI	OTDA	---	300	3,090	---	3,390
Community Support, Ascension Island	OTDA	---	1,938	1,300	---	3,238
TOTAL FOR PROJECTS IN FY 1966 ESTIMATE				33,872		

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GPO 868-867

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for F-1 Engine Program

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Various Locations

LOCATION OF PROJECT: Canoga Park, Santa Susana, Edwards, California

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New and Alterations

FUNDING:

FY 1964 and Prior Years	$59,368,000
FY 1965 Estimate	2,845,000
FY 1966 Estimate	2,158,000
Total Funding Through FY 1966	$64,371,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--
Construction	--	--	--	1,375,000
Production and development facilities	LS	--	785,000	785,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for F-1 Engine Program

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Production and Component Test Facs.	LS	--	220,000	220,000
Acceptance and Development Test Facilities	LS	--	370,000	370,000
Equipment	--	--	--	783,000
Development Laboratory Equipment	--	--	783,000	783,000
Design	--	--	--	--
Fallout Shelter	--	--	--	--
			TOTAL	$2,158,000

PROJECT DESCRIPTION:

This project provides the additional facilities required for the continued development, uprating, manufacture and testing of the F-1 Engine.

At Canoga Park, California, production and development facilities will be constructed to provide a 3,000 square foot Class II clean room, a 1,200 square foot reinforced concrete engine checkout cell, a 2,800 square foot acoustical room, and a 4,000 square foot Hydroshaker room. Development laboratory equipment including expansion of the water flow system, vibration equipment, Hydro-shaker units, additions and modifications to instrumentation equipment and the LN_2 and GN_2 distribution systems will also be provided.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for F-1 Engine Program

SUPPORTING DATA:

At Santa Susana, construction in support of the production and component test facilities consists of a 1,600 square foot turbo-pump building, miscellaneous modifications to utilities, roads, paving, drainage control and equipment foundations; test system additions and modifications to the F-1 component test facilities, such as cryogenic transfer systems modifications, instrumentation and recording apparatus, digital data acquisition, servo controls and cryogenic filters; test support items such as: flow meter calibrator, tank cleaning equipment, and helium compressors; a 5,000 gallon high pressure propellant storage tank and general facility modifications necessitated by changes to the F-1 Engine.

At Edwards, construction in support of acceptance and development test facilities consists of modification and improvements to drainage facilities, roads, paving, equipment foundations, water supply and utility systems; modifications to instrumentation and recording systems, digital data systems, cameras, vacuum pumps, instrument power supplies, cryogenic transfer pumps, tank cleaning equipment and general test stand modifications.

PROJECT JUSTIFICATION:

Additional facilities are required at Canoga Park, Santa Susana, and Edwards to support the continued development, fabrication and testing of the F-1 Engine.

Experience has established that modifications and changes inevitably materialize during all phases of any research and development program. These changes must be incorporated into the hardware, and the facilities as applicable. An example of such a change was the unprecedented combustion instability encountered during development of the F-1 Engine which necessitated extensive engine modifications. These engine modifications and the additional development effort required to correct engine instability required facility modifications and additions during FY 63 and 64 in excess of 2 million dollars.

Since existing F-1 Engine facilities are highly specialized, any further changes to the engine will be reflected in modifications and/or additions to the facilities.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for F-1 Engine Program

SUPPORTING DATA:

A "Clean Room" at Canoga Park is required to provide a contaminate-free area for the assembly and disassembly of developmental engines. An engine checkout cell is required for the hazardous functional testing of engine pressure activated systems. An acoustical room is required for the sonic testing of engine components and assemblies. A hydro-shaker room is required to house hydro-shaker equipment, controls, and instrumentation used to test propellant connections in the engine system. The additional laboratory equipment is required to support a continuing program of research, development and production of the F-1 Engine at Canoga Park.

The turbo-pump building at Santa Susana is required to provide shop space for handling and servicing pumps and pump parts in the Bravo test area. The miscellaneous modifications, test system additions and modifications, and test support items are required to support advancement in engine technology necessary for perfecting reliability and performance. The high pressure propellant storage tank is required to permit component testing for a duration of 150 seconds at a 20 per cent increase in propellant flow. General modifications to the GN_2, LN_2, Helium and LOX facilities are required to support increase operating pressure and "uprating" of the F-1 Engine.

At Edwards, the modifications and improvements to the support facilities are required for continued testing support. Modifications and additions to test facilities are required to support engine delivery and developmental testing schedules. General test stand modifications are required to support the F-1 Engine "uprating program", including flow meter changes due to alterations in the propellant feed lines from the run tanks.

ESTIMATED FUTURE YEARS FUNDING: None

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION: Various Locations

APPROPRIATION: Construction of Facilities

PROGRAM OR PROJECT: Facilities for S-II Stage Program

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION. Office of Manned Space Flight.

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight.

AUTHORIZATION LINE ITEM: Various Locations

LOCATION OF PROJECT: Santa Susana and Seal Beach, California

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Modifications and Additions.

FUNDING:

FY 1964 and Prior Years	$ 736,500
FY 1965 Estimate	2,174,000
FY 1966 Estimate	2,350,000
Total Funding Through FY 1966	$5,260,500

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--
Construction	--	--	--	$1,690,000
Facility Modifications and Additions	--	--	--	1,690,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for S-II Stage Program

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment	---	---	LS	$660,000
Air Condition Bulkhead Fabrication Facility	LS	---	257,000	257,000
Air Condition Vertical Assembly Facility	LS	---	403,000	403,000
Design	---	---	---	---
Fallout Shelter	---	---	---	---
			TOTAL	$2,350,000

PROJECT DESCRIPTION:

This project provides the facility modifications and additions required to support the S-II Stage Program.

At Seal Beach, construction consists of air conditioning six bulkhead weld positions in the Bulkhead Fabrication Facility and three of the four vertical weld stations in the Vertical Assembly Facility. One of the stations, which approximate 3,000 square feet each, is presently air conditioned. The regulated conditions necessary are 65 to 80 degrees Fahrenheit with a maximum relative humidity of 45 per cent. A twenty-foot addition to the height of the Vertical Assembly and Vertical Checkout Facilities is also to be provided.

At Santa Susana, construction in support of the Battleship and All-Systems Test Facilities consists of flame deflector modifications, additional high pressure gas and propellant storage vessels and distribution systems modifications.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for S-II Stage Program

SUPPORTING DATA:

PROJECT JUSTIFICATION:

Modifications and additions are required of the facilities at Seal Beach and Santa Susana, California, to support a continuing fabrication and testing program for the S-II stage. This stage is being developed for the Saturn V Program.

Experience has established that modifications and changes inevitably materialize during all phases of any research and development program. Examples of such changes are:

The mid-1962 increase of 40 inches in the diameter of the S-IVB stage; the 6½ foot increase in the length of the S-II stage for an optimum-sized vehicle;

The enlargement of the Seal Beach Bulkhead Fabrication Facility at approximately $600,000, necessitated by the requirement for alternate bulkhead fabrication development techniques;

The addition of two vertical systems checkout stations at Seal Beach, costing approximately $2,800,000, required to meet stage delivery schedules.

The facilities utilized to manufacture and test the S-II stage, are highly specialized. Any change in the configuration of the stage or in manufacturing and testing operations as stage development progresses, requires an alteration of facilities. One potential configuration change currently being studied would increase the length of the stage 16 feet. This will require increased height in the Vertical Assembly Building and the Vertical Checkout Facility at Seal Beach, and appropriate changes to the test facilities at Santa Susana.

At Seal Beach, welding operations on the S-II stage are conducted in both the Bulkhead Fabrication and the Vertical Assembly Facilities. Analysis of the welding conducted in these facilities indicates that a high percentage of rework has resulted from corrosion and/or condensation on the metals welded. Corrosion and condensation can be most effectively controlled by a temperature and humidity regulated system. Therefore, this system is required to assure a higher percentage of acceptable welds and a capability to meet the Saturn V production schedules.

ESTIMATED FUTURE YEAR FUNDING: None

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for S-IVB Stage Program

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Various Locations

LOCATION OF PROJECT: Sacramento Field Station, Sacramento, California

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Additions and Modifications

FUNDING:

FY 1964 and Prior Years	$ 5,929,000
FY 1965 Estimate	9,488,500
FY 1966 Estimate	1,900,000
Total Funding Through FY 1966	$17,317,500

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Construction	---	---	---	$1,150,000
Test Stand Diffuser System	EA	2	300,000	600,000
Facility Modifications and Additions	LS	---	550,000	550,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for S-IVB Stage Program

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment	---	---	---	750,000
Instrumentation	LS	---	500,000	500,000
High Pressure Gas Converter and storage	LS	---	250,000	250,000
Design	---	---	---	---
Fall-out Shelter	---	---	---	---
			TOTAL	$1,900,000

PROJECT DESCRIPTION:

This project provides for construction of additional facilities required to support the S-IVB stage program.

The facilities to be constructed at Sacramento, California, include fabrication and installation of diffuser systems on the Beta 1 and Beta III test stands, additional high pressure gas conversion and storage facilities, modifications and additions to test facility instrumentation, and modifications to the structural, cryogenic and hypergolic systems.

PROJECT JUSTIFICATION:

Additional facilities are required at Sacramento, California, to maintain S-IVB stage quality and production schedules.

Modifications and changes have inevitably materialized during research and development programs such as the S-IVB stage. These changes must be incorporated on the hardware, and in turn the facilities as applicable. An example of changes experienced are the Miscellaneous Modifications and Additions, totalling approximately 1 million dollars, to the propellant and gas storage-transfer systems, as a result of development changes on the stage and GSE.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for S-IVB Stage Program

SUPPORTING DATA:

Some of these modifications and additions were: relocation of gas and propellant lines for GSE interfaces; installation of a LH_2 engine feed duct bleed vent line; and provision of a forward and aft area GN_2 purge system.

Additional facility changes are anticipated in order to meet new test conditions that will be determined during the continuing development program. Modifications and additions will be required to the instrumentation, structure, cryogenic and hypergolic systems of the test stands. In addition, structural modifications to the test stands are required to provide for lateral thrust loads resulting from gimballing of the J-2 engine. Additional high pressure gas conversion and storage facilities are required to supplement existing facilities which have become marginal as a result of test program changes. The diffuser systems are required to test S-IVB stage operation under altitude simulated conditions.

ESTIMATED FUTURE YEAR FUNDING: None

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for J-2 Engine Program

SUPPORTING DATA:

PROGRAM OFFICE FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Various Locations

LOCATION OF PROJECT: Canoga Park and Santa Susana, California

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New and Alterations

FUNDING:

FY 1964 and Prior Years	$18,383,000
FY 1965 Estimate	11,256,000
FY 1966 Estimate	3,720,000
Total Funding Through FY 1966	$33,359,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	$2,456,000
Production Test Facilities	LS	---	1,400,000	1,400,000
Development Test Facilities	---	---	1,056,000	1,056,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for J-2 Engine Program

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment	---	---	---	$1,264,000
Development and Production Equipment	LS	---	1,264,000	1,264,000
Design	---	---	---	---
Fall-out Shelter	---	---	---	---
			TOTAL	$3,720,000

PROJECT DESCRIPTION:

This project provides the additional facilities required for continued development, production, uprating, experimental engine development and testing of the J-2 Engine at Santa Susana and Canoga Park, California.

At the Santa Susana Bowl Area, construction consists of modifications to Vertical Test Stands 2 and 3, which includes enlargement of the liquid hydrogen and oxygen run tanks and propellant lines in order to augment existing run tank capacity by approximately 10 per cent. Vertical Test Stand 2 is a single position test stand and Vertical Test Stand 3 is a dual position test stand (one sea level position and one altitude simulation position). Also to be provided in the Bowl Area is an approximate 50 per cent increase in tank storage capacity of the liquid oxygen, hydrogen, nitrogen and helium facilities. In the Delta Area, construction supporting the dual position Delta 2 test stand includes structural modifications, new propellant transfer lines and a "run" capacity increase in the liquid hydrogen and oxygen tanks of approximately 10 per cent. The Delta 1 stand will be augmented to permit placement and construction of the Hyper-flow steam system necessary for operation of the altitude simulation chamber. The single position Delta 1 stand will be modified for a run capability of 500 seconds with altitude simulation. Additional storage capacity of approximately 50 per cent will also be provided for the Delta Area liquid hydrogen, oxygen, nitrogen and helium storage facilities.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for J-2 Engine Program

SUPPORTING DATA:

In the Component Test Areas, construction includes test cell modifications consisting of approximately a 50 per cent increase in propellant tank capacity, additional transfer lines and instrumentation for Test Laboratories III and V.

At Santa Susana and Canoga Park, development and production equipment including a temperature altitude chamber, structural test system, ultrasonic cleaner, mass spectrometer and production equipment consisting of lathes, grinders and milling machines are also to be provided.

PROJECT JUSTIFICATION:

Additional facilities are required at Santa Susana and Canoga Park, California, to support the continued development, testing, production, uprating, and experimental engine development for the J-2 Engine Program.

Past experience has established that modifications and changes inevitably materialize during all phases of any research and development program. These changes must be incorporated on the hardware and in turn on the facilities as applicable. An example of such a change was the 1963 increase in the J-2 engine firing duration capability from 350 to 500 seconds. This change necessitated a revision to the "on-stand run tanks" of the Delta 2 test stand at a cost of approximately $500,000. Another change, at a cost of approximately $600,000, provided a capability on the test stand for recirculation of propellants to simulate operation of the equipment planned for the vehicle, during engine chilldown.

Since the existing J-2 facilities are highly specialized in nature, anticipated changes in the engine will require modifications and/or additions to the facilities. The current J-2 engine development program is to continue through 1965. A "follow-on" development program will continue for the life of the engine which is forecast through FY 70.

Additional Production Test Facilities required to support Engine Program changes include the modifications and additions to the Delta 1 and 2 test stands, and an increase in propellant and gas storage capacity for the Delta area to permit advancement in engine reliability and performance of flight hardware. The additions and modifications to Component Test Laboratories III and V are required so that the facilities are made compatible with the engine and hardware changes as they are generated.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Various Locations	Construction of Facilities	Facilities for J-2 Engine Program

SUPPORTING DATA:

Additional Development Test Facilities, including modifications to Bowl Area test stands run tankage, propellant lines, and increases in the propellant and gas storage capacity, are required to support the continuing development program, product improvement testing, engine uprating and the experimental engine programs.

Procurement and installation of additional development and production equipment is required to maintain scheduled delivery rates.

ESTIMATED FUTURE YEAR FUNDING: None

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Modifications to Service Module Test Stand No. 1, WSMR

SUPPORTING DATA:

PROGRAM DIRECTOR FOR THE INSTALLATION: Office of Manned Space Flight

PROGRAM DIRECTOR FOR THE PROJECT: Office of Manned Space Flight

AUTHORIZATION LINE ITEM: Manned Spacecraft Center

LOCATION OF PROJECT: White Sands Missile Range, New Mexico

COGNIZANT NASA INSTALLATION: Manned Spacecraft Center

TYPE OF CONSTRUCTION: New

FUNDING:

FY 1964 and Prior Years	133,000
FY 1965 Estimate	77,000
FY 1966 Estimate	1,516,200
Total Funding Through FY 1966	$1,726,200

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	--	--	--	--
Construction				$1,516,200
Modification to Test Stand No. 1	LS	--	1,516,200	1,516,200

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Modifications to Service Module Test Stand No. 1, WSMR

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment	--	--	--	--
Design	--	--	--	--
Fallout Shelter	--	--	--	--
		TOTAL		$1,516,200

PROJECT DESCRIPTION:

This project provides for the Modification of the Apollo Service Module Test Stand No. 1 to incorporate an altitude simulation capability. The changes include: installation of a carbon steel altitude chamber approximately 30 feet in diameter and 40 feet high, a centerbody exhaust diffuser and two stage steam ejector system, and a chemical steam generator. Also included are alterations to the test stand structure, the cooling water system and necessary associated instrumentation and controls. An additional water well equipped with a 500 gpm pump will be provided to support the increased water demand necessitated by the new steam generation system.

PROJECT JUSTIFICATION:

It is required that the Apollo Spacecraft be equipped with propulsion engines to move it through space after separation from the launch vehicle. This will be accomplished through the use of the spacecraft service module propulsion engines which are to be used for the trans-earth and trans-lunar portions of the mission to the moon. Once achieving lunar orbit, the next phase of the mission will be lunar landing. To accomplish the latter phase, the LEM will be separated from the CSM and will descend to the lunar surface. The LEM has two engines, one for landing on the moon's surface (descent engine) and the second (ascent engine) will be used for ascending from the lunar surface and rendezvousing with the CSM.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Manned Spacecraft Center	Construction of Facilities	Modifications to Service Module Test Stand No. 1, WSMR

SUPPORTING DATA:

To qualify these propulsion engines for operations in outer space, it is required that they be tested in a similar environment. For this reason, it is necessary that facilities be provided to simulate outer space conditions. There is no propulsion testing facility existing that permits the testing of the service module engine under all operational conditions. The J-3 facility at Arnold Engineering Development Center (AEDC) limits the engine gimballing capability to 2° and does not permit testing to the required full 8° gimballing. Also, the facility is deficient in instrumentation to insure the required reliability of test results. Moreover, the AEDC facility is currently shared by three programs, namely the Apollo Service Module, the Air Force Titan III C Transtage and the LEM; therefore, schedule interferences exist and will continue so that delays in the Apollo propulsion test schedule will be a direct result.

On the basis of scheduled workload, the uncertainties of meeting optimum schedules with existing facilities, program schedule interferences and test limitations, it is necessary that an additional capability be provided at the earliest possible time. The most effective and expeditious method of meeting the requirements is to provide the existing service module test stand at the WSMR with an altitude capability.

ESTIMATED FUTURE YEAR FUNDING: None

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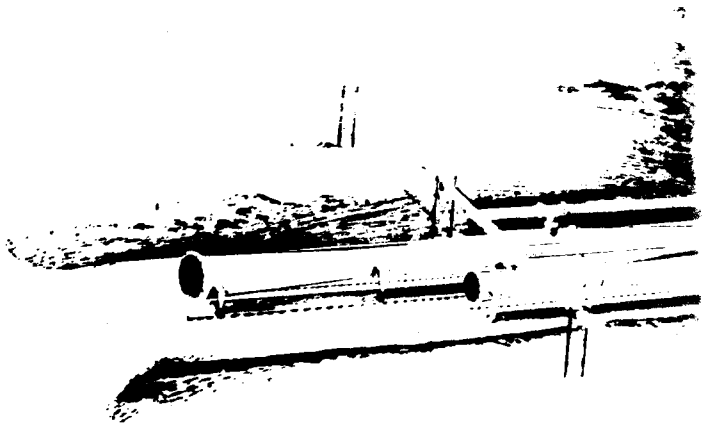

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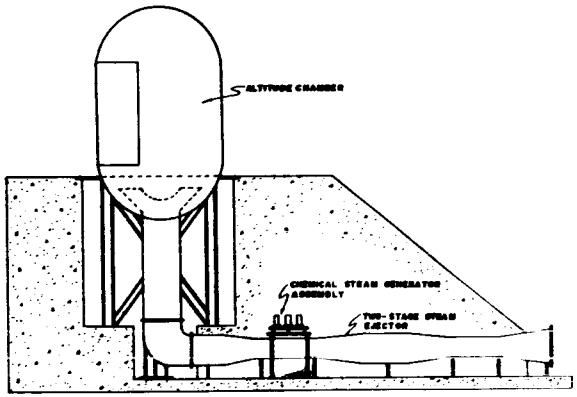
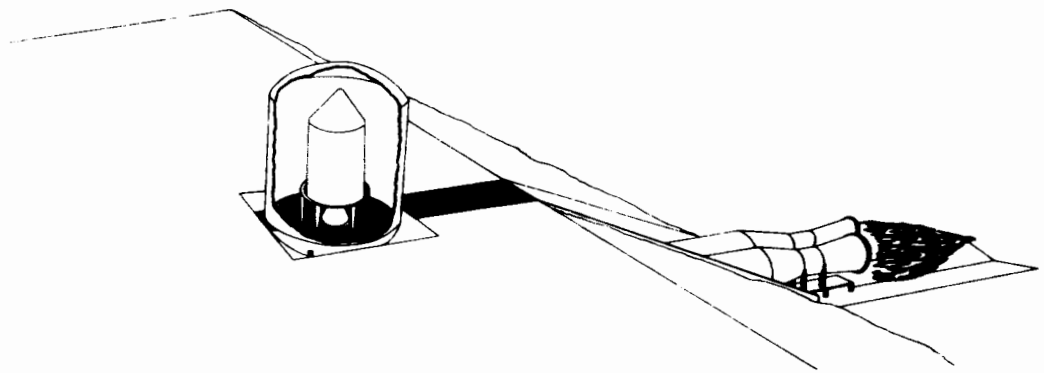


PARTIAL ALTITUDE CHAMBER
DIFFUSER-EJECTOR SECTION

MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

MODIFICATIONS TO SERVICE MODULE TEST STAND NO. I WSMR



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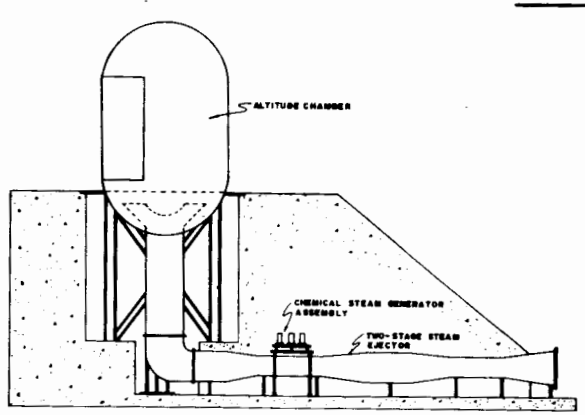
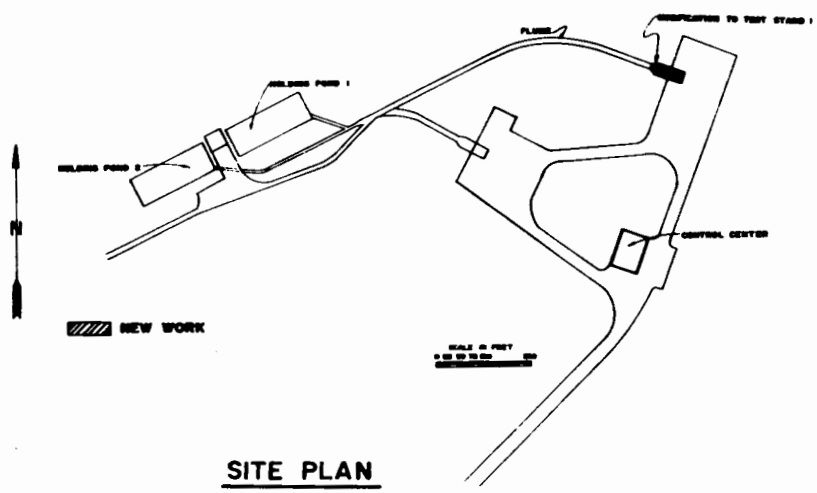


PARTIAL ALTITUDE CHAMBER
DIFFUSER-EJECTOR SECTION



SITE PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

(Page 1 of 7)

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Facilities for M-1 Engine Program

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Various Locations

LOCATION OF PROJECT: Sacramento, California

COGNIZANT NASA INSTALLATION: Lewis Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years *	$29,890,000
FY 1965 Estimate	4,072,000
FY 1966 Estimate	6,400,000
Total Funding Thru FY 1966	$40,362,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$375,000
K-2 stand	LS	---	$375,000	375,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

(Page 2 of 7)

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Facilities for M-1 Engine Program

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment				$6,025,000
Controls	LS	---	$176,000	176,000
Propellant storage vessels	LS	---	340,000	340,000
LH_2 propellant systems	LS	---	2,860,000	2,860,000
LO_2 propellant systems	LS	---	736,000	736,000
Water distribution systems	LS	---	152,000	152,000
Gantry crane systems	LS	---	119,000	119,000
Water deluge systems	LS	---	114,000	114,000
Test equipment	LS	---	596,000	596,000
Safety and support instrumentation	LS	---	271,000	271,000
Instrumentation cabling	LS	---	355,000	355,000
Signal conditioning instrumentation	LS	---	242,000	242,000
Recording and area support instrumentation	LS	---	64,000	64,000
Design	---	---	---	-0-
Fallout Shelter	---	---	---	---
		TOTAL		$6,400,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA (Page 3 of 7)

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Facilities for M-1 Engine Program

SUPPORTING DATA:

COST ESTIMATE BY FISCAL YEAR

	Fiscal Year 1962	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966
R & D Funds	$5,494,000 (1)	$ 1,200,000	$ ---	$ ---	$ ---
C of F Funds					
Lewis Center	87,809	13,000,000	10,030,000	4,072,000	6,400,000
Marshall Center	78,191	---	---	---	---
Total	$5,660,000	$14,200,000	$10,030,000	$4,072,000	$6,400,000

(1) By utilizing section 1 (d) of the F.Y. 1962 Authorization Act.

FOUR-WAY BREAKDOWN OF C OF F FUNDS

	Fiscal Year 1962	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966
Land Acquisition	---	---	---	---	---
Construction	---	$1,433,000	$ 636,000	$ 240,000	$ 375,000
Test stand modifications	---	433,000	---	200,000	---
New stands	---	1,000,000	636,000	40,000	375,000
Equipment	---	$9,463,000	$ 8,484,000	$ 3,532,000	$ 6,025,000
Controls	---	160,000	683,000	327,500	176,000

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JUSTIFICATION DATA (Page 4 of 7)

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Facilities for M-1 Engine Program

SUPPORTING DATA:

	Fiscal Year 1962	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966
Propellant Systems	---	$ 4,346,000	$ 2,098,000	$2,175,200	$3,936,000
Other Systems	---	157,000	1,370,000	133,500	385,000
Instrumentation	---	1,745,000	1,780,000	867,500	932,000
Fabrication equipment	---	2,052,000	821,000	28,300	---
Altitude simulation equipment	---	---	822,000	---	---
Test equipment	---	728,000	546,000	---	596,000
Quality control equipment	---	275,000	364,000	---	---
Design	$166,000	$ 2,104,000	$ 910,000	$ 300,000	$ -0-
Construction	(2)	(2)	67,000	30,000	
Equipment	(2)	(2)	843,000	270,000	
Total Cost	$166,000	$13,000,000	$10,030,000	$4,072,000	$6,400,000

(2) Breakouts not available prior to F.Y. 1964.

PROJECT PURPOSE:

The purpose of this project is to provide for additional test facilities required for the development through Pre-Flight Rating Tests, of the 1.5 million pound thrust M-1 Engine system. The M-1 Engine will provide high-performance capability in upper-stage applications for future manned space missions.

PROJECT DESCRIPTION:

Essentially this project provides for the activation of construction of a new test stand, designated as K-2, which will provide the capability for sustained run duration engine tests for both sea-level and simulated altitude conditions.

In addition, a minor portion of the funds will apply to the completion of K-1 test stand check-out and preliminary

SUPPORTING DATA:

design of the forthcoming test stand K-3.

Specifically, the project will provide for the following:

1. Test Stand K-2 Design - completion of preliminary design, definitization of criteria, and continuation of detail design of basic test stand and adjacent supporting facilities.

2. Test Stand K-2 Procurement and Construction - thrust mount structure, deluge system, power and lighting system, liquid hydrogen and liquid oxygen fill systems, gantry crane system, control and instrumentation cabling, and bay boxes.

3. Area Support (K-2)Procurement and Construction - liquid hydrogen storage vessel, liquid oxygen storage vessel, gaseous hydrogen receivers.

4. Equipping Central Control Room for K-2 Operation - transmission cable, hydrogen leak detection system, duct tanks, control systems, storage vessel instrumentation systems.

5. Completion of K-1 Test Stand - design services related to test stand check-out.

6. Design of K-3 Test Stand - continuation of facilities planning and initiation of preliminary design of the forthcoming K-3 test stand.

PROJECT JUSTIFICATION:

The funding requested for FY 1966 is required to provide the additional facilities necessary to support the development of the M-1 Engine in accordance with the requirements of the Program Plan. Prior year construction programs provided component test stands C, E, G, and H; various engineering laboratories for thrust chamber, gas generator and turbo-pump testing; and initiation of the Engine System Test Complex with the construction of the limited firing duration K-1 Engine Test Stand. The funding requested herein for FY 1966 will initiate the construction of the K-2 test stand as well as additional supporting facilities required for K-2 testing. Preliminary design related to stand K-3 will also commence in this period.

The K-2 test stand will be a dual position, horizontally oriented stand providing a run duration capability of 330

seconds. Each of the two positions will be equipped with a thrust measurement system in addition to the necessary auxiliary propellant systems required for stand operation and basic engine testing. Subsequent to the construction of the basic facilities the capability for simulated altitude (90,000 feet), tests will be added to one of the two test positions through the use of a watercooled, supersonic diffuser tube. In addition, low temperature conditioning capability will be added at this time.

The run duration of test stand K-1 is limited to 30 seconds for sea-level conditions and a 3 second simulated altitude start capability. In contrast K-2 will provide an extended run duration capability of 330 seconds required for demonstrating performance for both sea-level and the simulated altitude testing conditions.

Furthermore, K-2 will be the only stand on which the 40:1 area expansion ratio, high altitude M-1 nozzle can be tested. The existing K-1 stand and the forthcoming K-3 stand will provide only for testing without a nozzle extension or with a short 25:1 area expansion ratio nozzle. The K-2 test stand will provide the test capability for precise determination of M-1 engine performance parameters (e.g. thrust level, specific impulse, thrust vector misalignment) under actual conditions of intended use. Testing on K-2 will also allow a precise extrapolation of short nozzle test data to actual conditions.

In addition, K-2 test stand, in conjunction with K-3, will demonstrate the ability of the M-1 Engine to function satisfactorily in both horizontal and vertical operating modes.

The K-2 engine test stand is planned to be used for the initial extended-duration testing in early 1968. A lead time of two and a half years is required for the procurement, construction and check-out of the test stand and supporting facility systems. Thus, the initiation of construction of these facilities is mandatory in FY 1966 to support the development of the 1,500,000 pound thrust liquid hydrogen/liquid oxygen M-1 Engine.

The overall M-1 Facility Plan provides for a test stand (K-3) which, together with the environmental testing aspects of test stand K-2, will support fully the system at the PFRT milestone. To meet the Program Plan, initial design efforts for K-3 must be started in FY 1966. The K-3 test stand is intended for vertical firing at sea-level conditions and, with the on-stand propellant tankage provided, will be capable of 500 seconds duration, including $7\frac{1}{2}$ degree engine gimbaling. The test stand substructure and superstructure will be capable of accepting 3 million pound thrust loading and the 1.5 million pound thrust measurement system will have growth potential to 3 million pounds. This test stand, having the highest test rate potential will figure most prominently in supporting the program plan of attaining M-1 Engi PFT in 1971. At the same time, K-3 is the most crucial facility for determining engine component reliability because

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NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Lewis Research Center	Construction of Facilities	Facilities for M-1 Engine Program

SUPPORTING DATA:

of long duration high test rate capability.

ESTIMATED FUTURE YEAR FUNDING: $8,188,000

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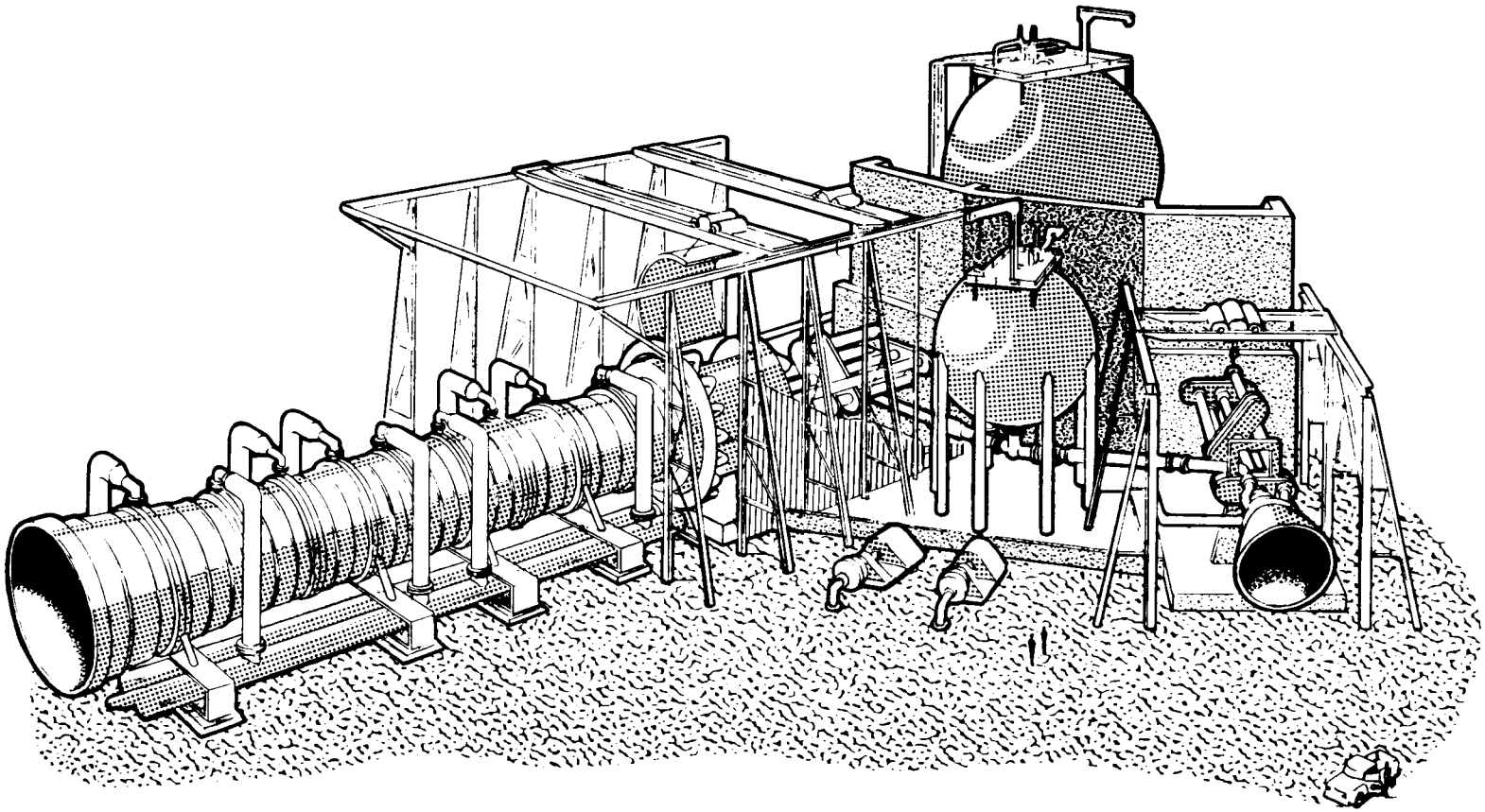
LEWIS RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

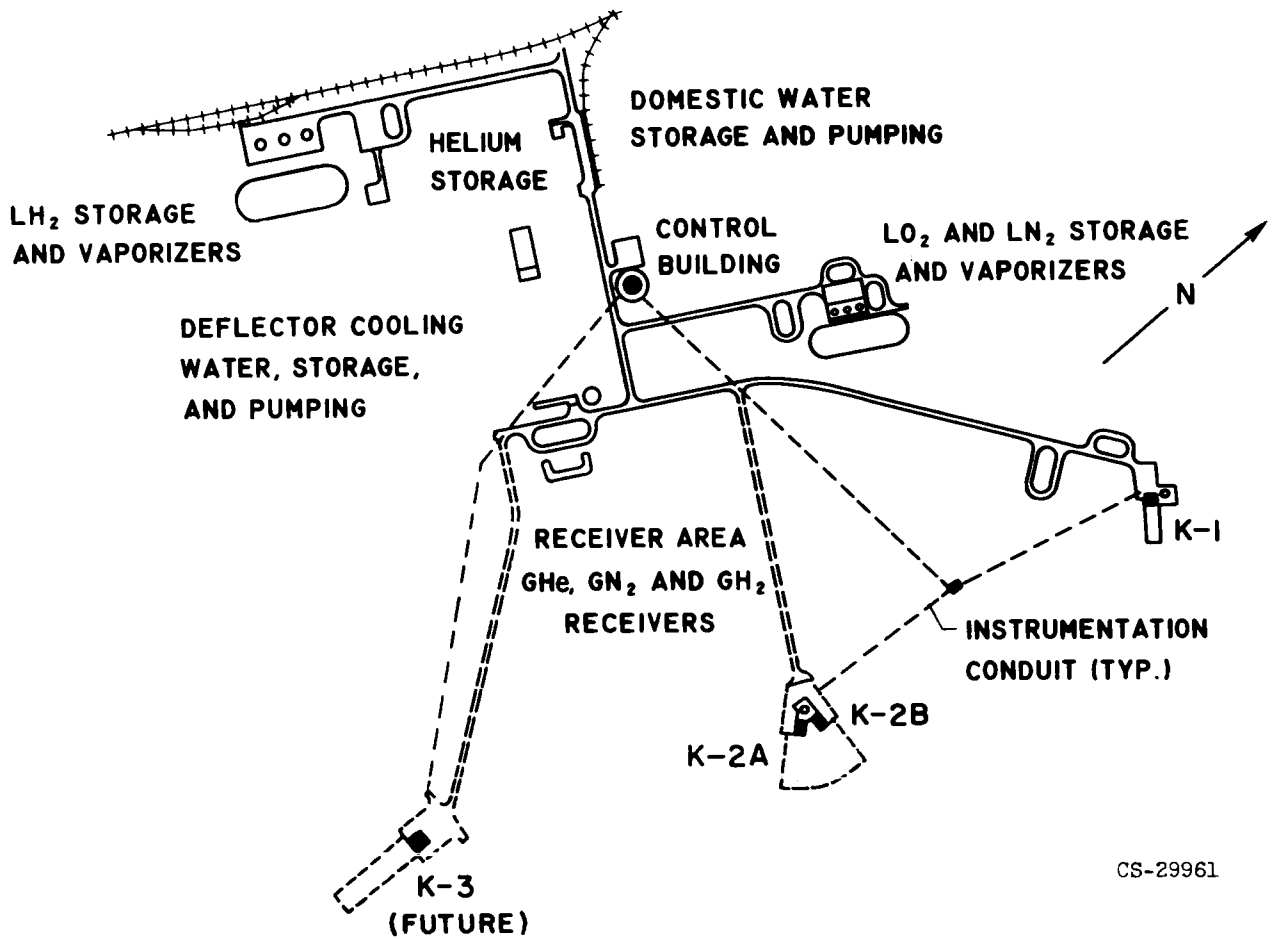
FACILITIES FOR M-1 ENGINE PROGRAM



Test Stand K-2 Concept.

LEWIS RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

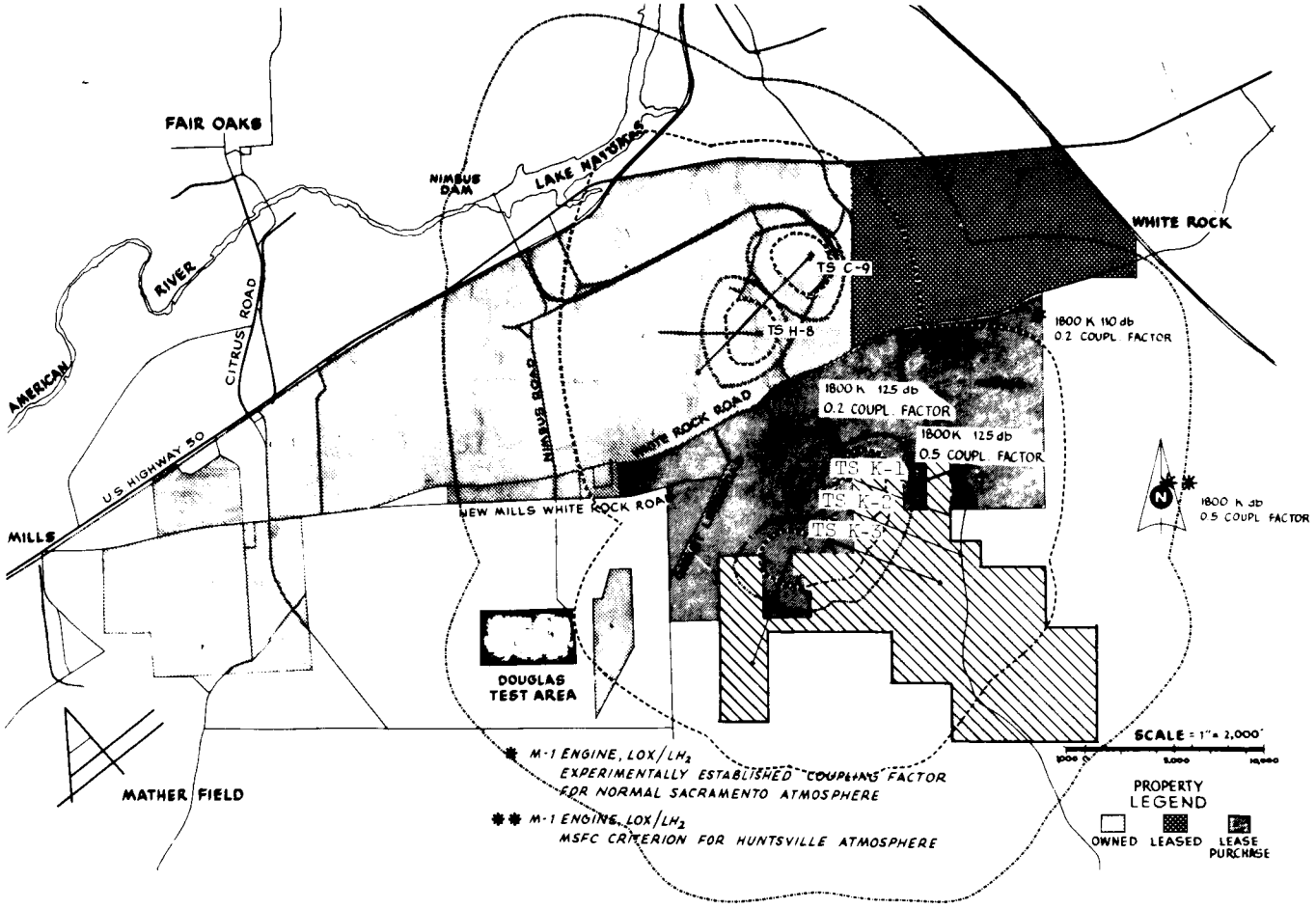
FACILITIES FOR M-1 ENGINE PROGRAM



ENGINE-SYSTEM TESTING K ZONE

LEWIS RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

FACILITIES FOR M-1 ENGINE PROGRAM



AGC PROPERTIES, SACRAMENTO, CALIFORNIA

Revised 9/24/64

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Flight Research Center	Construction of Facilities	Radar Installation at Wheeler Peak, Nevada

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Flight Research Center

LOCATION OF PROJECT: Wheeler Peak, Spring Mountains, Clark County, Nevada

COGNIZANT NASA INSTALLATION: Flight Research Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and prior years	$ 55,000
FY 1965 estimate	$ 40,000
FY 1966 estimate	$6,405,000
Total Funding Thru FY 1966	$6,500,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$763,000
AN FPQ-6 Building				
General	SF	5,000	20.78	103,900
Plumbing	SF	5,000	1.38	6,900

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Revised 9/24/64

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19

NAME OF INSTALLATION: Flight Research Center

APPROPRIATION: Construction of Facilities

PROGRAM OR PROJECT: Radar Installation at Wheeler Peak, Nevada

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Electrical	SF	5,000	8.75	43,750
Air Conditioning	LS	---	---	28,560
Radar Tower Foundation	CY	1,620	14.90	24,130
AN/FPQ-6 Boresight Facility				
General	SF	80	18.00	1,440
Electrical	SF	80	7.19	575
Tower Foundations	CY	2.5	124.00	310
Guy Anchors	CY	5	117.00	585
Cabling	LF	10,000	1.54	15,475
Power Generation Station	KVA	1,000	202.60	202,600
Supporting Construction				
Distribution Line	LF	---	---	1,560
Water Storage	GAL	---	---	2,170
Septic Tank and Drain	LS	---	---	1,550
Fuel Storage	LS	---	---	3,140
Access Road	MI	19.5	15,385.00	300,000
Parking Area	SY	40	13.63	545
Security Gate	LS	---	---	710
Site Preparation	LS	---	---	25,100
Equipment				5,642,000
AN/FPQ-6 Radar Set including emplacement and installation	---	1	4,130,000	4,130,000
Servo-Driven Antenna System	---	1	300,000	300,000
S-Band Telemetry Receiver	---	2	50,000	100,000

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Revised 9/24/64

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION: Flight Research Center

APPROPRIATION: Construction of Facilities

PROGRAM OR PROJECT: Radar Installation at Wheeler Peak, Nevada

SUPPORTING DATA:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Servo Amplifier	---	1	5,000	5,000
Antenna Position and Control		1	6,000	6,000
UHF Receiver		3	12,000	36,000
UHF Transmitter		3	22,000	66,000
Display Console for T/M and Communications		1	65,000	65,000
Telemetry Tape Recorder		2	27,000	54,000
Optical Tracker		1	50,000	50,000
Digital Data Transmission System		1	50,000	50,000
Precision Digital Data System		1	120,000	120,000
Time Conversion		1	5,000	5,000
Plotting System		1	85,000	85,000
Relocate Microwave Equipment			60,000	60,000
Pre-detection telemetry recorder		2	135,000	270,000
H F transmitter and receiver		1	60,000	60,000
Computer input-output buffer, Edwards		1	100,000	100,000
Interface to Air Force tracking facility			50,000	50,000
Non-technical collateral equipment			30,000	30,000
Design				
Fallout Shelter		---	---	---
TOTAL				$6,405,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Flight Research Center	Construction of Facilities	Radar Installation at Wheeler Peak,Nev.

SUPPORTING DATA:

PROJECT DESCRIPTION:

This project provides for the emplacement of a long-range, high-precision AN/FPQ-6 radar on Wheeler Peak, Spring Mountains, Clark County, Nevada, which is about 50 miles northwest of Las Vegas, Nevada. The proposed facilities include, in addition to the radar system, a standard design single-story environmental enclosure, a MK-51 optical tracker, a microwave link to Shoshone Mountain to couple into existing facilities, a combination voice-communication and telemetry link to the experimental aircraft, a radar boresight tower for radar alignment and a cabling system connecting the boresight tower to the radar facility. Since the site is presently uninhabited, the following additional facilities will be required: a road spur connecting the site to a main access road, a diesel-powered generating plant with a 1,000-KVA capacity, an associated transformer substation, a 10,000-gallon fuel oil tank to supply the diesel generators and heating equipment, and water storage and a septic tank for sewerage disposal. Since the AN/FPQ-6 radar will provide coverage essentially from the area of Edwards Air Force Base to the area of Ely, Nevada, the Air Force owned and NASA operated Aerodynamic Test Range radar equipment at Beatty and Ely Nevada will be deactivated.

PROJECT JUSTIFICATION:

Any research center requires specialized laboratory equipment suitable for the laboratory function and mission. In the case of the Flight Research Center, the facilities required are aircraft, instrumentation, and ground-laboratory equipment. The laboratory equipment includes calibration equipment such as a radar range to serve as a space reference system for all of the research flight testing performed at the Center. The availability of an accurate reference system is a necessity for virtually every flight research program.

Of the fundamental research investigations that are conducted in any type of high-speed aircraft, it is necessary, as it is in wind-tunnel investigations, to determine accurately the environment in which the flight investigations are being conducted. In wind-tunnel tests, it is the wall corrections, model support corrections, and the actual flow conditions; in flight, it is the accurate measurement of the atmospheric conditions and the airplane attitude. The accuracy with which these basic on-board investigations are conducted is not only based upon the accuracy of the measuring equipment for the investigation but also upon the environmental conditions in which the test bed aircraft is being flown. The radar system and its accuracy in positioning the aircraft in space coordinated with measurements of the atmosphere and the on-board instrumentation provides the complete instrumentation requirement for the flight investigation being conducted.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Flight Research Center	Construction of Facilities	Radar Installation at Wheeler Peak, Nev.

SUPPORTING DATA:

Space positioning reference systems were initially used for purposes of calibration of air-data-system installations which, with the low-performance aircraft then in use, required only a single-radar installation. With the inception of the X-15 program, the range acquired the additional duties of navigation system backup and chase plane vectoring. Because of the higher performance of the X-15, it was necessary to expand range coverage to the present 3-station Aerodynamic Test Range. The radars were basically the same as had been used previously; and, although they were marginally accurate to support the X-15 and other aeronautical research programs, they were chosen because of reliability and availability. The equipment has become technically obsolete, difficult to support with spares, and does not meet the more demanding requirements of existing and planned future flight research programs. It is required that the tracking facility be updated; and, because of the approximate 2-year period required to update this facility, it is necessary to begin as soon as possible.

Since the performance capability of test aircraft continues to increase, it becomes more difficult to obtain accurate air data with on-board systems. This puts the burden of supplying accurate air data information increasingly upon the tracking system. The increased aircraft performance also extends the tracking range with accompanying decreased accuracy at long range. The present radar system contains errors of approximately 2,000 feet in space and 100 feet to 200 feet per second in velocity at radar ranges of 100 to 200 miles. The present system seriously limits the accuracy with which pressure data such as airspeed, base pressure and pressure distribution can be obtained. The proposed AN/FPQ-6 radar will be capable of measuring airspeed to within ±10 feet per second and air vehicle space positioning to within ±100 feet at radar ranges of predominant interest.

To obtain meaningful data on an aircraft, a concentrated effort is expended on airborne instrumentation. The proposed facility will provide the necessary accuracy, for example, to match the accuracy of the airborne instrumentation in defining dynamic pressure, a fundamental measurement necessary to determine accurate lift and drag characteristics of any aircraft tested. The accuracy of the proposed facility will be required for the development and calibration of more precise altimetry and airborne navigational systems. This application is a firm requirement for the SST program in order that more precise air spacing of aircraft can be accomplished than is now possible.

This project has other advantages in addition to the fulfillment of requirements for more accurate tracking data. Because of the increased capability of the proposed radar and the ideal location afforded by Wheeler Peak, this single facility will replace the radar equipment at 2 Aerodynamic Test Range sites (Beatty, Nevada and Ely, Nevada), which, with the site at Edwards, are currently operated to give approximately the same coverage. The site at Edwards will remain in commission for secondary support of the AN/FPQ-6 radar site. The annual cost of operating the 3 Aerodynamic Test Range sites is approximately $0.9 million. The estimated annual cost of operating the Wheeler Peak site and the present site at Edwards is about $0.6 million.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Flight Research Center	Construction of Facilities	Radar Installation at Wheeler Peak, Nev.

SUPPORTING DATA:

In planning for NASA requirements, the Flight Research Center has coordinated its activities closely with the Air Force Flight Test Center, which is also updating its tracking facilities. Since the 2 organizations operate in the same general geographical areas, this coordination is necessary to avoid interference or duplication and to plan for mutual support wherever feasible. Within a recently concluded Joint Range Development and Operational Plan, NASA and Air Force agree to operate facilities, which together form a single Edwards Flight Test Range.

The Wheeler Peak site will cover the majority of the research flights conducted by the Flight Research Center, except at low altitude near and south of Edwards, where NASA will depend on Air Force coverage. The major flight test workload, and, therefore, facility concentration, of the Air Force Flight Test Center, is in the local Edwards area; however, some portions of the Air Force projects require uprange coverage extending to Wendover, Utah. The proposed Wheeler Peak site will supply tracking coverage to the Air Force in the uprange areas not covered by local Air Force capability. The entire Edwards Flight Test Range will be linked together with an Air Force operated microwave data-transmission system such that data from any site will be available to both organizations.

In summary, the project is justified for two principal reasons, (1) the obsolescence of current equipment with the difficulty of supporting this equipment precludes the ability of meeting the requirement for more accurate tracking to support flight research and (2) this facility will become an integral part of a single Edwards Flight Test Range which will provide mutual support for both the NASA Flight Research Center and the Air Force Flight Test Center without interference and unnecessary duplication.

ESTIMATED FUTURE YEAR FUNDING: None

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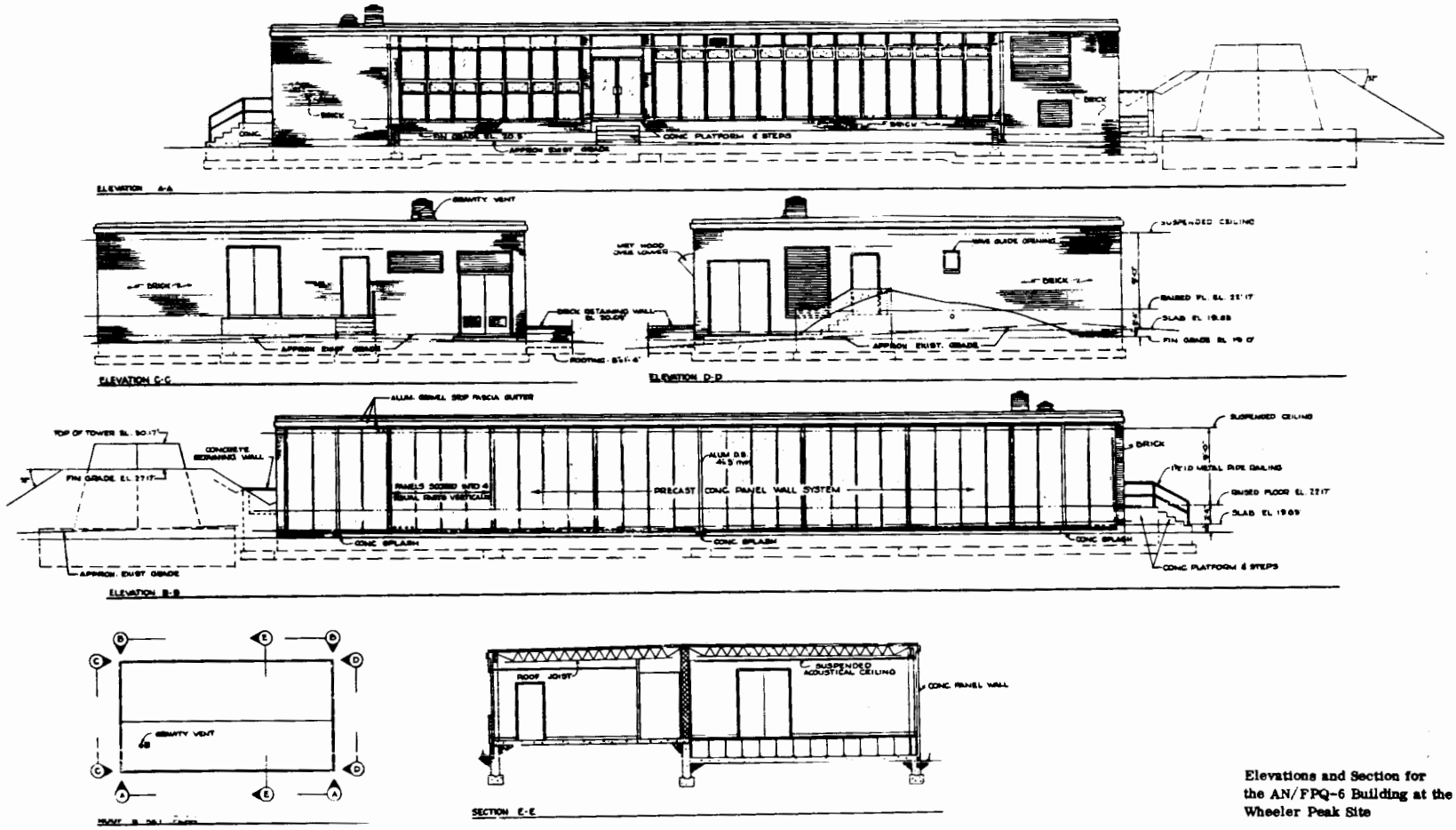
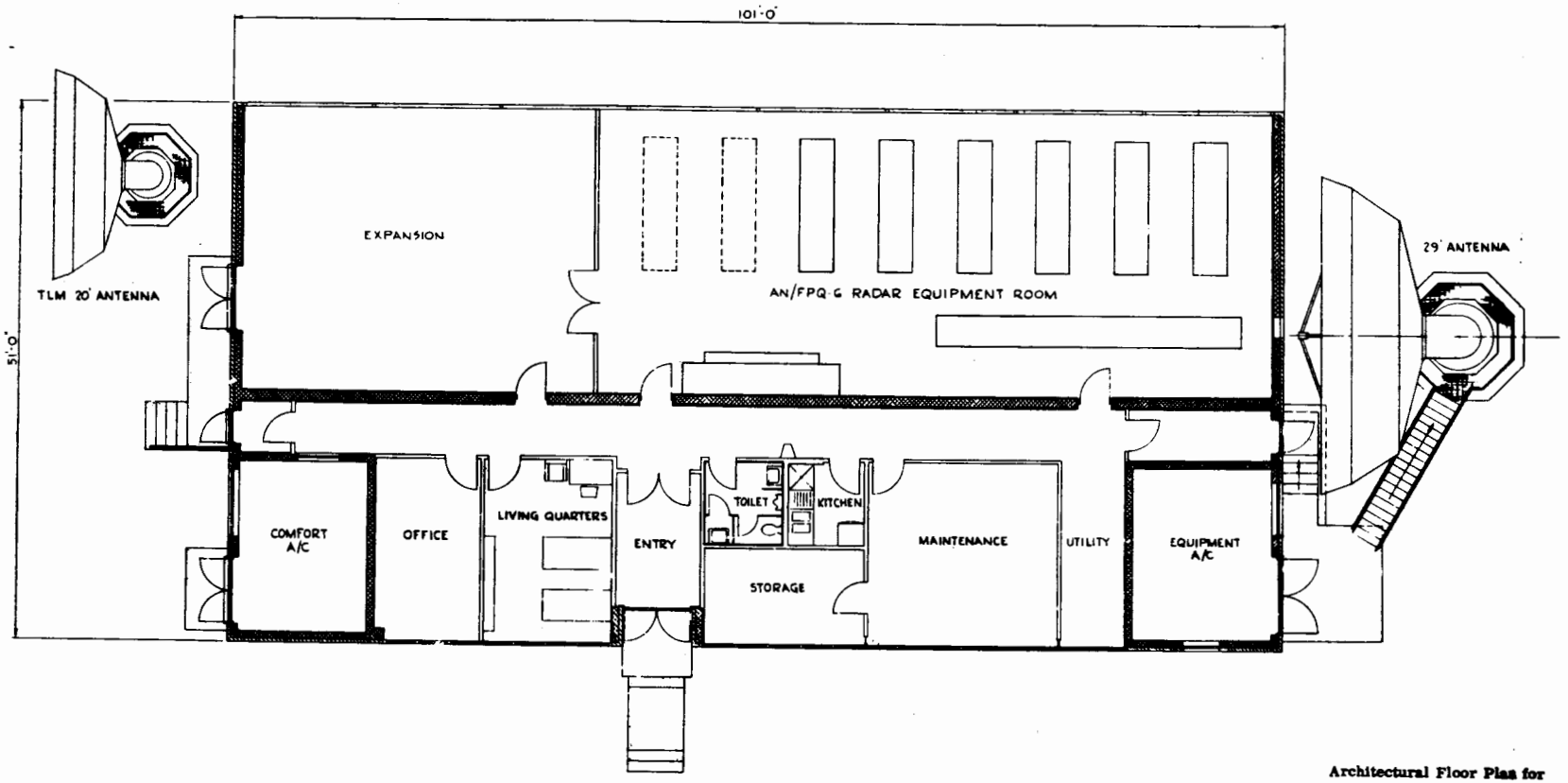
FLIGHT RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES
RADAR FACILITY



Elevations and Section for the AN/FPQ-6 Building at the Wheeler Peak Site

FLIGHT RESEARCH CENTER
FISCAL YEAR 1966 ESTIMATES

RADAR FACILITY



Architectural Floor Plan for the AN/FPQ-6 Building at the Wheeler Peak Site

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
JET PROPULSION LABORATORY	Construction of Facilities	Addition to Building G-18 Pioneer Site Addition to Building G-33 Echo Site Goldstone Space Communication Station Fort Irwin, California

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Jet Propulsion Laboratory

LOCATION OF PROJECT: Fort Irwin, California

COGNIZANT NASA INSTALLATION: Jet Propulsion Laboratory

TYPE OF CONSTRUCTION PROJECT: New Buildings

FUNDING:

FY 1964 and Prior Years	$5,000
FY 1965 Estimate	14,000
FY 1966 Estimate	236,000
Total Funding Thru FY 1966	$255,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
JET PROPULSION LABORATORY	Construction of Facilities	Addition to Building G-18

SUPPORTING DATA:

Pioneer Site
Addition to Building G-33
Echo Site
Goldstone Space Communication Station
Fort Irwin, California

PROJECT COST ESTIMATE

G-18 Addition - Pioneer Site

A. LAND ACQUISITION			-0-
B. SITE DEVELOPMENT AND UTILITY INSTALLATIONS			$8,700
(1) Site Development		1,300	
Earthwork	800		
Sidewalks	500		
(2) Utility Installation		7,400	
a. Mechanical			
Gas	200		
Water	300		
Sewer	2,000		
Ditching	500		

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b. Electrical

T. Conduit	100
Ditching	200
PA Conduit	100
Power Conduit	200
Power Cable	3,000
Transformer Bank	800

C. FACILITY CONSTRUCTION AND MODIFICATION $126,300
Total Square Feet = 3,800 @ $30.70 per square foot

D. EQUIPMENT, INSTRUMENTATION AND SUPPORT SYSTEMS . . . . . -0-

E. DESIGN AND ENGINEERING SERVICES . . . . . -0-

Total Estimated Cost $135,000

G-33 Addition - Echo Site

A. LAND ACQUISITION . . . . . -0-

B. SITE DEVELOPMENT AND UTILITY INSTALLATIONS $6,200

(1) Site Development 800

Earthwork 800

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
JET PROPULSION LABORATORY	Construction of Facilities	Addition to Building G-18 Pioneer Site Addition to Building G-33 Echo Site Goldstone Space Communication Station Fort Irwin, California

SUPPORTING DATA:

(2) Utility Installation		5,400	
a. Mechanical			
Gas	200		
Water	100		
Sewer	100		
b. Electrical			
T. Conduit	200		
Ditching	300		
PA Conduit	100		
Power Conduit	600		
Power Cable	3,000		
Transformer Bank	800		
C. FACILITY CONSTRUCTION AND MODIFICATION Total Square Feet = 2,500 @ $37.92 per square foot		94,800	
D. EQUIPMENT, INSTRUMENTATION AND SUPPORT SYSTEMS		-0-	
E. DESIGN		-0-	
Total Estimated Cost			$101,000
Total Estimated Project Cost			$236,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
JET PROPULSION LABORATORY	Construction of Facilities	Addition to Building G-18 Pioneer Site Addition to Building G-33 Echo Site Goldstone Space Communication Station Fort Irwin, California

SUPPORTING DATA:

ADDITION TO BUILDING G-18

PROJECT DESCRIPTION

This project proposes construction of a laboratory, office and small lunch facility. It will be designed to alleviate current over-crowded offices and laboratories at the Pioneer Station, Goldstone. Additionally a lunch area will be included for approximately 100 people. This facility will be an addition to the east end of the existing laboratory building.

Exterior dimensions proposed are approximately 51 feet wide by 75 feet long for a total addition of 3,800 square feet. Space utilization in approximate figures will be 1,450 square feet for offices, 1,000 square feet for laboratories, 1,000 square feet for the lunch room and 350 square feet for the air conditioning and mechanical equipment associated with this building.

This one-story addition using spread footings, concrete block walls, concrete roof on insulation forms and carried on steel beams will match the existing building. Air conditioning to satisfy equipment and personnel requirements will be provided as a part of this project.

PROJECT JUSTIFICATION

The Pioneer site, since the initiation of the S-band conversion of the DSN, has become a very active facility. The working staff has increased from about 40 to approximately 100 and is expected to remain at this level. This has resulted in a considerable shortage of office and laboratory space now being partially satisfied by the use of rented trailers. It has also become quite apparent that a satellite lunch facility to the main Echo cafeteria must be added to the Pioneer site, thus avoiding the 16 mile round trip transport of the approximate 100 people to lunch at the Echo site every day. The satellite lunch facility will consist of

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steam tables for serving warm luncheons which are prepared at the main Echo cafeteria, and an adequate eating area.

The addition of this facility will make it feasible to provide the support requested by the flight projects, particularly Surveyor and Apollo, and avoid the necessity for those projects to bring out trailers for their use.

ADDITION TO BUILDING G-33

PROJECT DESCRIPTION

This project is required to consolidate currently widespread communications equipment and functions at the Goldstone Tracking Station. This facility will be designed as an addition to the operations building at the Echo Station and will have sufficient space to accommodate current and planned communications equipment.

Exterior dimensions proposed are approximately 37 feet wide by 69 feet long, for a total addition of 2,500 square feet. Space utilization in approximate figures will be 1,450 square feet for the Communications Equipment room, 650 square feet for the Communications Equipment Repair laboratory and 400 square feet for the air conditioning and mechanical equipment associated with this addition.

This one-story addition using spread footings, concrete block walls, concrete roof on insulation forms and carried on steel beams will match the existing building. Air conditioning to satisfy equipment and personnel requirements will be provided as a part of this project.

PROJECT JUSTIFICATION

The Echo site serves as the headquarters area for the DSN activities at Goldstone. In particular it is the

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
JET PROPULSION LABORATORY	Construction of Facilities	Addition to Building G-18 Pioneer Site Addition to Building G-33 Echo Site Goldstone Space Communication Station Fort Irwin, California

SUPPORTING DATA:

terminus for communications to and from the other sites and from Goldstone to all outside agencies. The growth of the Goldstone activities which include the NASA Goddard Minitrack and Communications Satellite Ground Station facilities, has established a need for specialized facility for this communications terminus. As the additional facilities have been added over the past six years, communications facilities have been added wherever space could be assigned resulting in a pattern of widespread dispersion of facilities. Savings in maintenance and operations costs are expected from combining these communications facilities into one adequately designed structure in which the equipment can be laid out in an optimum manner for operations and maintenance functions. Furthermore, it is planned to add additional terminal equipment to support the increasing requirements for data, video, voice, and teletype communications needs.

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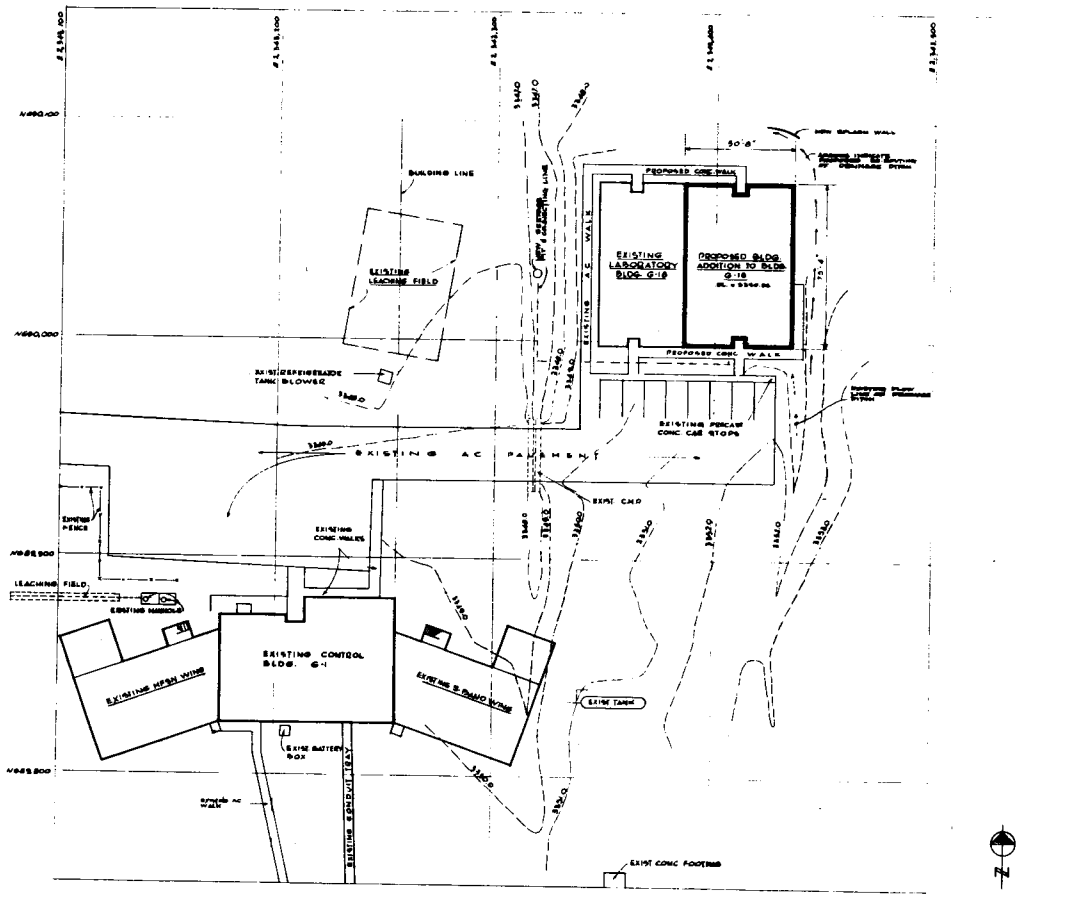
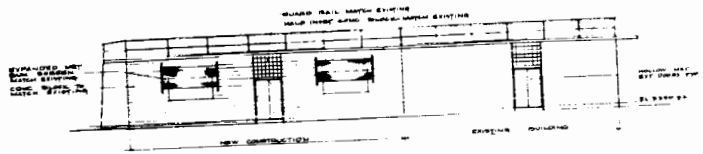
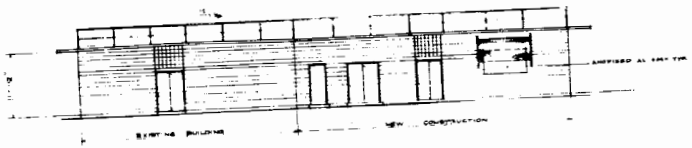


JET PROPULSION LABORATORY
DEEP SPACE NETWORK
ADDITION TO BLDG G-18 PIONEER SITE
PLOT PLAN

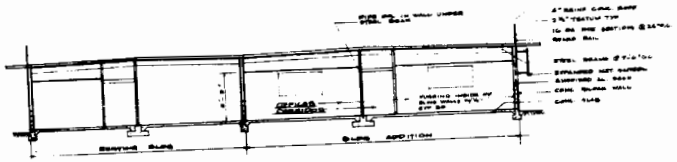


NORTH ELEVATION

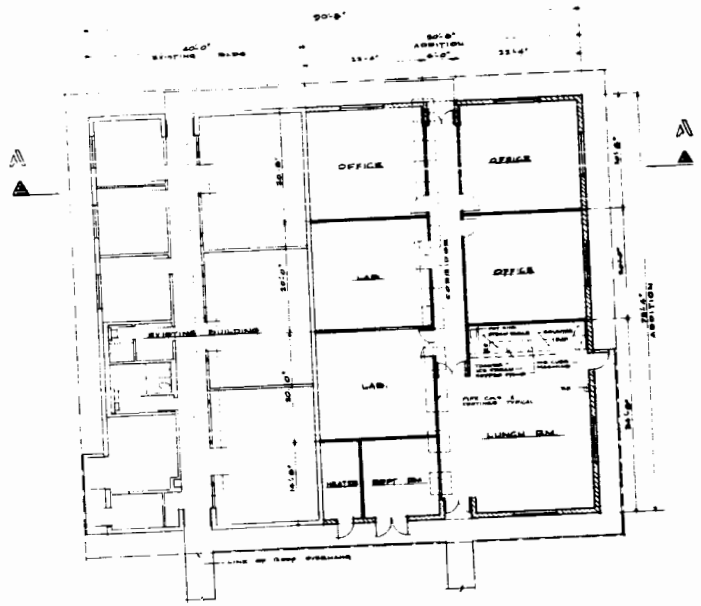


SOUTH ELEVATION

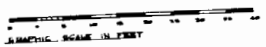
EAST ELEVATION



SECTION A-A

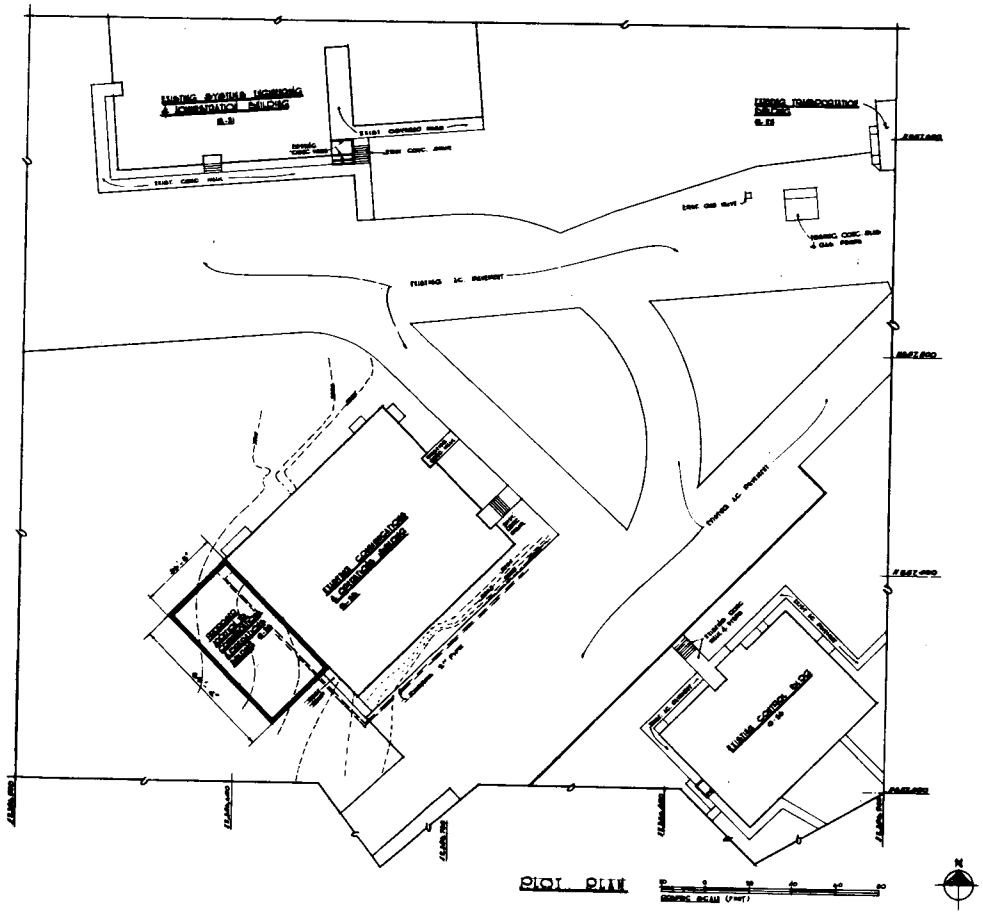


FLOOR PLAN



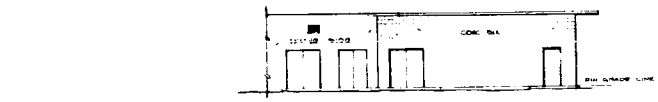
GRAPHIC SCALE IN FEET

ALBERT C. MARTIN AND ASSOCIATES ARCHITECTS AND ENGINEERS 888 S. BEATTY AVE. LA 17 CALIF.	JET PROPULSION LABORATORY PASADENA CALIF. DEEP SPACE NETWORK
	VOLKSTOWN KINGS CONSERVATION BUREAU FOR RURAL CALIFORNIA ADDITION TO BLDG. 9-18 PIONEER SITE
SUPERVISING ARCHITECT DATE	FLOOR PLAN, SECTION & ELEVATIONS
SUPERVISING ENGINEER DATE	JOB CAPT. BM PROJ. MGR. JAM DWG. NO. SHEET 2 OF 6

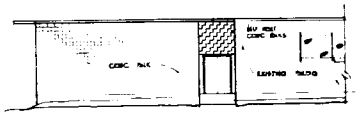


DEEP SPACE NETWORK

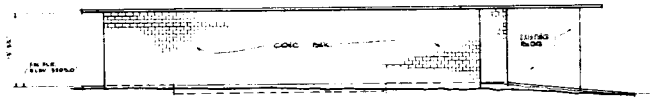
PLOT PLAN



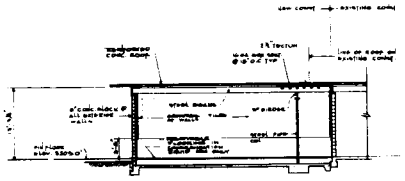
NORTH ELEVATION



SOUTH ELEVATION

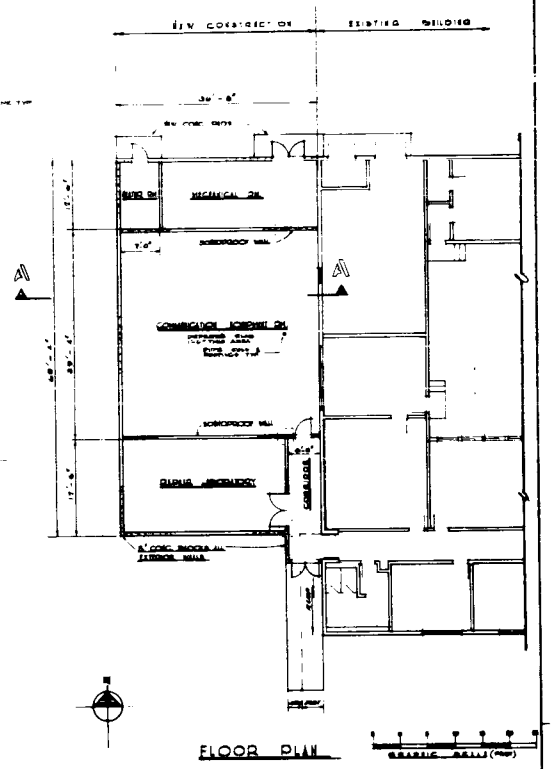


WEST ELEVATION



SECTION AA

SCALE 1" = 1'-0"



FLOOR PLAN

GRAPHIC SCALE (FEET)

ALBERT C. MARTIN AND ASSOCIATES ARCHITECTS AND ENGINEERS 1888 S. BROADWAY LOS ANGELES	JET PROPULSION LABORATORY PASADENA, CALIF. DEEP SPACE NETWORK		
SUBMITTED BY DATE	GOLDSTONE DEEP SPACE COMMUNICATION COMPLEX NEAR BARSTOW, CALIFORNIA ADDITION TO BLDG. G-55 SCALE 0-TS		
APPROVED WORTHING DATE	FLOOR PLAN SECTION & ELEVATIONS		
APPROVED JPL DATE	JOB CODE	DRAWN BY	DWG. NO. / SHEET 2 OF 9

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
JET PROPULSION LABORATORY	Construction of Facilities	Manned Space Flight Net Wing-Madrid Space Communication Station-Madrid, Spain

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Jet Propulsion Laboratory

LOCATION OF PROJECT: Madrid, Spain

COGNIZANT NASA INSTALLATION: Jet Propulsion Laboratory

TYPE OF CONSTRUCTION PROJECT: New Wing

FUNDING:

FY 1964 and Prior Years	$7,500
FY 1965 Estimate	28,000
FY 1966 Estimate	472,000
Total Funding Thru FY 1966	507,500

PROJECT COST ESTIMATE

A. LAND ACQUISITION			-0-
B. SITE DEVELOPMENT AND UTILITY INSTALLATIONS			$10,400
(1) Site Development		4,500	
Earthwork	4,000		
Sidewalks	500		

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
JET PROPULSION LABORATORY	Construction of Facilities	Manned Space Flight Net Wing-Madrid Space Communication Station-Madrid, Spain

SUPPORTING DATA:

(2) Utility Installation		5,900	
a. Mechanical			
Oil		500	
Water		500	
Sewer		500	
b. Electrical			
T. Conduit		300	
PA Conduit		300	
Power Conduit		800	
Power Cable		2,000	
Transformer Bank		1,000	
C. FACILITY CONSTRUCTION AND MODIFICATION Total Square Feet = 8,600 @ $39.33 per square foot			338,200
D. EQUIPMENT, INSTRUMENT AND SUPPORT SYSTEMS			123,400
Engine Generator		94,000	
Tunnel		29,400	
E. DESIGN			-0-
F. FALLOUT SHELTER			-0-
Total Estimated Cost			$472,000

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
JET PROPULSION LABORATORY	Construction of Facilities	Manned Space Flight Net Wing-Madrid Space Communication Station-Madrid, Spain

SUPPORTING DATA:

PROJECT DESCRIPTION

This project is the construction of a new Manned Space Flight Net (MSFN) wing. This will be an addition to the west end of the existing Operations and Engineering building at the Madrid Space Communications Station.

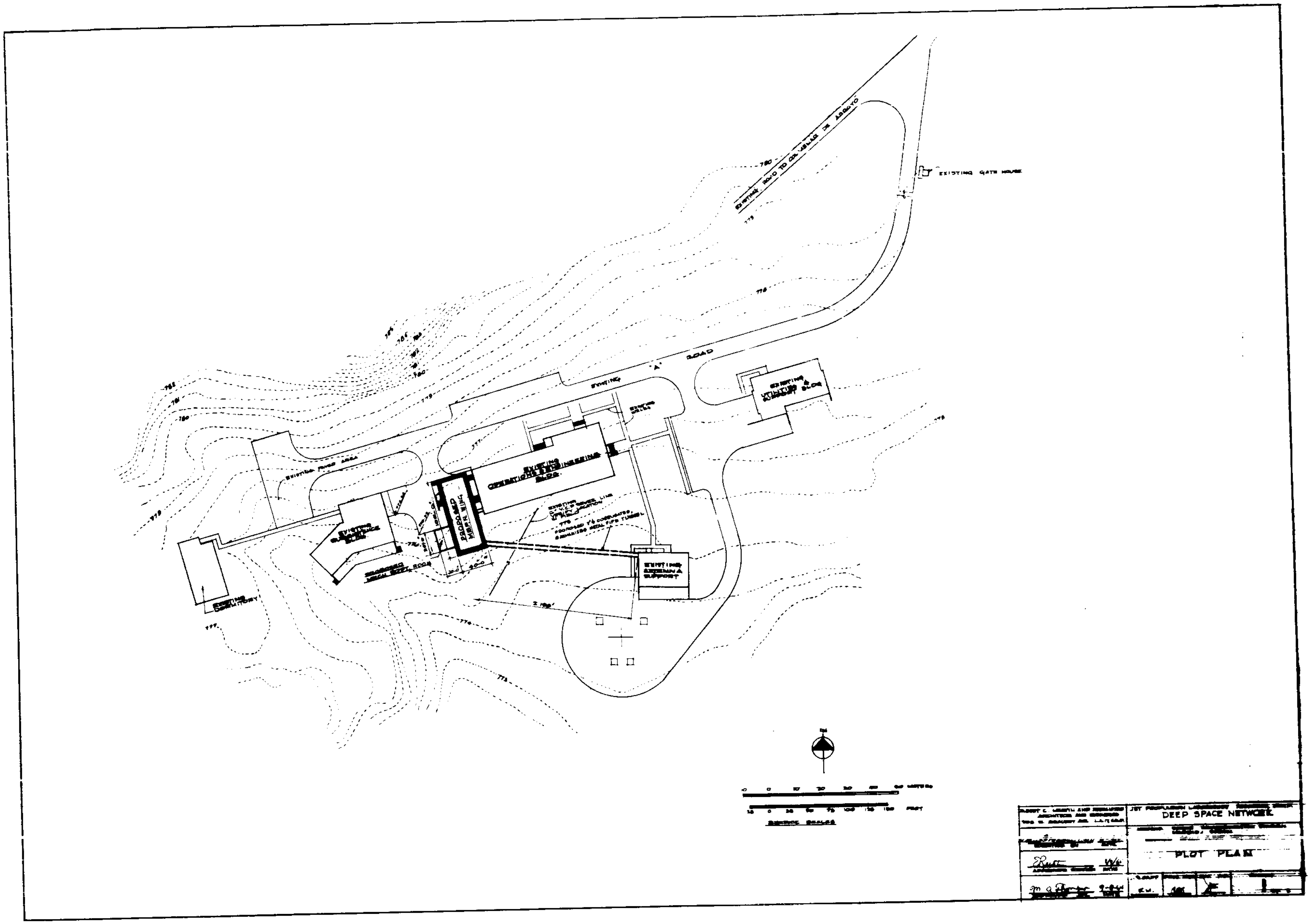
Exterior dimensions proposed are approximately 40 feet wide by 100 feet long. The building will consist of 4,000 square feet of basement area to serve as a plenum and raceway for the equipment above, a first floor of 4,000 square feet to contain the technical equipment required as backup capability to support the lunar phase of the Apollo mission. Additionally, on the first floor, there will be a mechanical utility structure of approximately 600 square feet to house the required heating and air conditioning equipment for this wing.

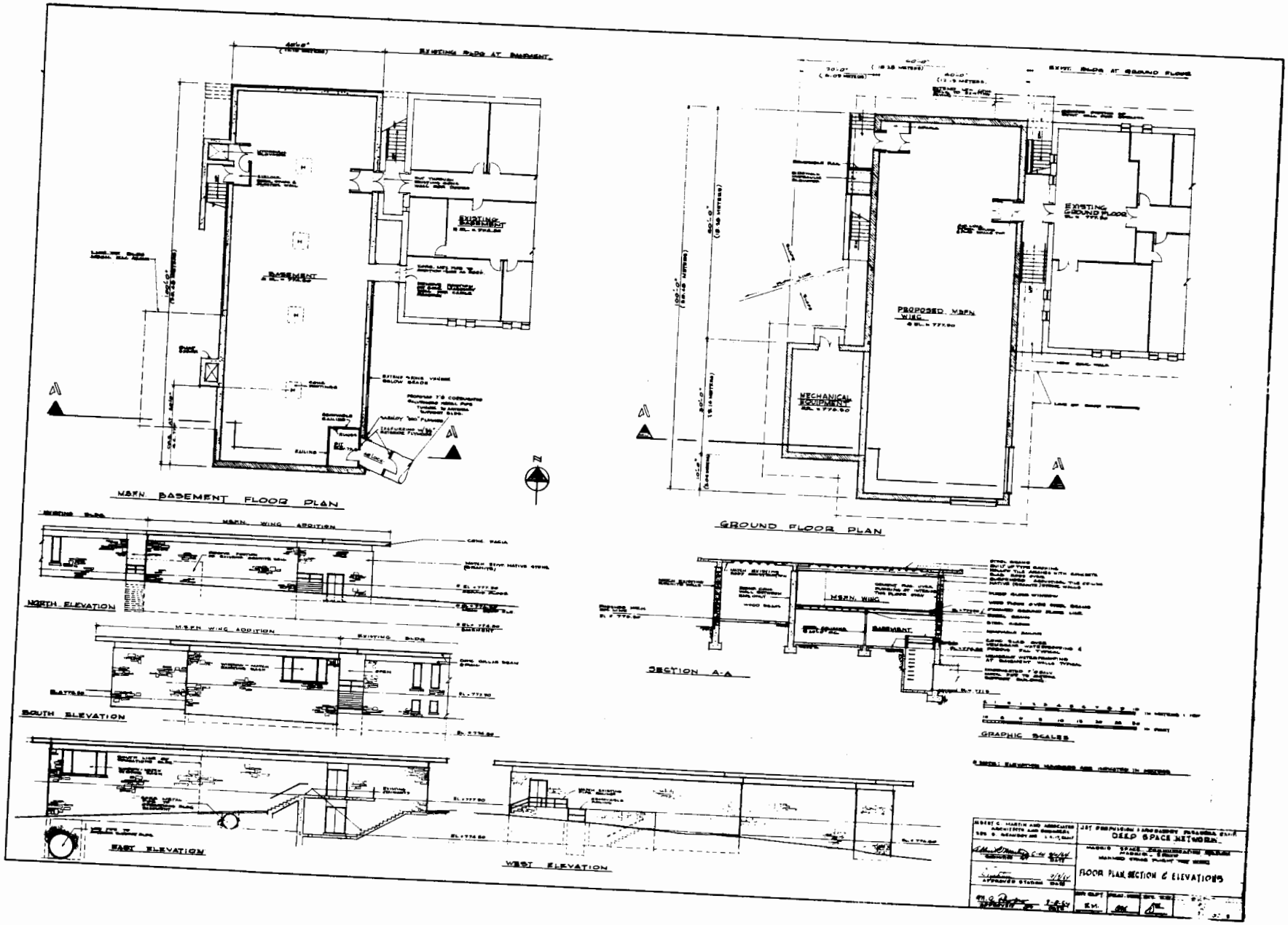
The proposed addition will match the adjacent existing building, i.e. concrete slab on grade for basement, reinforced concrete basement walls, steel frame and wood panels first floor (technical requirement), native granite exterior walls and concrete roof on curved tiles.

PROJECT JUSTIFICATION

NASA Headquarters OTDA has assigned JPL the task of providing at each of 3 DSN stations, Goldstone, Canberra, and Madrid, a backup capability to support the lunar phase of the Apollo mission. In order to house the technical operations equipment necessary to carry out this function, it has been estimated that a 4,000 square foot air conditioned equipment room must be added to the Control Building at these sites. A 2,700 square foot addition has been added with the MSFN wing to the Goldstone Pioneer station Control Building and other space can be shared (notably the Butler buildings) to make up the 4,000 square foot total which now appears the right match to the requirements.

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.


EXISTING GATE HOUSE
EXISTING "A" ROAD
EXISTING OPERATIONS & ENGINEERING BLDG.
EXISTING UTILITIES & SUPPORT BLDG.
EXISTING ANTENNA SUPPORT
PROPOSED MSFN WING
DEEP SPACE NETWORK
PLOT PLAN


EXISTING BLDG AT BASEMENT
EXISTING BASEMENT
BASEMENT
MSFN BASEMENT FLOOR PLAN
EXIST. BLDG AT GROUND FLOOR
PROPOSED MSFN WING
MECHANICAL EQUIPMENT
EXISTING GROUND FLOOR
GROUND FLOOR PLAN
MSFN WING ADDITION
NORTH ELEVATION
MSFN WING ADDITION
EXISTING BLDG
SOUTH ELEVATION
EAST ELEVATION
WEST ELEVATION
MSFN WING
BASEMENT
SECTION A-A
GRAPHIC SCALES
DEEP SPACE NETWORK
FLOOR PLAN, SECTION & ELEVATIONS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
JET PROPULSION LABORATORY	Construction of Facilities	Manned Space Flight Net Wing-Canberra Space Communication Station- Canberra, Australia

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Jet Propulsion Laboratory

LOCATION OF PROJECT: Canberra, Australia

COGNIZANT NASA INSTALLATION: Jet Propulsion Laboratory

TYPE OF CONSTRUCTION PROJECT: New Wing

FUNDING:

FY 1964 and Prior Years	$7,500
FY 1965 Estimate	30,500
FY 1966 Estimate	509,500
Total Funding Thru FY 1966	$547,500

PROJECT COST ESTIMATE

A. LAND ACQUISITION			-0-
B. SITE DEVELOPMENT AND UTILITY INSTALLATIONS			$ 9.700
(1) Site Development		2,700	
Earthwork	2,000		
Paving	500		
Sidewalks	200		

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
JET PROPULSION LABORATORY	Construction of Facilities	Manned Space Flight Net Wing-Canberra Space Communication Station-Canberra, Australia

SUPPORTING DATA:

(2) Utility Installation		7,000
a. Mechanical		
Oil	400	
Water	500	
Sewer	500	
Ditching	500	
b. Electrical		
T. Conduit	500	
Ditching	500	
PA Conduit	300	
Power Conduit	800	
Power Cable	2,000	
Transformer Bank	1,000	
C. FACILITY CONSTRUCTION AND MODIFICATION Total Square Feet = 8,600 @ 45.97 per square foot		395,300
D. EQUIPMENT, INSTRUMENTATION AND SUPPORT SYSTEMS		104,500
Engine Generator	91,700	
Tunnel	12,800	
E. DESIGN		-0-
F. FALLOUT SHELTER		-0-
Total Estimated Cost		$509,500

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
JET PROPULSION LABORATORY	Construction of Facilities	Manned Space Flight Net Wing-Canberra Space Communication Station-Canberra, Australia

SUPPORTING DATA:

PROJECT DESCRIPTION:

This project is the construction of a new Manned Space Flight Net (MSFN) wing adjacent to the existing Operations and Engineering building at the Canberra Space Communications Station.

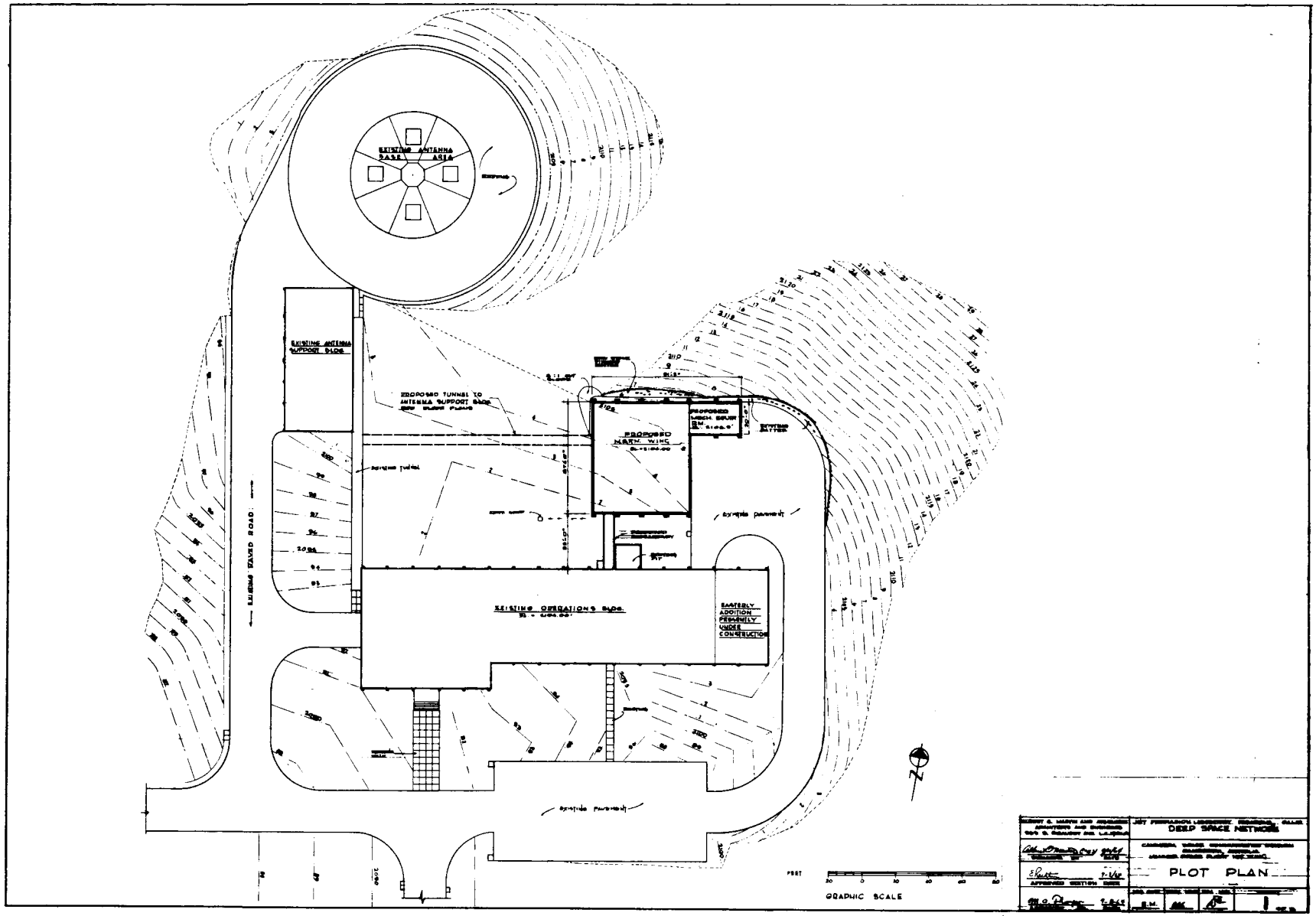
Exterior dimensions proposed are approximately 60 feet wide by 67 feet long. The building will consist of 4,000 square feet of basement area to serve as a plenum and raceway for the equipment above, a first floor of 4,000 square feet to contain the technical equipment required as backup capability to support the lunar phase of the Apollo mission. Additionally, on the first floor, there will be a mechanical utility structure of approximately 600 square feet to house the required heating and air conditioning equipment for this wing.

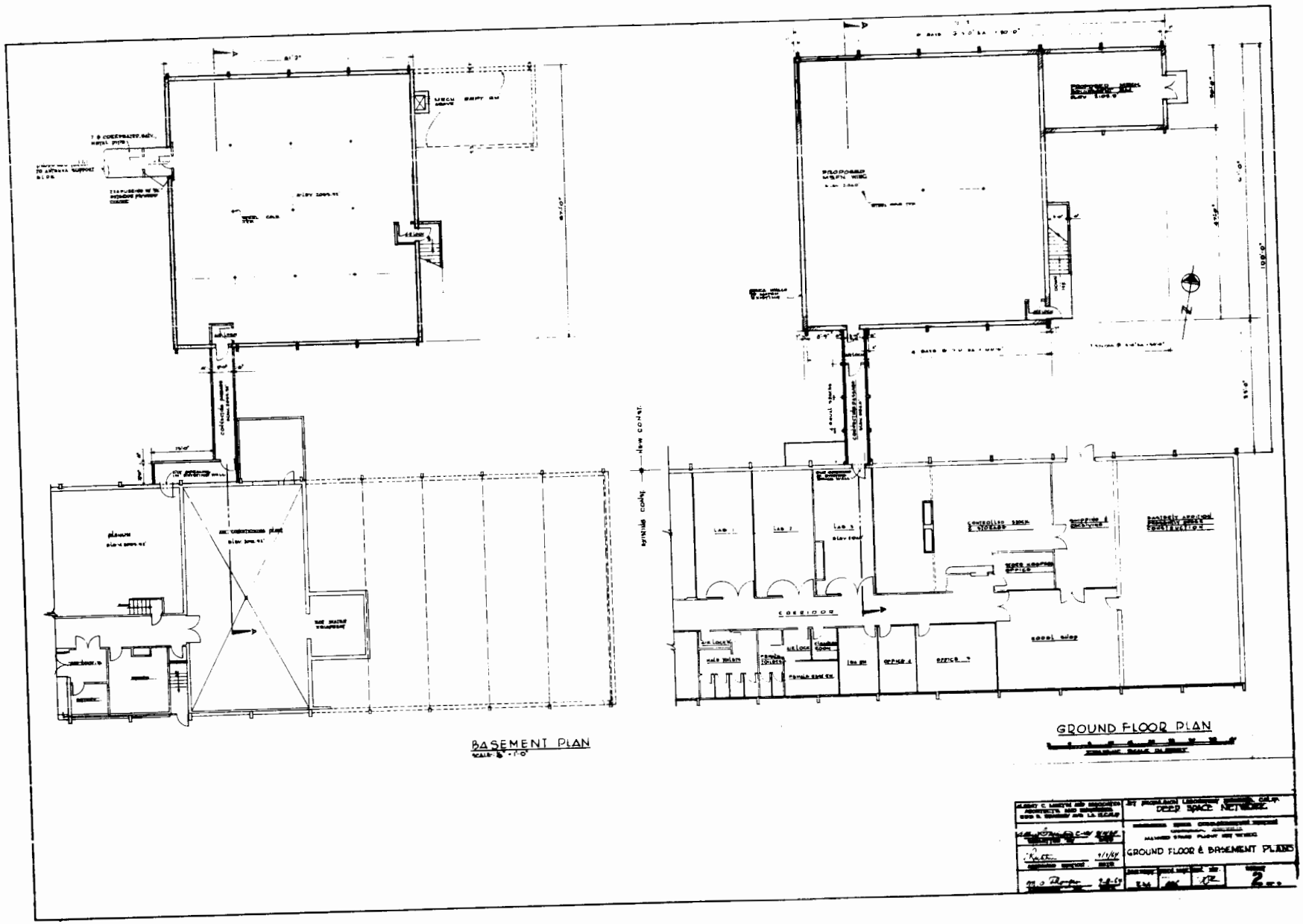
The proposed addition will match the adjacent existing building, i.e. concrete slab on grade for basement, reinforced concrete basement walls, steel frame and wood panels first floor (technical requirement), reinforced brick walls, with a structural steel roof framing and wood joists.

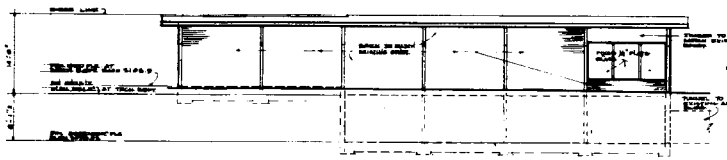
PROJECT JUSTIFICATION:

NASA Headquarters OTDA has assigned JPL the task of providing at each of 3 DSN stations, Goldstone, Canberra and Madrid, a backup capability to support the lunar phase of the Apollo mission. In order to house the technical operations equipment necessary to carry out this function, it has been estimated that a 4,000 square foot air conditioned equipment room must be added to the Control Building at these sites. A 2,700 square foot addition has been added with the MSFN wing to the Goldstone Pioneer station Control Building and other space can be shared (notably the Butler buildings) to make up the 4,000 square foot total which now appears the right match to the requirements.

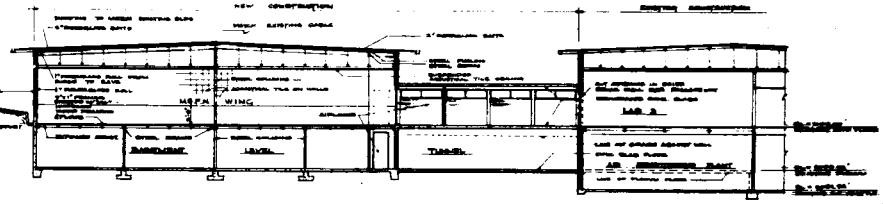
NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.


EXISTING ANTENNA BASE AREA
EXISTING ANTENNA SUPPORT BLDG.
PROPOSED TUNNEL TO ANTENNA SUPPORT BLDG.
PROPOSED NORTH WING
EXISTING OPERATIONS BLDG.
EASTERLY ADDITION PERMANTLY UNDER CONSTRUCTION
EXISTING PAVED ROAD
GRAPHIC SCALE
DEEP SPACE NETWORK
PLOT PLAN

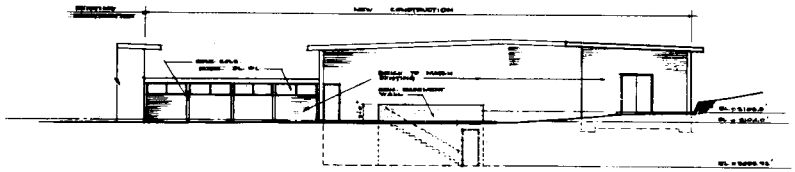

BASEMENT PLAN
GROUND FLOOR PLAN
CORRIDOR
LAB 1
LAB 2
LAB 3
OFFICE 1
OFFICE 2
OFFICE 3
DEEP SPACE NETWORK
GROUND FLOOR & BASEMENT PLANS
2



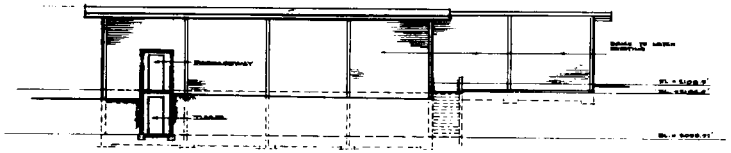
NORTH ELEVATION



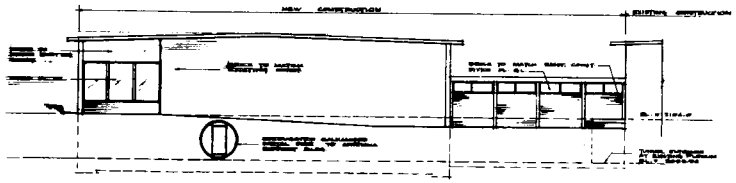
SECTION A-A



EAST ELEVATION



SOUTH ELEVATION



WEST ELEVATION

GRAPHIC SCALE IN FEET

JET PROPULSION LABORATORY
DEEP SPACE NETWORK
SECTION & ELEVATIONS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Stadan Facility Expansion

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Various Locations

LOCATION OF PROJECT: Fairbanks, Alaska

COGNIZANT NASA INSTALLATION: Goddard Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Extension

FUNDING:

FY 1964 and Prior Years	$ 23,000
FY 1965 (Estimate)	60,000
FY 1966 (Estimate)	1,115,000
Total Funding through FY 1966	$1,198,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Stadan Facility Expansion

SUPPORTING DATA:

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,115,000
Operations Building Addition	SF	6,000	$64.00	384,000
Utility and Storage Bldg. Addition	SF	6,400	60.00	384,000
Range and Range Rate Bldg. Addition	SF	750	40.00	30,000
Range and Range Rate Bldg. Modification	LS	---	31,000	31,000
Special Air-Conditioning for High Heat Loss Equipment	LS	---	85,000	85,000
Switchgear and Transformers	LS	---	57,000	57,000
Utilities	LS	---	44,000	44,000
Site Preparation, Paving and Landscaping	LS	---	36,000	36,000
Electrical Distribution	LS	---	64,000	64,000
Equipment	---	---	---	---
Design				-0-
For Construction	LS	---	---	-0-
Fallout Shelter	---	---	---	---
		TOTAL		$1,115,000

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Stadan Facility Expansion

SUPPORTING DATA:

PROJECT DESCRIPTION:

This project proposes the construction of the following: approximately 6,400 square feet of area to the Utility and Storage Building for critical magnetic tape storage, an equipment maintenance area and facilities for hydraulic, generator and heavy equipment maintenance; approximately 750 square feet of area to the Range and Range Rate Building for a Mechanical Equipment Room and critical logistics area at the Range and Range Rate site, and an addition to the Operations and Telemetry Building of approximately 6,000 square feet of area for the requirements imposed by present and planned future projects, including Tiros VII, VIII, IX, X, OTS, TOS; POGO, EGO, AOSO, IMP, and space for relocation of College Minitrack electronics. The building construction will conform to the architectural appearance of the existing structures. Air-conditioning and humidity-temperature controls will be installed to provide the environment necessary for efficient operation of electronic equipment in all required areas. An elevated floor system will be installed in areas where electronic equipment cableways are necessary. This system is invaluable in cabling and routine signal and power distribution line maintenance. The materials used in construction of the buildings shall be of the sub-arctic type especially suited to the extreme temperature ranges of the locale. The utilities will be extended from existing systems where practical, and independent of existing services where necessary.

PROJECT JUSTIFICATION:

The addition to the Utility and Storage Building is necessary to house and adequately accommodate a combined electronic and hydraulic maintenance, vehicle maintenance and related storage areas in support of the Ulaska Facility complex. This area is especially critical for mass storage of high quality magnetic telemetry and computer tapes.

The continued addition of new equipment at this station, and the support of additional projects have greatly reduced logistic storage areas. Extreme weather conditions in the area restricts maintenance operations during a great part of the year. It is necessary that proper facilities be available to permit minimum maintenance under any weather condition. During the long and severe winter season this routine maintenance is hampered and major

[illegible] 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

SUPPORTING DATA:

PROJECT JUSTIFICATION (Continued)

overhauls are completely ruled out. In the present situation, a major drive failure during the winter could conceivably close the station for several weeks. In addition, no area is available for the overhaul of diesel generators producing power for the Ulaska and Gilmor Stations. The facility, because of its location, will serve both large antenna stations in the area as well as the SATAN and Minitrack systems to be installed shortly.

The addition to the Operations building is required to house spacecraft control consoles, spacecraft data processing, and unique command consoles for OGO, AOSO, IMP and pre-operational Tiros satellites. This equipment requires strict control of both temperature and humidity within very narrow tolerances. Wide variation in humidity or temperature will cause the computer and data handling equipment to become totally inoperative. Accordingly, previously tested and proven environmental control systems will be installed. A floating or raised floor system will be used to accomodate the great number and variety of inter-equipment cables required. All available space in the existing Operations Building has been fully utilized.

The addition to the Range and Range Rate Building is required for mechanical and air-conditioning equipment which provides complete temperature-humidity control in the operations area. This equipment requires accurate relative humidity control for efficient operation.

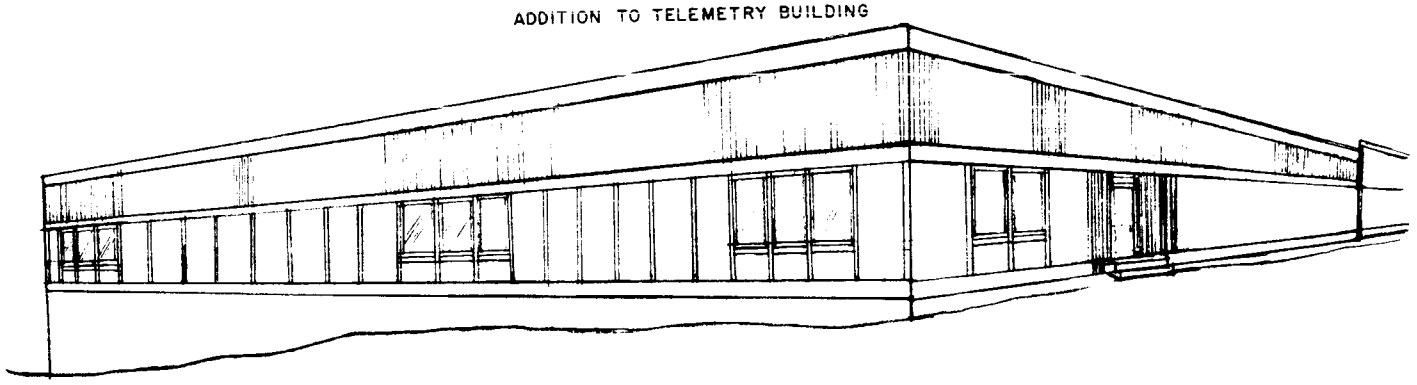
NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

VARIOUS LOCATIONS

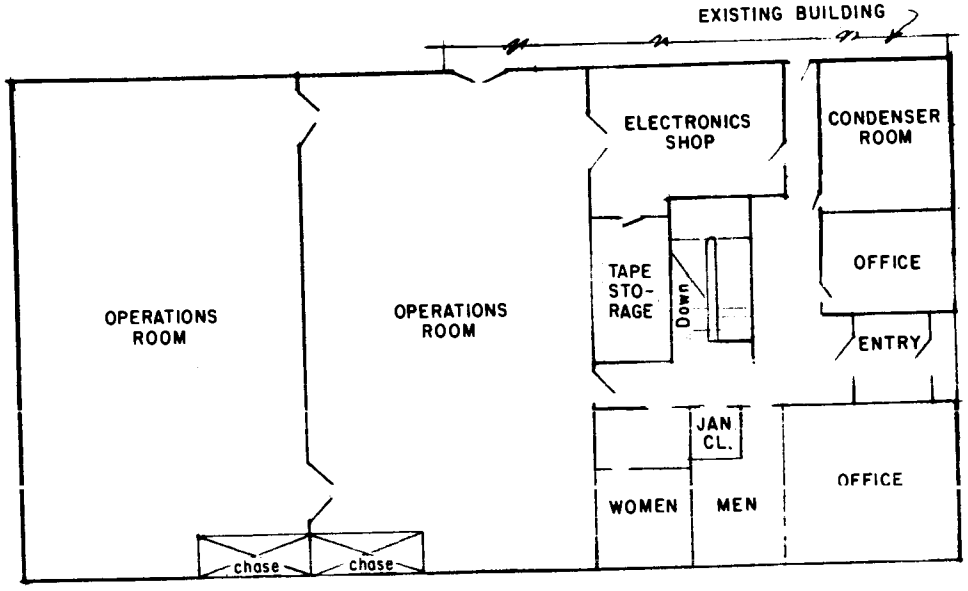
FISCAL YEAR 1966 ESTIMATES

STADAN FACILITY, FAIRBANKS, ALASKA

ADDITION TO TELEMETRY BUILDING



PERSPECTIVE
(No Scale)



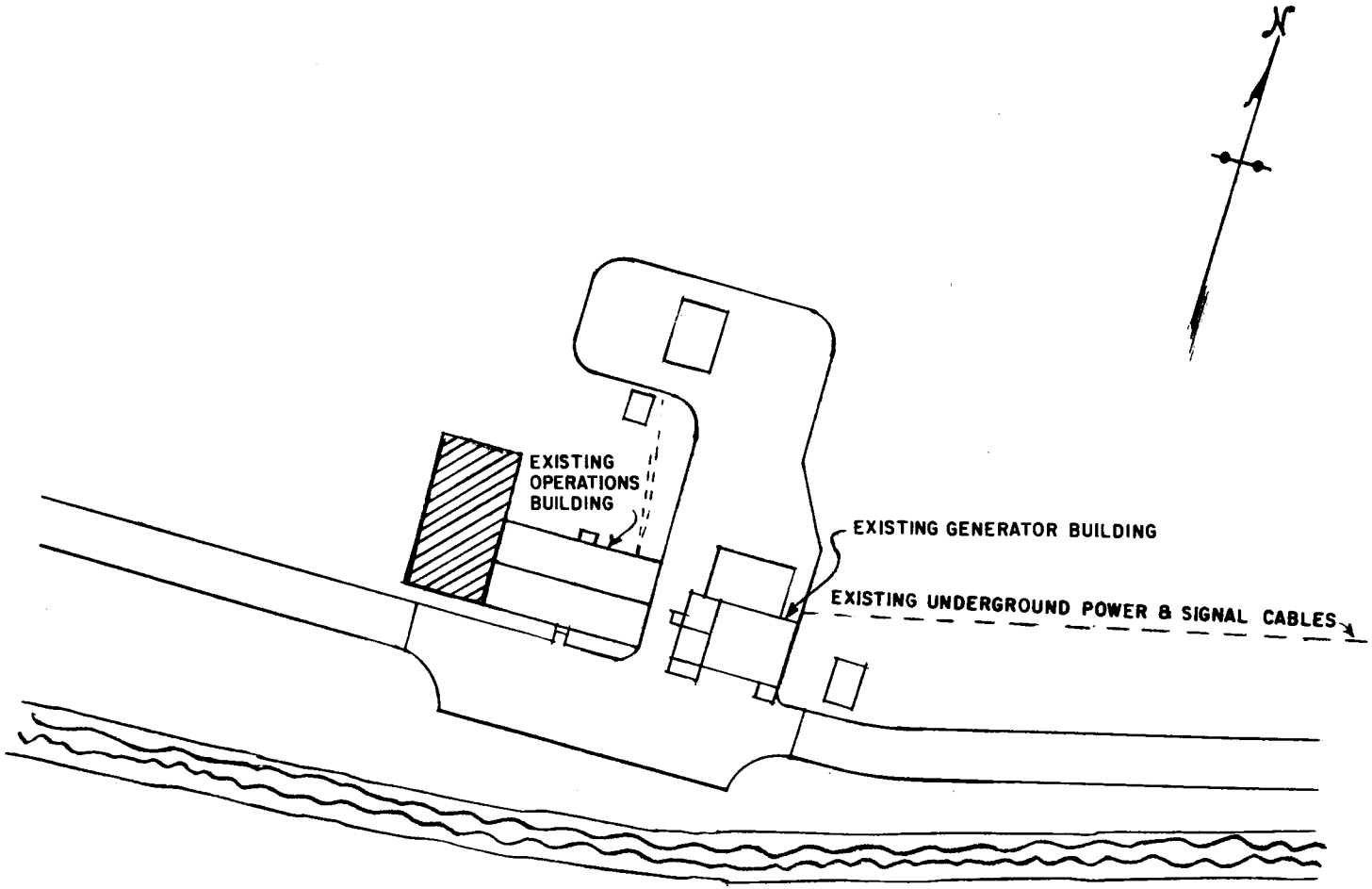
PLAN
Scale: 1/16"=1'-0"

VARIOUS LOCATIONS

FISCAL YEAR 1966 ESTIMATES

STADAN FACILITY, FAIRBANKS, ALASKA

ADDITION TO TELEMETRY BUILDING



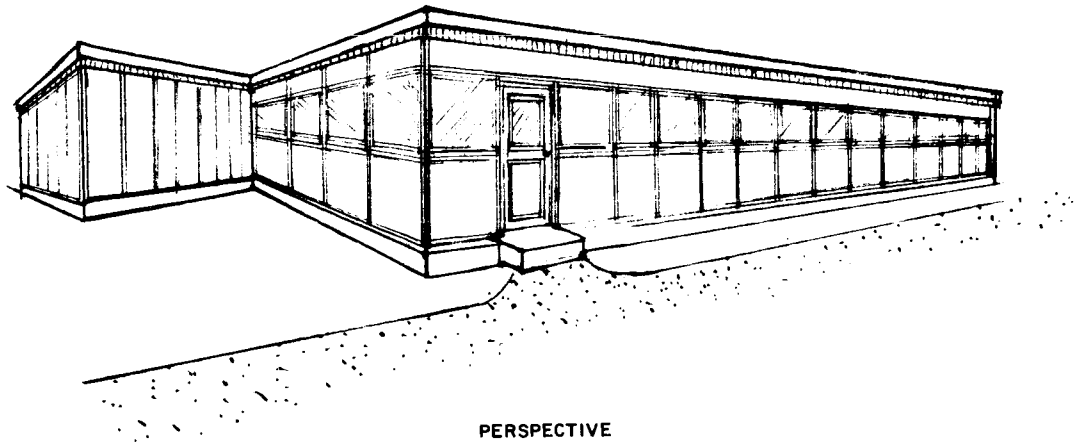
SITE PLAN
(No Scale)

VARIOUS LOCATIONS

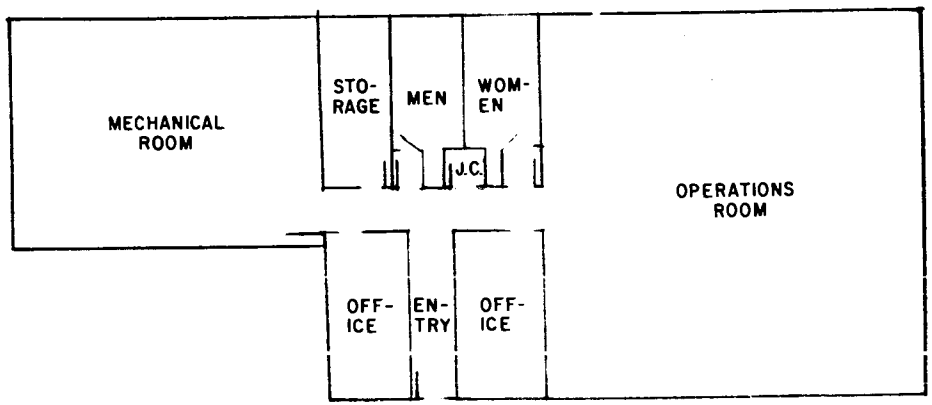
FISCAL YEAR 1966 ESTIMATES

STADAN. FACILITY, FAIRBANKS, ALASKA

RANGE AND RANGE RATE OPERATIONS BLDG.



PERSPECTIVE
(No Scale)



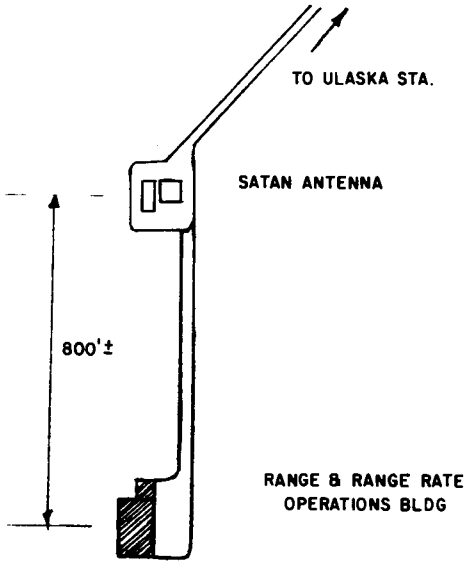
PLAN
Scale [illegible]

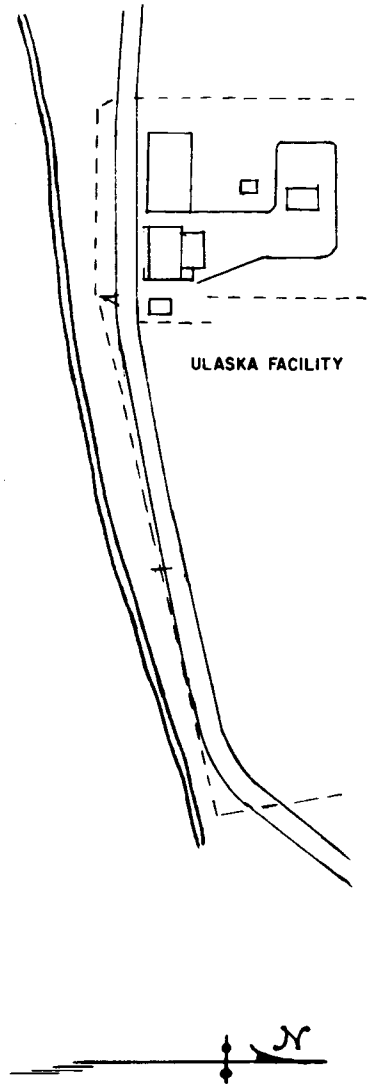
VARIOUS LOCATIONS

FISCAL YEAR 1966 ESTIMATES

STADAN FACILITY, FAIRBANKS, ALASKA

RANGE AND RANGE RATE FACILITY



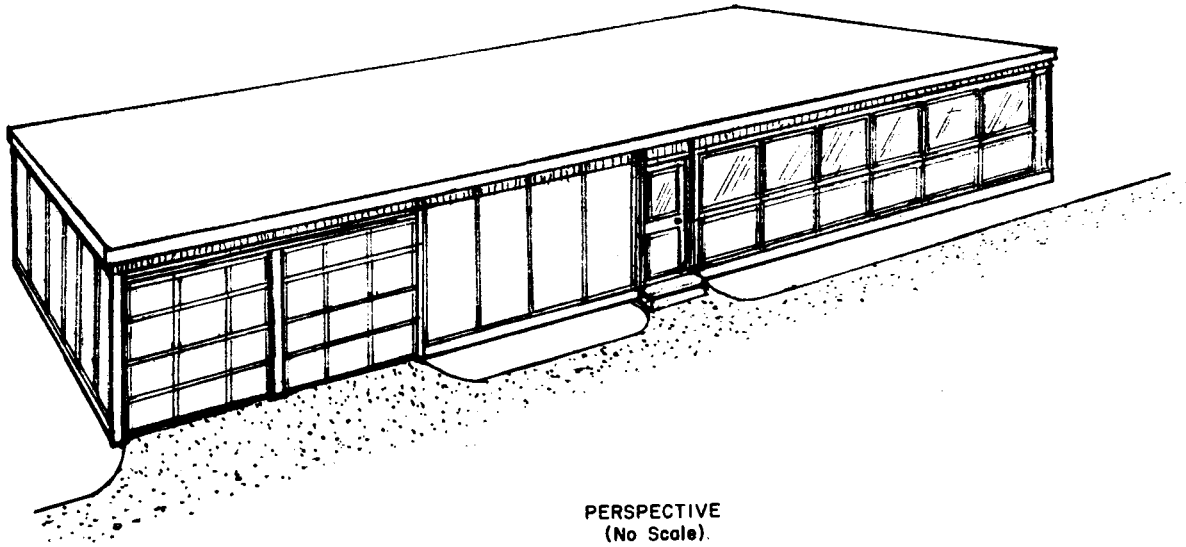


VARIOUS LOCATIONS

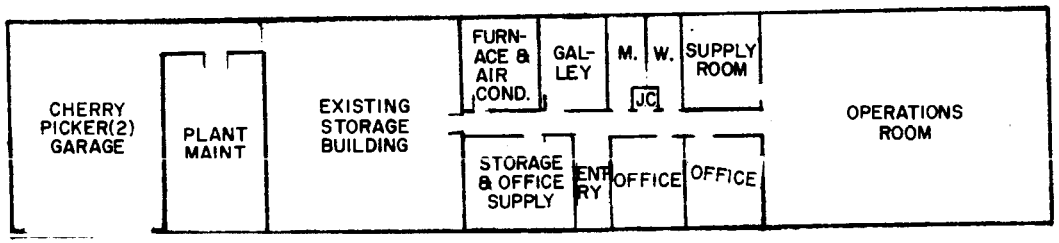
FISCAL YEAR 1966 ESTIMATES

STADAN FACILITY, FAIRBANKS, ALASKA

ADDITION TO STORAGE BUILDING



PERSPECTIVE
(No Scale)



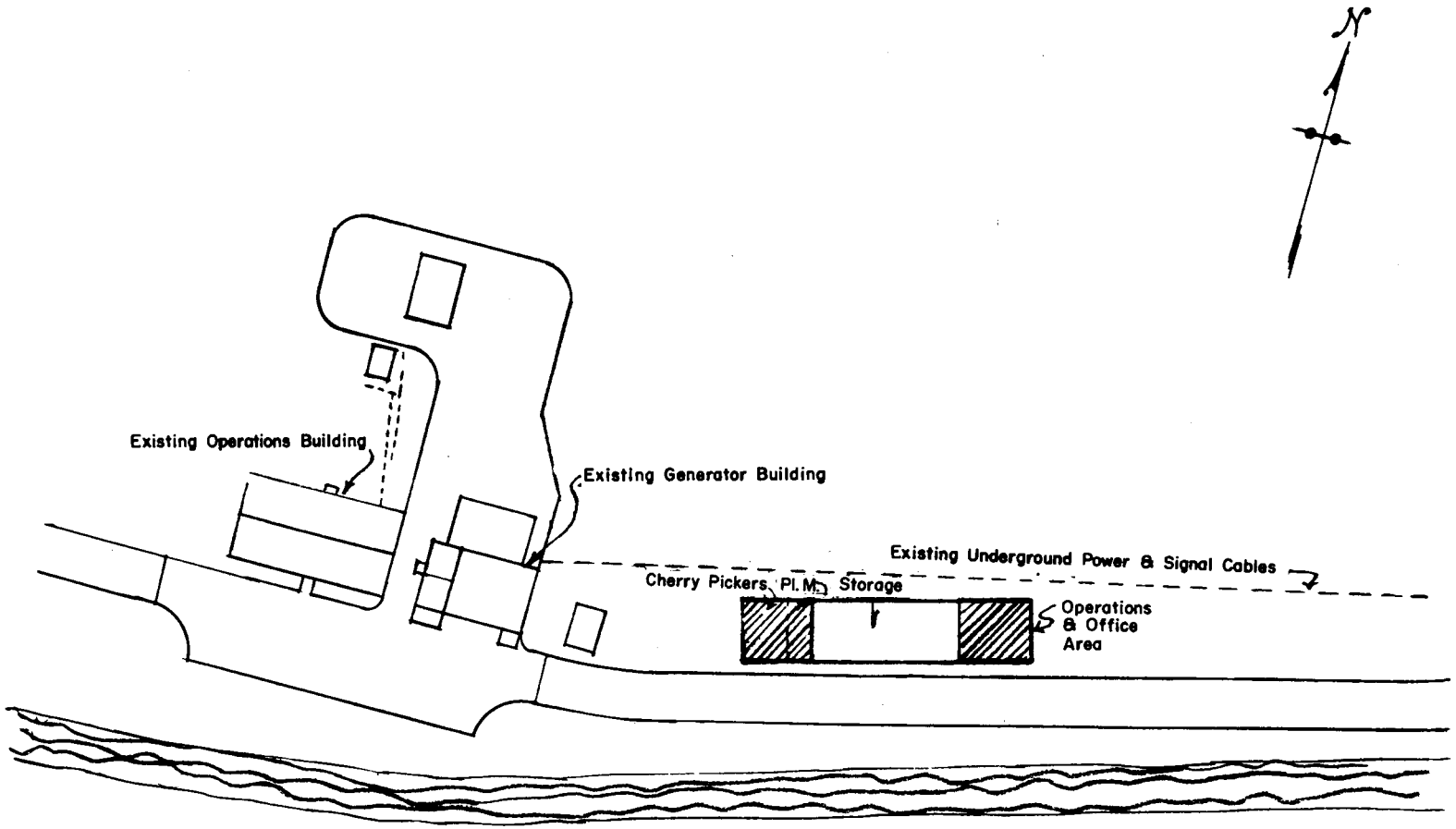
PLAN
Scale: 1" = 30'-0"

VARIOUS LOCATIONS

FISCAL YEAR 1966 ESTIMATES

STADAN FACILITY, FAIRBANKS, ALASKA

ADDITION TO STORAGE BUILDING



SITE PLAN
(No Scale)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 [illegible]

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Apollo Network Ground Station

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Various Locations

LOCATION OF PROJECT: Antigua, W.I.

COGNIZANT NASA INSTALLATION: Goddard Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ 162,000
FY 1965 (Estimate)	---
FY 1966 (Estimate)	2,700,000
Total Funding Thru FY 1966	$2,862,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Apollo Network Ground Station

SUPPORTING DATA:

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	ACRE	40	$5,000	200,000
Construction				2,500,000
Instrumentation & Operations Bldg.	SF	12,000	60.00	720,000
Generator Building	SF	4,000	40.00	160,000
Collimation Tower Enclosure	LS	---	20,000	20,000
Generators, Switchgear and Transformers	LS	---	540,000	540,000
Utilities	LS	---	200,000	200,000
Fencing	LS	---	25,000	25,000
Roads, Parking, Grading and Landscaping	LS	---	100,000	100,000
Hydro-Mechanical Services	LS	---	40,000	40,000
Antenna & Collimation Tower Foundations	LS	---	65,000	65,000
Collimation Tower Site Grading and Access Roads	LS	---	100,000	100,000
Intra-Site Cable	LS	---	110,000	110,000
Underground Power & Signal Cables & Elec. Distribution	LS	---	120,000	120,000
Communications	LS	---	300,000	300,000

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Apollo Network Ground Station

SUPPORTING DATA:

PROJECT COST ESTIMATE (Cont'd)

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment	---	---	---	---
Design	---	---	---	---
Fallout Shelter	---	---	---	---
			TOTAL	$2,700,000

PROJECT DESCRIPTION:

In support of the Apollo Project, facilities for the installation of a Unified S-Band System are required at Antigua, W.I. This system will be used to provide tracking, communication and the transmission of voice and data to and from the spacecraft during the orbital and lunar phases of the Apollo Missions. The Unified S-Band System, Antenna and associated equipment for installation at the Antigua, W.I. site are being procured under prior year funding due to development and fabrication lead time involved.

The design and construction of the Operations Building (12,000 sq. ft.), Generator Building (4,000 sq. ft.) including generators, switchgear and transformers are required. In support of these structures will be site improvements including roads and grading, utility systems, and antenna and collimation tower foundations. The facility will be designed and constructed to conform to architectural practice of the locale. Included in this project are funds for the acquisition of approximately 40 acres of land.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Apollo Network Ground Station

SUPPORTING DATA:

PROJECT JUSTIFICATION:

The Manned Space Flight Network flight program is advancing into the Apollo phase with its series of progressively more complex orbital, cislunar and lunar space flights. The tracking, command, data acquisition and communications operations have increased in complexity and requires additional and more complex ground support facilities. Continuous coverage is imperative during the launch and insertion phases into orbit (regardless of mission duration) and the orbital checkout prior to the injection phase of an Apollo mission. In order to provide ground support to the Apollo Missions at the time of S-IVB cutoff for orbital and lunar missions, in the launch azimuths of 90 to 108 degrees, this station at Antigua, W.I. is considered mandatory. This project will provide the facilities for the installation of tracking, telemetry reception, updata transmission and air-to-ground voice communications required by Apollo missions. During the orbital phase the Antigua Station will provide the extension of coverage to the Continental United States stations on orbits passing over the site. It is proposed to install a Unified S-Band System, (a prime requisite for the Apollo Program) which is the only System in the network capable of providing tracking data and communications with spacecraft during lunar missions, at this facility. The proposed facility, located in this geographic location will serve as one link in a worldwide Unified S-Band Network and will provide NASA with the capability to satisfy the requirements of the Manned Space Flight Program.

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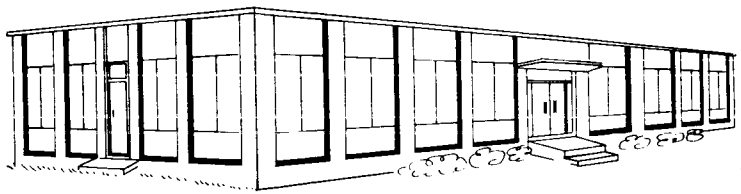
VARIOUS LOCATIONS

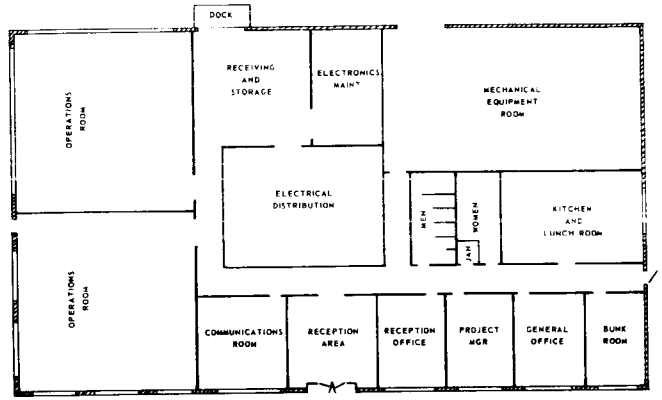
FISCAL YEAR 1966 ESTIMATES

APOLLO NETWORK GROUND STATION – ANTIGUA, W.I.

INSTRUMENTATION AND OPERATIONS BUILDING

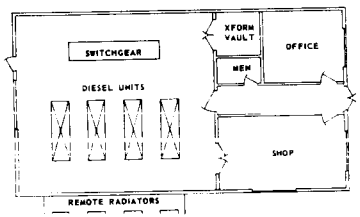


PERSPECTIVE

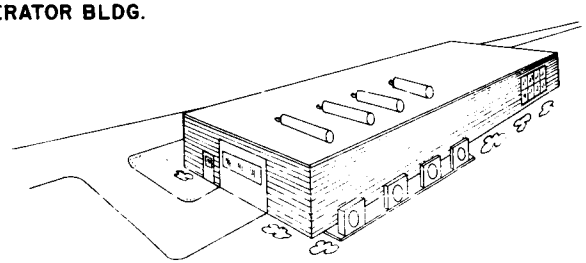


PLAN

DIESEL-GENERATOR BLDG.



PLAN



PERSPECTIVE

SCALE 0 10 50 FEET

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Community Support

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Various Locations

LOCATION OF PROJECT: Antigua, W. I.

COGNIZANT NASA INSTALLATION: Goddard Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ ---
FY 1965 (Estimate)	210,000
FY 1966 (Estimate)	3,090,000
Total Funding through FY 1966	$3,300,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Community Support

SUPPORTING DATA:

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$3,090,000
Three (3) Personnel Buildings (Officer Type Quarters)	LS	---	$533,300	1,600,000
One (1) Personnel Building (Quonset Type Building)	LS	---	200,000	200,000
Modifications to Existing Mess Facility	LS	---	170,000	170,000
Dry and Cold Storage Addition (Mess Hall)	LS	---	100,000	100,000
Laundry Building Addition	LS	---	200,000	200,000
Power Building Addition Including Diesel Generator	LS	---	240,000	240,000
Diesel Storage Tank (150,000 gallon) including sitework, fencing, piping	LS	---	100,000	100,000
Water Storage Tanks, Pumping Stations and Associated Piping	LS	---	60,000	60,000
Sanitary and Storm Sewers	LS	---	50,000	50,000
General Storage Building	LS	---	120,000	120,000
Vehicle Maintenance Building Modifications	LS	---	50,000	50,000
Dispensary Addition	LS	---	50,000	50,000
Recreation Facilities Addition	LS	---	150,000	150,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Community Support

SUPPORTING DATA:

PROJECT COST ESTIMATE: (Continued)

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment	---	---	---	---
Design				-0-
For Construction	LS	---	---	-0-
Fallout Shelter	---	---	---	---
		TOTAL		$3,090,000

PROJECT DESCRIPTION:

This project proposes the construction of facilities to house the personnel of the Apollo Network Ground Station Unified S-Band Facility which is to be located near the United States Air Force auxiliary air station (Coolidge Airfield) on the Island of Antigua, W. I. The construction consists of the following: Three (3) officer-type Barracks Buildings, one (1) Quonset Hut Building, each having the capacity of housing twenty-eight personnel; a General Storage Building; additional Mess facilities including a dry and cold storage area; additional laundry facilities; a Power Building addition including a 500 KW diesel generator and a diesel oil storage tank, site-work, fencing and piping; Water Storage tanks with pumping stations and associated piping; Sanitary and Storm sewers; Vehicle Maintenance Building Modifications; Dispensary addition; and additional recreational facilities. The proposed facilities are planned to be constructed within property boundaries presently leased to the United States Air Force. The facility will be designed and constructed in accordance with the architectural practices of the locale.

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Community Support

SUPPORTING DATA:

PROJECT JUSTIFICATION:

The Island of Antigua, W. I., located in a desired geographical area for the construction of a facility for the installation of a Unified S-Band System to fulfill the requirements of the NASA world-wide Unified S-Band Network, is remote from any large land area embracing a major population center and does not itself contain a major population center where housing and support facilities would be available. Therefore it is necessary that the proposed buildings be constructed on the Island of Antigua, W. I. to ensure that adequate facilities are available to house personnel. The existing facilities located on the leased United States Air Force Coolidge Airbase are completely inadequate to support additional personnel. It is expected that the proposed facilities will support an estimated 60-70 permanent and 15-20 temporary duty personnel who are required for the operation of this Manned Space Flight Station during the normal tracking and data operations and during the pre-launch, initial, and post-launch stages of any particular mission which is to be flown requiring the Unified S-Band System of this station.

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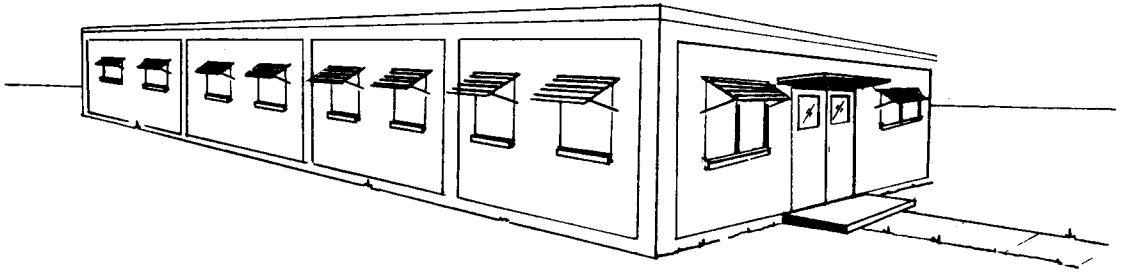
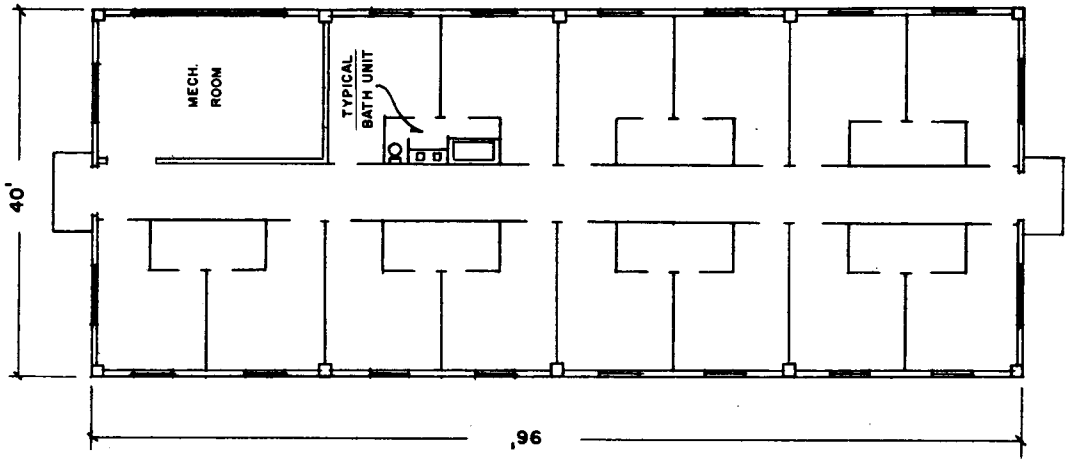
VARIOUS LOCATIONS
FISCAL YEAR 1966 ESTIMATES

COMMUNITY SUPPORT, ANTIGUA, W. I.

PERSONNEL QUARTERS



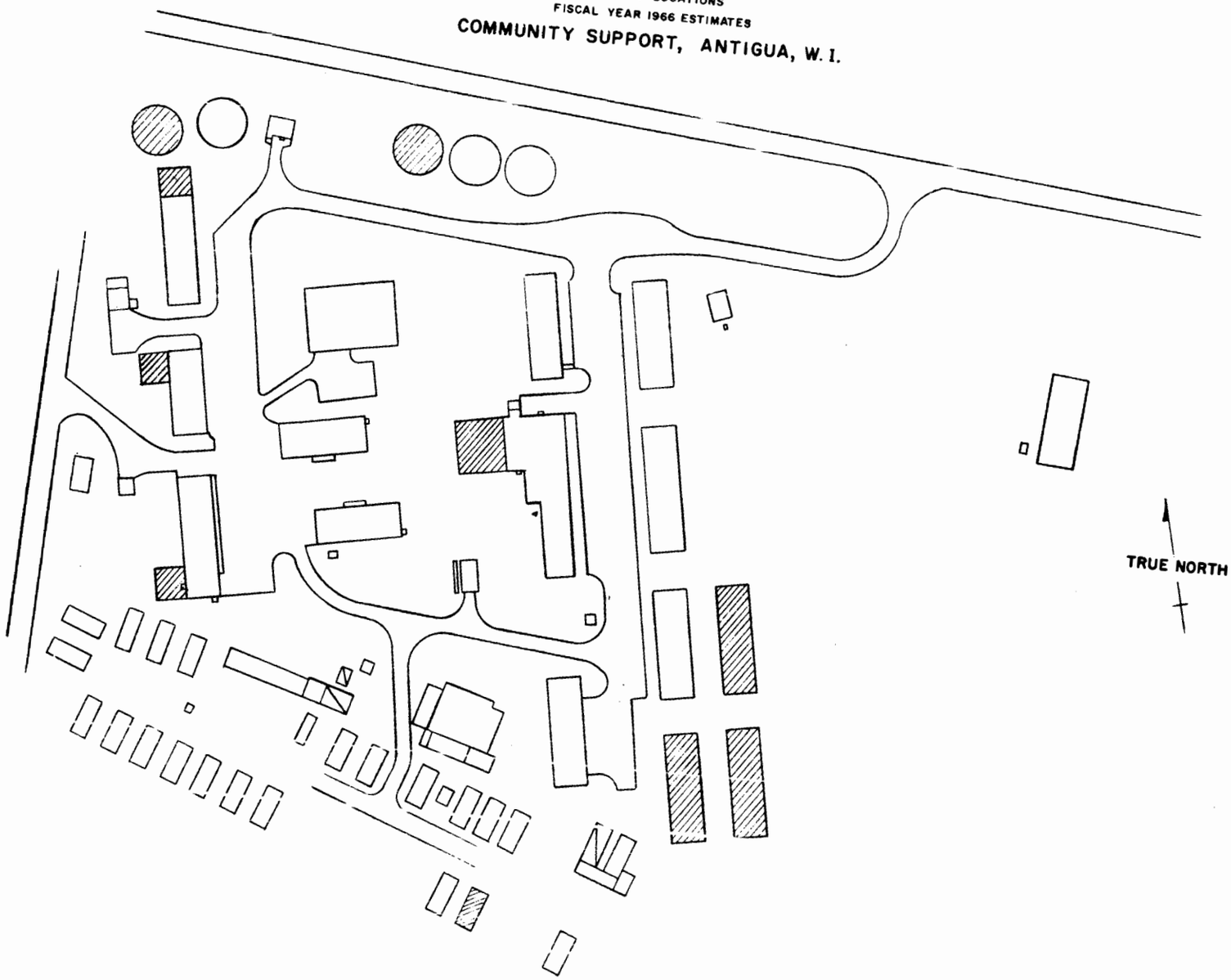
PERSPECTIVE



PLAN

VARIOUS LOCATIONS
FISCAL YEAR 1966 ESTIMATES

COMMUNITY SUPPORT, ANTIGUA, W. I.



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 1966

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Community Support

SUPPORTING DATA:

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

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

AUTHORIZATION LINE ITEM: Various Locations

LOCATION OF PROJECT: Ascension Island

COGNIZANT NASA INSTALLATION: Goddard Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1964 and Prior Years	$ ---	---
FY 1965 (Estimate)	---	1,938,000
FY 1966 (Estimate)		1,300,000
Total Funding through FY 1966		$3,238,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Community Support

SUPPORTING DATA:

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,300,000
One (1) Personnel Building (Officer Type Quarters)	LS	---	$600,000	600,000
Two (2) Personnel Buildings (Quonset Type Building)	LS	---	200,000	200,000
Expansion Existing Mess Facility	LS	---	150,000	150,000
Power Building Addition Including Diesel Generator	LS	---	240,000	240,000
Water Storage Tanks, Pumping Stations and Associated Piping	LS	---	60,000	60,000
Dispensary Addition	LS	---	50,000	50,000
Equipment	---	---	---	---
Design				---
For Construction	---	---	---	---
Fallout Shelter	---	---	---	---
			TOTAL	$1,300,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

JUSTIFICATION DATA

BUDGET ESTIMATES

FY 19 66

NAME OF INSTALLATION	APPROPRIATION	PROGRAM OR PROJECT
Goddard Space Flight Center	Construction of Facilities	Community Support

SUPPORTING DATA:

PROJECT DESCRIPTION:

This project proposes the construction of facilities to house the personnel of the integrated Apollo Network and Deep Space Network Facility which is to be located near the United States Air Force air station (Wideawake Airfield) on Ascension Island. The construction consists of the following: one (1) officer-type Barracks Building, two (2) Quonset Hut Building for indigenous housing; additional Mess facilities; a Power Building addition including a 500 KW diesel generator; Water Storage tanks with pumping stations and associated piping; and a Dispensary addition. The facility will be designed and constructed in accordance with the architectural practices of the locale.

PROJECT JUSTIFICATION:

The Ascension Island, located in a desired geographical area for the construction of a facility for the installation of a Unified S-Band System to fulfill the requirements of the NASA world-wide Unified S-Band Network, is remote from any large land area embracing a major population center and does not itself contain a major population center where housing and support facilities would be available. Therefore it is necessary that the proposed buildings be constructed on the Ascension Island to ensure that adequate facilities are available to house personnel. The existing facilities located on the United States Air Force Base are completely inadequate to support additional personnel. It is expected that the proposed facilities will support an estimated 95 permanent and 15-20 temporary duty personnel who are required for the operation of the Manned Space Flight and Deep Space equipment during the normal tracking and data operations and during the pre-launch, initial, and post-launch stages of any particular mission which is to be flown requiring the integrated Unified S-Band System at this station.

NASA FORM 944 (REV. JUL 64) PREVIOUS EDITIONS ARE OBSOLETE.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
All	Office of the Associate Administrator	---	---	---

INSTALLATION MISSION

See justification.

PERSONNEL STRENGTH	FY 19	FY 19	FY 19
NASA PERSONNEL *(End of Year)*			
CONTRACTOR & OTHER PERSONNEL			
TOTAL ALL PERSONNEL	Not Applicable		

INVENTORY		
ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*		
LAND *(Lease or Permit)*		
PLANT VALUE *(as of June 30, 19)*		
TOTAL		

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1964	FY 1965 *(Estimated)*	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Facility Planning and Design	---	10,572	10,000	10,000	Not Applicable	Not Applicable
TOTAL FOR PROJECTS IN FY 1966	ESTIMATE			10,000		

NASA FORM 1029 DEC 63

GPO 888-887

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

FACILITY PLANNING AND DESIGN

PROGRAM OFFICE: Office of the Associate Administrator (NASA General)

AUTHORIZATION LINE ITEM: Facility Planning and Design

FUNDING:

FY 1964	$10,571,600
FY 1965 Estimate	10,000,000
FY 1966 Estimate	10,000,000

DESCRIPTION:

The funds requested under this item are required for advanced facility planning and design on projects for which construction funds may be requested in subsequent budgets.

JUSTIFICATION:

Long-range plans in several program areas must anticipate the need for the construction of facilities beyond the budget year for which estimates are being submitted. A considerable saving in time and an increase in the accuracy of construction cost estimates is possible with the availability of a facility planning and design fund which can be used to initiate the design of high-priority facilities prior to the enactment of project authorization and the appropriation of funds.

With these funds, NASA will continue as an on-going and continuing activity the general activity of facility planning and design of future construction projects which have not as yet been authorized or for which appropriations have not been made. NASA will also continue to make special project studies, feasibility studies, and other studies necessary to develop and improve overall criteria and standards for the design and construction of facilities.

FP&D FUND USAGE BY FISCAL YEAR
(ESTIMATED)

Fiscal Year	($ in Millions)	Total Program Level ($ in Millions)
FY 1964 Cof Program Year		
PER FY 1966 CoF Program (1)	2.051	200.000
Design Completion FY 1965 Program (1)	8.521	252.000
	10.572	
FY 1965 CoF Program Year		
PER FY 1966 CoF Program (1)	.947	200.000
PER FY 1967 CoF Program	2.403	150.000
Design Completion FY 1966 Program	6.650	132.883
	10.000	
FY 1966 CoF Program		
PER FY 1968 CoF Program	2.250	150.000
Design Completion FY 1967 Program	4.500	100.000
	6.750	
Special Studies (Eg. ETS 2 + 3)	3.250	
	10.000	

(1) Actual