National Aeronautics and Space Administration

BUDGET ESTIMATES

FISCAL YEAR 1966

Volume V

MANNED SPACE FLIGHT PROGRAMS

RESEARCH AND DEVELOPMENT
CONSTRUCTION OF FACILITIES
ADMINISTRATIVE OPERATIONS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

MANNED SPACE FLIGHT PROGRAMS

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RESEARCH AND DEVELOPMENT

GENERAL STATEMENT

The program of research and development and supporting activities of the National Aeronautics and Space Administration is directed toward maintaining the United States in a position of world leadership in aeronautics and space. The major program elements designed to achieve this objective are:

MANNED SPACE FLIGHT: Extended duration and rendezvous flights in earth orbit, and lunar landing and return.

SPACE SCIENCE AND APPLICATIONS: A broad program of scientific study of the Earth, Moon, Sun, planets, stars and interplanetary space, and the development of technology pertinent to applied uses such as meteorological and communication satellites.

ADVANCED RESEARCH AND TECHNOLOGY: An effort required to provide the technological base for the future aeronautics and space programs.

TRACKING AND DATA ACQUISITION: A function pertinent to the support of the extensive NASA space flight program.

MANNED SPACE FLIGHT

A major part of the amount requested for FY 1966 will be applied to the manned space flight program. The broad objectives of this program which remain unchanged are: to increase and broaden our capability to support men in space and provide them with a space operation's capability for scientific and technological purposes. Toward this end there are projects Gemini and Apollo, as well as studies and supporting development needed for advanced manned flight missions. Gemini will furnish information on the operation of two men in space for periods of up to two weeks; and will provide for the development of space navigation, guidance, rendezvous and docking techniques. The objectives of Apollo are developing hardware, operational, and support systems to provide a broad national capability for a program of space exploration. This program has as a specific goal, in this decade, of achieving manned flight to the moon, lunar landing, limited lunar exploration and the safe return of the men to Earth. The advanced flight mission activity provides information and supporting developments pertinent to the extension of the current manned flight programs.

In FY 1966 the Gemini program will move into its long duration manned flight phase and the initial rendezvous flight will be undertaken. This activity will be of direct significance to Apollo. The Apollo program will be involved in extensive ground test activity in preparation for the first flight tests of the command and service modules with the Saturn IB launch

vehicle, which will take place in FY 1966, and in preparations for later flight tests of the Saturn V launch vehicle. In the area of advanced flight missions particular attention will be given to design studies and advanced component development to extend the usefulness of the Apollo spacecraft.

SPACE SCIENCE AND APPLICATIONS

A significant part of the budget requested for FY 1966 will support the space science and applications program. The objectives of the science part of the program are scientific studies of the Earth, space about the Earth, the Moon, the planets and interplanetary space. This program encompasses the following types of flight projects: Geophysical satellites, earth orbiting solar and astronomical observatories, soft landing lunar probes, lunar orbiting satellites, probes to the planet Mars and probes into interplanetary space. The biosatellite program, directed toward the study of the effects of space environment on biological systems, will be continued. In the area of applications, projects TIROS and Nimbus continue to reflect NASA support for the on-going operational weather satellite development for the Weather Bureau; in addition, the program provides for the technology required for future operational systems. Effort will also continue in the development of the Applications Technology Satellite, which will provide information required for the design and development of future communications, meteorological and scientific satellite systems.

ADVANCED RESEARCH AND TECHNOLOGY

The advanced research and technology effort constitutes a continuing overall program to support the current aeronautics and space programs and to assure the scientific and engineering bases for undertaking future programs. The major portion of this work, which looks beyond the present programs, is to develop new knowledge and technological advancements applicable to missions of the future. This program includes effort in the fields of spacecraft and launch vehicle technology, human factors, electronics, chemical and nuclear propulsion, space power systems and aeronautics including supersonic transport research.

TRACKING AND DATA ACQUISITION

A world-wide network of tracking and data acquisition stations is essential to support the broad space flight program of the agency. The tracking and data acquisition effort during FY 1966, as in prior years, will be directed to support the planned flight programs and provide, where necessary, increased tracking and data acquisition capability. Particular attention will be given to the support of the Apollo manned space flight program and to the large observatory class of unmanned satellites in the space science program.

TECHNOLOGY UTILIZATION

The technology utilization program provides for the identification, evaluation and dissemination to the industrial community, technical information gained from the various programs for which there are potential industrial and commercial applications. Included in the program are efforts to develop better methods for management of large-scale research and development programs, to improve our understanding of matters related to the growth of science and technology programs, and to the transfer of technological advances and innovations developed in the NASA program to industry at large.

FINANCING

The FY 1966 budget to support the research and development program, discussed in detail in this volume, is $4,575,900,000. This compares to a program totaling $4,268,632,000 for FY 1965.

The program amounts shown for FY 1964 and FY 1965 in this budget reflect two significant adjustments in comparison to the amounts appropriated for these two fiscal years. These are: 1 - Certain support services (principally housekeeping) are now included in the budget for the "Administrative Operations" appropriation; and 2 - Of the FY 1965 appropriation, $72,494,000 has been applied to the FY 1964 Apollo program.

Expenditures for the current fiscal year are estimated at $3,782,000,000 and $4,120,000,000 for FY 1966.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

GENERAL STATEMENT

This appropriation provides for the design, construction, purchase of equipment, modernization of facilities, and for advanced design of facilities planned for future authorization. The major program elements may be summarized as follows:

MANNED SPACE FLIGHT: These projects will support the Apollo spacecraft and Saturn launch vehicle development and test efforts. Specific items included will provide for needed astronaut training facilities, engineering work areas and augmentation of support facilities.

SCIENTIFIC INVESTIGATIONS IN SPACE: Projects in this category will support activities in space science. They will provide for needed improvements in the testing of spacecraft and experiments carried as spacecraft payloads for the unmanned lunar and planetary exploration program, for improvements in other facilities for unmanned spacecraft missions and for necessary improvements to launch area facilities for the medium class and small launch vehicles.

ADVANCED RESEARCH AND TECHNOLOGY: These estimates cover projects including laboratory and supporting facilities for the Electronics Research Center as well as research facilities for other Installations.

AIRCRAFT TECHNOLOGY AND SUPPORTING OPERATIONS: Estimates for these projects include facilities to support the advanced aircraft programs and facilities for tracking and data acquisition.

The appropriation for FY 1965 was $262,880,500. The same amount was authorized for 1965. $74,700,000 is requested for FY 1966; a decrease of $188,180,500 from the 1965 appropriation. Total expenditures for construction of facilities are estimated to be $406,000,000 in FY 1966, a decrease of $118,000,000 from the $524,000,000 estimated for FY 1965.

The budget request contains $78,000 to provide fall-out shelters for selected new facilities. The amount has been determined in consultation with the Department of Defense based on DOD policy and criteria.

The format for reflecting fall-out shelters in each of the projects in the budget request varies. The reason is to distinguish among those facilities in which provision for fall-out protection is either inherent in the structure, provision is required, or, because of prohibitive costs and

hazardous areas provision for fall-out protection would not be desirable.

This volume contains material in support of the requested authorization and appropriation for FY 1966.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ADMINISTRATIVE OPERATIONS

GENERAL STATEMENT

The Administrative Operations appropriation provides for personnel, travel, and other supporting expenses of NASA installations including Headquarters engaged in the conduct of Research and Development programs. These installations are institutionally administered by the Associate Administrator who has prime responsibility for the R&D programs conducted at each installation. The Associate Administrator for Manned Space Flight is responsible for the Kennedy Space Center, Manned Spacecraft Center, and the Marshall Space Flight Center. Goddard Space Flight Center, the Pacific Launch Operations Office, and Wallops Station are under the institutional cognizance of the Associate Administrator for Space Science and Applications. The Associate Administrator for Advanced Research and Technology is institutionally responsible for the Ames Research Center, the Electronics Research Center, the Flight Research Center, Langley Research Center, the Lewis Research Center, and the Space Nuclear Propulsion Office. Headquarters reports directly to the Associate Administrator, and the Western Operations Office reports to the Deputy Associate Administrator for Industry Affairs. Installation descriptions and funding requirements are grouped in this volume in accordance with the prime missions of the installations.

Manpower

With the exception of an increase of 300 positions for the Electronics Research Center, there is no planned increase in manpower at other NASA installations during FY 1966. The following tabulations indicate the distribution of NASA personnel by program and the numbers of personnel by center:

Personnel Distribution

	1964	1965	1966
Direct Personnel by Program			
Manned Space Flight			
Gemini	1,141	1,402	1,385
Apollo	8,266	8,835	8,857
Advanced missions	343	343	343
	9,750	10,580	10,585
Space Science and Applications			
Physics and astronomy	1,234	1,292	1,297
Lunar and planetary exploration	296	388	382
Sustaining university program	68	73	73

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	1964	1965	1966
Space Science and Applications (cont'd)			
Launch vehicle development.....	340	317	314
Launch vehicle procurement.....	324	346	334
Bioscience.....	240	236	239
Meteorological satellites.....	297	312	306
Communication satellites.....	127	76	65
Applications technology satellites...	56	103	113
	2,982	3,143	3,123
Advanced Research and Technology			
Basic research.....	1,268	1,259	1,266
Space vehicle systems	1,389	1,366	1,324
Electronics systems.....	906	1,040	1,325
Human factor systems.....	214	211	219
Nuclear-electric systems.....	529	490	489
Nuclear rockets.....	530	524	524
Chemical propulsion.....	425	409	309
Solar and chemical power.....	275	318	319
Aeronautics.....	1,394	1,467	1,600
	6,930	7,084	7,375
Tracking and Data Acquisition	851	802	800
Technology Utilization.....	50	50	50
Sub-total, direct positions.....	20,563	21,659	21,933
Support Personnel			
Director and staff.....	472	537	540
Administration.....	4,411	4,432	4,439
Research and development support.....	5,499	5,521	5,533
NASA-wide support.....	1,039	1,051	1,055
Sub-total, support positions.....	11,421	11,541	11,567
Total, permanent positions.....	31,984	33,200	33,500
Sub-total, other positions.....	515	600	600
Total, all positions.....	32,499	33,800	34,100

Personnel Requirements

	1964	1965	1966
Manned Space Flight			
Kennedy Space Center.....	1,592	2,045	2,045
Manned Spacecraft Center.....	4,171	4,686	4,686
Marshall Space Flight Center....	7,502	7,489	7,489
	13,265	14,220	14,220
Space Science and Applications			
Goddard Space Flight Center.....	3,610	3,677	3,677
Pacific Launch Operations Office	22	19	19
Wallops Station.....	516	518	518
	4,148	4,214	4,214
Advanced Research and Technology			
Ames Research Center.....	2,201	2,185	2,185
Electronics Research Center.....	25	250	550
Flight Research Center.....	605	605	605
Langley Research Center.....	4,279	4,238	4,238
Lewis Research Center.....	4,851	4,815	4,815
Space Nuclear Propulsion Office.	112	116	116
	12,073	12,209	12,509
Supporting Activities			
Headquarters, NASA.....	2,091	2,156	2,156
North Eastern Operations Office.	32	- 0 -	- 0 -
Western Operations Office.....	375	401	401
	2,498	2,557	2,557
Permanent positions.....	31,984	33,200	33,500
Positions, other than permanent.....	515	600	600
TOTAL.....	32,499	33,800	34,100

Funding

The FY 1966 funding request for Administrative Operations is $36.3 million less than the FY 1965 estimate. This decrease is primarily due to the initial procurement of major automatic data processing equipment in FY 1965, where the procurement of such equipment was more economical than continued rental. The estimate in FY 1966 for the procurement of additional equipment is sharply reduced from FY 1965. The object classification description of resources requested is tabulated below:

ANALYSIS OF RESOURCES REQUIREMENTS BY OBJECT CLASSIFICATION

(Thousands of Dollars)

		1964	1965	1966
11.	Personnel compensation.....	288,081	336,696	345,207
12.	Personnel benefits.....	20,241	23,490	24,193
21.	Travel and transportation of persons	18,536	21,000	21,000
22.	Transportation of things.....	5,400	5,675	5,049
23.	Rents, communications and utilities.	47,230	53,191	49,556
24.	Printing and reproduction.....	4,387	4,683	4,869
25.	Other services.....	70,952	93,037	108,023
26.	Supplies and materials.....	24,203	22,968	23,140
31.	Equipment.....	22,236	79,152	23,109
32.	Lands and structures.....	10,339	5,811	5,235
40.	Insurance claims and indemnities...	5	18	19
Total.....		511,610	645,721	609,400

Of the $645.7 million shown for FY 1965, $22.5 million is included as the comparative cost of items formerly provided from the Research and Development appropriation and which are being budgeted as part of the Administrative Operations request for the first time in FY 1966. In FY 1966, $24.8 million is requested for these items which are: housekeeping support of the Merritt Island Launch Area at the Kennedy Space Center, NASA, and at the White Sands Missile Range; the cost at the Jet Propulsion Laboratory of the lease of administrative aircraft and certain contract administration costs.

Personnel Compensation and Benefits

The cost of providing for personnel compensation and benefits is estimated to be $9.2 million more in FY 1966 than in FY 1965. This increased cost is directly related to the increase of 704 manyears of employment in FY 1966 over FY 1965. Of this increase, 544 manyears are due to the cost of the full year for the 1,300 increase in NASA's strength in FY 1965. The

balance, or 160 manyears, is the manyears derived from the 300 additional positions planned for the Electronics Research Center in FY 1966.

Other Costs

The FY 1966 request for travel and other supporting expenses shows a net reduction of $45.5 million from the FY 1965 estimate. This net reduction includes a decrease of approximately $56 million in the procurement of ADP equipment, which is only partially offset by increases in utilities, other services, and supplies and materials. In general, these increases are the result of additional facilities being completed and becoming operational, a higher level of average employment, and the partial restoration in FY 1966 of items which were deferred in FY 1965 when NASA absorbed the cost of the "Government Employees Salary Reform Act of 1964", approved in August 1964 (PL 88-426). The specific increases as they relate to each installation are explained in the installation presentations contained in this volume.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

SUMMARY OF RESEARCH AND DEVELOPMENT BUDGET PLAN
AS RECONCILED TO FINANCING SCHEDULE

	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966
Budget Activity:			
1. Manned Space Flight:			
(a) Gemini.....	$418,900,000	$308,400,000	$242,100,000
(b) Apollo.....	2,272,952,000	2,606,778,000	2,997,385,000
(c) Advanced mission studies.....	21,200,000	26,000,000	10,000,000
2. Scientific Investigations in Space:			
(a) Physics and astronomy.....	189,118,000	182,546,000	224,300,000
(b) Lunar and planetary exploration.....	267,445,000	281,803,000	294,515,000
(c) Bioscience.....	21,479,000	37,700,000	40,600,000
(d) Launch vehicle development.....	125,100,000	107,900,000	97,500,000
3. Space Applications.....	100,451,000	73,165,000	94,600,000
4. Space Technology.....	298,692,000	283,600,000	235,500,000
5. Aircraft Technology.....	21,795,000	35,240,000	42,200,000
6. Supporting Activities:			
(a) Tracking and data acquisition.....	194,347,000	274,750,000	246,200,000
(b) Sustaining university program.....	40,000,000	46,000,000	46,000,000
(c) Technology utilization.....	3,500,000	4,750,000	5,000,000
Total Budget Plan.....	$3,974,979,000	$4,268,632,000	$4,575,900,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

SUMMARY OF RESEARCH AND DEVELOPMENT BUDGET PLAN
AS RECONCILED TO FINANCING SCHEDULE

	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966
Financing:			
Appropriation.....	$3,926,000,000	$4,363,594,000	$4,575,900,000
Transferred to-			
"Construction of facilities" (77 Stat. 439).....	-20,046,300	---	---
"Administrative Operations" (77 Stat. 439).....	-15,685,000	---	---
Appropriation (adjusted).....	3,890,268,700	4,363,594,000	4,575,900,000
Transferred to "Construction of facilities" in FY 1965	-1,411,000	---	---
Prior year funding applied - available from adjustments to FY 1963 budget plan....	2,785,300	---	---
Transfers from prior years "Construction of facilities" funds.....	17,293,000	---	---
Reprograming to prior year budget plan.....	72,494,000	-72,494,000	---
Comparative transfer to "Administrative Operations"	-6,451,000	-22,468,000	---
Total financing of budget plan.....	$3,974,979,000	$4,268,632,000	$4,575,900,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

RESEARCH AND DEVELOPMENT

BUDGET PLAN BY PROGRAM BY COGNIZANT OFFICE

BUDGET ACTIVITY		FY 1964	FY 1965	FY 1966
	MANNED SPACE FLIGHT.....	$2,713,052,000	$2,941,178,000	$3,249,485,000
1a	Gemini.....	418,900,000	308,400,000	242,100,000
1b	Apollo.....	2,272,952,000	2,606,778,000	2,997,385,000
1c	Advanced mission studies.....	21,200,000	26,000,000	10,000,000
	SPACE SCIENCE AND APPLICATIONS.....	$746,879,000	$731,486,000	$797,515,000
2a	Physics and astronomy.	148,623,000	136,814,000	172,100,000
2b	Lunar and planetary exploration.....	205,762,000	206,150,000	215,615,000
6b	Sustaining university program.....	40,000,000	46,000,000	46,000,000
2d	Launch vehicle development.....	111,900,000	96,500,000	63,600,000
*	Launch vehicle procurement.....	129,986,000	154,672,000	194,500,000
2c	Bioscience.....	21,479,000	28,700,000	31,500,000
3	Meteorological satellites.....	63,177,000	31,200,000	42,700,000
3	Communications satellites.....	8,413,000	8,055,000	2,800,000
3	Applications technology satellites.....	17,539,000	23,395,000	23,700,000
	ADVANCED RESEARCH AND TECHNOLOGY.....	$317,201,000	$316,468,000	$277,700,000
4	Basic research.....	22,653,000	21,231,000	22,000,000
4	Space vehicle systems.	45,714,000	44,495,000	35,000,000
4	Electronic systems....	28,700,000	25,422,000	34,400,000
4	Human factor systems..	13,200,000	13,320,000	14,900,000
4	Nuclear-electric systems.....	45,963,000	42,492,000	27,000,000
4	Nuclear-rockets.....	79,176,000	56,731,000	53,000,000
4	Chemical propulsion...	46,000,000	63,792,000	30,000,000

BUDGET ACTIVITY	FY 1964	FY 1965	FY 1966
ADVANCED RESEARCH AND TECHNOLOGY (Cont'd)..			
4 Solar and chemical power.....	$14,000,000	$13,745,000	$14,200,000
5 Aeronautics.....	21,795,000	35,240,000	42,200,000
6a TRACKING AND DATA ACQUISITION.....	$194,347,000	$274,750,000	$246,200,000
6c TECHNOLOGY UTILIZATION.	$3,500,000	$4,750,000	$5,000,000
TOTAL PLAN	$3,974,979,000	$4,268,632,000	$4,575,900,000

* Funds for the procurement of launch vehicles are statistically distributed to unmanned flight programs (e.g. Physics and Astronomy, Space Vehicle Systems).

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

DISTRIBUTION OF RESEARCH AND DEVELOPMENT BUDGET PLAN BY INSTALLATION AND FISCAL YEAR

(In thousands of dollars)

PROGRAM OFFICE	TOTAL	J. F. KENNEDY SPACE CENTER, NASA	MANNED SPACECRAFT CENTER	MARSHALL SPACE FLIGHT CENTER	GODDARD SPACE FLIGHT CENTER	PACIFIC LAUNCH OPERATIONS OFFICE	WALLOPS STATION	AMES RESEARCH CENTER	ELECTRONICS RESEARCH CENTER	FLIGHT RESEARCH CENTER	LANGLEY RESEARCH CENTER	LEWIS RESEARCH CENTER	SPACE NUCLEAR PROPULSION OFFICE	HEADQUARTERS	WESTERN OPERATIONS OFFICE
Office of Manned Space Flight															
1964	2,713,052	49,881	1,356,036	1,266,424	206	-	-	75	-	-	2,017	2,975	-	35,091	347
1965	2,941,178	48,622	1,397,050	1,437,356	275	-	-	75	-	-	2,900	600	-	54,100	200
1966	3,249,485	69,345	1,465,040	1,656,600	500	-	-	200	-	-	3,700	300	-	53,550	250
Office of Space Science and Applications															
1964	746,879	1,819	3,256	780	235,148	-	-	25,843	-	44	35,168	197,522	-	87,202	160,097
1965	731,486	4,808	7,254	675	183,408	90	1,390	35,085	-	85	59,806	197,323	-	108,994	132,568
1966	797,515	4,225	17,800	13,440	227,712	-	4,500	28,305	-	100	51,860	196,730	-	105,375	147,468
Office of Advanced Research and Technology															
1964	317,201	-	3,702	31,821	8,252	-	-	14,404	-	8,447	38,741	99,759	60,355	25,026	26,694
1965	316,468	-	1,750	28,511	8,127	-	-	17,724	1,873	9,190	32,548	115,825	44,995	34,322	21,603
1966	277,700	-	3,235	18,035	9,300	-	-	16,945	5,200	16,530	42,776	61,595	48,900	33,638	21,546
Office of Tracking and Data Acquisition															
1964	194,347	-	-	2,900	132,817	-	5,100	-	-	1,800	2,450	-	-	7,210	42,070
1965	274,750	-	-	2,000	195,201	-	5,450	-	-	2,200	2,200	-	-	7,900	59,799
1966	246,200	-	-	1,500	173,400	-	5,900	-	-	2,000	2,500	-	-	7,900	53,000
Office of Technology Utilization and Policy Planning															
1964	3,500	-	-	-	-	-	-	-	-	-	-	-	-	3,500	-
1965	4,750	-	-	-	-	-	-	-	-	-	-	-	-	4,750	-
1966	5,000	-	-	-	-	-	-	-	-	-	-	-	-	5,000	-
Total Budget Plan															
1964	3,974,979	51,700	1,362,994	1,301,925	376,423	-	5,100	40,322	-	10,291	78,376	300,256	60,355	158,029	229,208
1965	4,268,632	53,430	1,406,054	1,468,542	387,011	90	6,840	52,884	1,873	11,475	97,454	313,748	44,995	210,066	214,170
1966	4,575,900	73,570	1,486,075	1,689,575	410,912	-	10,400	45,450	5,200	18,630	100,836	258,625	48,900	205,463	222,264

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

DISTRIBUTION OF RESEARCH AND DEVELOPMENT BUDGET PLAN BY INSTALLATION AND FISCAL YEAR

(In thousands of dollars)

PROGRAM		TOTAL	J. F. KENNEDY SPACE CENTER, NASA	MANNED SPACECRAFT CENTER	MARSHALL SPACE FLIGHT CENTER	GODDARD SPACE FLIGHT CENTER	PACIFIC LAUNCH OPERATIONS OFFICE	WALLOPS STATION	AMES RESEARCH CENTER	ELECTRONICS RESEARCH CENTER	FLIGHT RESEARCH CENTER	LANGLEY RESEARCH CENTER	LEWIS RESEARCH CENTER	SPACE NUCLEAR PROPULSION OFFICE	HEADQUARTERS	WESTERN OPERATIONS OFFICE 1/
OFFICE OF MANNED SPACE FLIGHT, TOTAL	1964	2,713,052	49,881	1,356,036	1,266,424	206	-	-	75	-	-	2,017	2,975	-	35,091	347
	1965	2,941,178	48,622	1,397,050	1,437,356	275	-	-	75	-	-	2,900	600	-	54,100	200
	1966	3,249,485	69,345	1,465,040	1,656,600	500	-	-	200	-	-	3,700	300	-	53,550	250
Gemini	1964	418,900	-	418,900	-	-	-	-	-	-	-	-	-	-	-	-
	1965	308,400	-	308,050	-	-	-	-	-	-	-	-	-	-	350	-
	1966	242,100	-	241,700	-	-	-	-	-	-	-	-	-	-	400	-
Apollo	1964	2,272,952	49,481	933,486	1,257,179	206	-	-	75	-	-	-	2,975	-	29,293	257
	1965	2,606,778	48,172	1,080,800	1,429,406	275	-	-	75	-	-	1,200	600	-	46,050	200
	1966	2,997,385	68,945	1,221,940	1,651,300	500	-	-	200	-	-	2,000	300	-	51,950	250
Advanced mission studies	1964	21,200	400	3,650	9,245	-	-	-	-	-	-	2,017	-	-	5,798	90
	1965	26,000	450	8,200	7,950	-	-	-	-	-	-	1,700	-	-	7,700	-
	1966	10,000	400	1,400	5,300	-	-	-	-	-	-	1,700	-	-	1,200	-
OFFICE OF SPACE SCIENCE AND APPLICATIONS, TOTAL	1964	746,879	1,819	3,256	780	235,148	-	-	25,843	-	44	35,168	197,522	-	87,202	160,097
	1965	731,486	4,808	7,254	675	183,408	90	1,390	35,085	-	85	59,806	197,323	-	108,994	132,568
	1966	797,515	4,225	17,800	13,440	227,712	-	4,500	28,305	-	100	51,860	196,730	-	105,375	147,468
Physics and astronomy	1964	148,623	-	1,020	195	123,753	-	-	605	-	44	2,333	150	-	20,047	476
	1965	136,814	-	2,300	20	107,473	-	1,390	1,764	-	85	2,280	-	-	21,168	334
	1966	172,100	-	2,600	20	133,585	-	4,500	2,255	-	100	1,730	-	-	26,660	650
Lunar and planetary exploration	1964	205,762	-	1,867	505	1,084	-	-	15,382	-	-	20,146	-	-	9,521	157,257
	1965	206,150	-	4,429	535	1,111	-	-	16,054	-	-	43,050	-	-	10,667	130,304
	1966	215,615	-	14,000	300	900	-	-	8,600	-	-	37,300	-	-	9,500	145,015
Sustaining university program	1964	40,000	-	-	-	-	-	-	-	-	-	-	-	-	39,940	60
	1965	46,000	-	-	-	-	-	-	-	-	-	-	-	-	45,965	35
	1966	46,000	-	-	-	-	-	-	-	-	-	-	-	-	45,965	35
Launch vehicle development	1964	111,900	983	-	-	250	-	-	-	-	-	115	109,497	-	1,055	-
	1965	96,500	1,783	-	-	925	-	-	-	-	-	650	91,317	-	1,825	-
	1966	63,600	1,050	-	13,000	550	-	-	-	-	-	300	47,600	-	1,100	-
Launch vehicle procurement	1964	129,986	836	-	-	23,326	-	-	-	-	-	11,930	87,875	-	6,019	-
	1965	154,672	3,025	-	-	19,960	90	-	-	-	-	13,106	106,006	-	12,485	-
	1966	194,500	3,175	-	-	23,025	-	-	-	-	-	11,700	149,130	-	7,470	-
Bioscience	1964	21,479	-	234	-	250	-	-	9,856	-	-	-	-	-	9,896	1,243
	1965	28,700	-	475	-	250	-	-	17,267	-	-	-	-	-	9,209	1,499
	1966	31,500	-	1,000	-	250	-	-	17,450	-	-	-	-	-	11,550	1,250
Meteorological satellites	1964	63,177	-	135	80	62,346	-	-	-	-	-	444	-	-	172	-
	1965	31,200	-	50	120	29,575	-	-	4	-	-	420	-	-	1,035	-
	1966	42,700	-	200	120	39,720	-	-	-	-	-	530	-	-	2,130	-
Communication satellites	1964	8,413	-	-	-	7,661	-	-	-	-	-	200	-	-	552	-
	1965	8,055	-	-	-	1,415	-	-	-	-	-	300	-	-	6,340	-
	1966	2,800	-	-	-	1,500	-	-	-	-	-	300	-	-	1,000	-
Applications technology satellites	1964	17,539	-	-	-	16,478	-	-	-	-	-	-	-	-	-	1,061
	1965	23,395	-	-	-	22,699	-	-	-	-	-	-	-	-	300	396
	1966	28,700	-	-	-	28,182	-	-	-	-	-	-	-	-	-	518

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

DISTRIBUTION OF RESEARCH AND DEVELOPMENT BUDGET PLAN BY INSTALLATION AND FISCAL YEAR

(In thousands of dollars)

PROGRAM		TOTAL	J. F. KENNEDY SPACE CENTER, NASA	MANNED SPACECRAFT CENTER	MARSHALL SPACE FLIGHT CENTER	GOODARD SPACE FLIGHT CENTER	PACIFIC LAUNCH OPERATIONS OFFICE	WALLOPS STATION	AMES RESEARCH CENTER	ELECTRONICS RESEARCH CENTER	FLIGHT RESEARCH CENTER	LANGLEY RESEARCH CENTER	LEWIS RESEARCH CENTER	SPACE NUCLEAR PROPULSION OFFICE	HEADQUARTERS	WESTERN OPERATIONS OFFICE 1/
OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY, TOTAL	1964	317,201	-	3,702	31,821	8,252	-	-	14,404	-	8,447	38,741	99,759	60,355	25,026	26,694
	1965	316,468	-	1,750	28,511	8,127	-	-	17,724	1,873	9,190	32,548	115,825	44,995	34,322	21,603
	1966	277,700	-	3,235	18,035	9,300	-	-	16,945	5,200	16,530	42,776	61,595	48,900	33,638	21,546
Basic Research	1964	22,653	-	-	986	235	-	-	1,692	-	-	1,466	3,464	-	7,831	6,979
	1965	21,231	-	-	916	257	-	-	1,881	-	30	1,861	2,234	-	8,260	5,792
	1966	22,000	-	-	920	260	-	-	1,900	200	30	1,920	2,750	-	8,220	5,800
Space vehicle systems	1964	45,714	-	629	13,569	878	-	-	1,942	-	1,403	15,257	3,186	-	3,282	5,568
	1965	44,495	-	730	16,744	956	-	-	2,922	-	2,020	9,659	2,326	-	5,700	3,438
	1966	35,000	-	855	4,490	930	-	-	2,655	-	1,180	13,461	1,770	-	6,519	3,140
Electronic systems	1964	28,700	-	1,079	4,644	3,274	-	-	2,399	-	1,072	8,848	463	-	4,087	2,834
	1965	25,422	-	475	3,469	2,797	-	-	3,650	1,873	1,103	6,390	445	-	2,493	2,727
	1966	34,400	-	880	4,525	3,035	-	-	3,390	5,000	1,400	9,120	580	-	3,270	3,200
Human factor systems	1964	13,200	-	1,900	235	-	-	-	3,820	-	1,342	1,835	137	-	3,931	-
	1965	13,320	-	445	220	-	-	-	4,113	-	2,000	3,204	230	-	3,108	-
	1966	14,900	-	900	300	-	-	-	4,680	-	1,500	4,450	200	-	2,870	-
Nuclear-electric systems	1964	45,963	-	94	263	1,320	-	-	-	-	-	-	41,719	-	685	1,882
	1965	42,492	-	100	290	1,142	-	-	-	-	-	400	37,038	-	1,186	2,336
	1966	27,000	-	100	400	1,200	-	-	-	-	-	-	22,700	-	1,000	1,600
Nuclear rockets	1964	79,176	-	-	7,153	-	-	-	-	-	-	-	11,330	60,355	-	338
	1965	56,731	-	-	1,280	-	-	-	-	-	-	-	10,450	44,995	-	6
	1966	58,000	-	-	1,300	-	-	-	-	-	-	-	7,800	48,900	-	-
Chemical propulsion	1964	46,000	-	-	3,542	375	-	-	-	-	-	1,144	31,205	-	3,194	6,540
	1965	63,792	-	-	3,592	550	-	-	-	-	-	1,480	45,227	-	8,760	4,183
	1966	30,000	-	500	5,100	800	-	-	-	-	-	1,980	8,095	-	8,825	4,700
Solar and chemical power	1964	14,000	-	-	1,429	2,170	-	-	105	-	-	710	6,403	-	630	2,553
	1965	13,745	-	-	2,000	2,425	-	-	191	-	-	690	4,309	-	1,009	3,121
	1966	14,200	-	-	1,000	3,075	-	-	170	-	-	740	5,000	-	1,109	3,106
Aeronautics	1964	21,795	-	-	-	-	-	-	4,446	-	4,630	9,481	1,852	-	1,386	-
	1965	35,240	-	-	-	-	-	-	4,967	-	4,037	8,864	13,566	-	3,806	-
	1966	42,200	-	-	-	-	-	-	4,150	-	12,420	11,105	12,700	-	1,825	-
OFFICE OF TRACKING AND DATA ACQUISITION	1964	194,347	-	-	2,900	132,817	-	5,100	-	-	1,800	2,450	-	-	7,210	42,070
	1965	274,750	-	-	2,000	195,201	-	5,450	-	-	2,200	2,200	-	-	7,900	59,799
	1966	246,200	-	-	1,500	173,400	-	5,900	-	-	2,000	2,500	-	-	7,900	53,000
Tracking and data acquisition	1964	194,347	-	-	2,900	132,817	-	5,100	-	-	1,800	2,450	-	-	7,210	42,070
	1965	274,750	-	-	2,000	195,201	-	5,450	-	-	2,200	2,200	-	-	7,900	59,799
	1966	246,200	-	-	1,500	173,400	-	5,900	-		2,000	2,500			7,900	53,000
OFFICE OF TECHNOLOGY UTILIZATION AND POLICY PLANNING	1964	3,500	-	-	-	-	-	-	-	-	-	-	-	-	3,500	-
	1965	4,750	-	-	-	-	-	-	-	-	-	-	-	-	4,750	-
	1966	5,000	-	-	-	-	-	-	-	-	-	-	-	-	5,000	-
Technology utilization	1964	3,500	-	-	-	-	-	-	-	-	-	-	-	-	3,500	-
	1965	4,750	-	-	-	-	-	-	-	-	-	-	-	-	4,750	-
	1966	5,000	-	-	-	-	-	-	-	-	-	-	-	-	5,000	-
TOTAL BUDGET PLAN	1964	3,974,979	51,700	1,362,994	1,301,925	376,423	-	5,100	40,322	-	10,291	78,376	300,256	60,355	158,029	229,208
	1965	4,268,632	53,430	1,406,054	1,468,542	387,011	90	6,840	52,884	1,873	11,475	97,454	313,748	44,995	210,066	214,170
	1966	4,575,900	73,570	1,486,075	1,689,575	410,912	-	10,400	45,450	5,200	18,630	100,836	258,625	48,900	205,463	222,264

1/Amount for Western Operations Office includes funds for the Jet Propulsion Laboratory as shown in the Research and Development program justification (Vol. II)

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

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

Budget Activity	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966
1. Manned Space Flight.....	$496,841,600	$213,481,500	$27,825,000
2. Scientific Investigations in Space.....	16,698,700	5,765,000	8,377,000
3. Space Applications.....	3,933,000	---	---
4. Space Technology.....	60,949,700	23,812,000	20,435,000
5. Aircraft Technology.....	2,585,000	4,452,000	762,000
6. Supporting Activities.....	134,442,300	15,370,000	17,301,000
Total Budget Plan.....	$715,450,300	$262,880,500	$74,700,000
Financing:			
Appropriation.....	$680,000,000	$262,880,500	$74,700,000
Transferred from (77 Stat. 439) —			
"Research and development".....	20,046,300	---	---
"Administrative operations".....	13,300,000	---	---
Appropriation (adjusted).....	713,346,300	262,880,500	74,700,000
Transferred from "Research and development" in FY 1965 (77 Stat. 439).....	1,779,000	---	---
Prior year funding applied — available from adjustments to prior year budget plans	325,000	---	---
Total financing of budget plan.....	$715,450,300	$262,880,500	$74,700,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

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

	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966
1. MANNED SPACE FLIGHT.....	$496,841,600	$213,481,500	$27,825,000
John F. Kennedy Space Center, NASA.....	280,520,300	85,377,200	7,295,000
Manned Spacecraft Center	36,142,000	24,443,000	4,400,000
Marshall Space Flight Center.....	30,081,000	14,999,700	4,776,000
Michoud Plant.....	9,058,000	6,313,500	300,000
Mississippi Test Facility.....	96,163,300	54,182,000	2,121,000
Various Locations.....	44,877,000	28,166,100	6,133,000
Facility Planning and Design.....	---	---	2,800,000
2. SCIENTIFIC INVESTIGATIONS IN SPACE.....	$16,698,700	$5,765,000	$8,377,000
Ames Research Center....	96,000	---	2,749,000
Goddard Space Flight Center.....	13,164,500	500,000	2,400,000
Jet Propulsion Laboratory	3,243,200	2,895,000	---
John F. Kennedy Space Center, NASA.....	170,000	1,741,000	1,300,000
Various Locations.....	5,000	---	---
Wallops Station.....	20,000	629,000	1,048,000
Facility Planning and Design.....	---	---	880,000
3. SPACE APPLICATIONS.....	$3,933,000	$ ---	$ ---
Goddard Space Flight Center.....	3,933,000	---	---

	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966
4. SPACE TECHNOLOGY.....	$60,949,700	$23,812,000	$20,435,000
Ames Research Center.....	11,464,000	3,100,000	---
Electronics Research Center.....	4,820,000	10,050,000	10,000,000
Langley Research Center....	9,872,700	3,253,000	7,568,000
Lewis Research Center.....	20,468,000	1,555,000	867,000
Nuclear Rocket Development Station.....	4,190,000	---	---
Various Locations.....	10,135,000	5,854,000	---
Facility Planning and Design.....	---	---	2,000,000
5. AIRCRAFT TECHNOLOGY.....	$2,585,000	$4,452,000	$762,000
Ames Research Center.....	20,000	2,630,000	---
Flight Research Center.....	2,495,000	---	---
Langley Research Center....	70,000	1,322,000	682,000
Lewis Research Center.....	---	500,000	---
Facility Planning and Design.....	---	---	80,000
6. SUPPORTING ACTIVITIES.....	$134,442,300	$15,370,000	$17,301,000
Goddard Space Flight Center	84,000	1,291,000	---
Jet Propulsion Laboratory..	---	725,000	---
John F. Kennedy Space Center, NASA.....	4,000,000	1,955,000	---
Various Locations.....	129,803,300	10,279,000	15,561,000
Wallops Station.....	555,000	1,120,000	---
Facility Planning and Design.....	---	---	1,740,000
TOTAL PLAN.....	$715,450,300	$262,880,500	$74,700,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

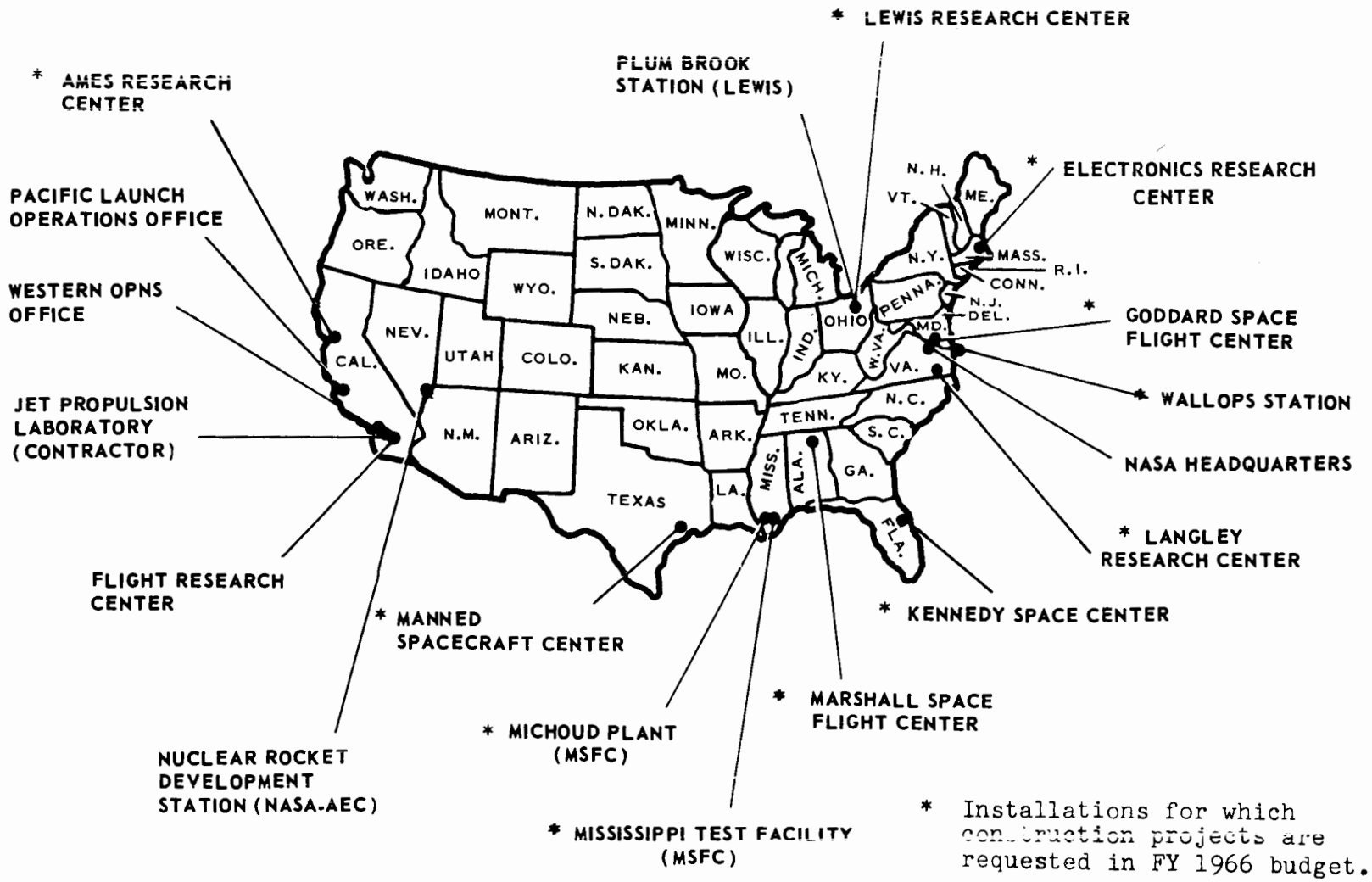
SUMMARY OF CONSTRUCTION OF FACILITIES BUDGET PLAN BY LOCATION

Location	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966
Ames Research Center.....	$11,580,000	$5,730,000	$2,749,000
Electronics Research Center.....	4,820,000	10,050,000	10,000,000
Flight Research Center.....	2,495,000	---	---
Goddard Space Flight Center.....	17,181,500	1,791,000	2,400,000
Jet Propulsion Laboratory.....	3,243,200	3,620,000	---
John F. Kennedy Space Center, NASA.....	284,690,300	89,073,200	8,595,000
Langley Research Center.....	9,942,700	4,575,000	8,250,000
Lewis Research Center.....	20,468,000	2,055,000	867,000
Manned Spacecraft Center.....	36,142,000	24,443,000	4,400,000
Marshall Space Flight Center....	30,081,000	14,999,700	4,776,000
Michoud Plant.....	9,058,000	6,313,500	300,000
Mississippi Test Facility.....	96,163,300	54,182,000	2,121,000
Nuclear Rocket Development Station.....	4,190,000	---	---
Various Locations.....	184,820,300	44,299,100	21,694,000
Wallops Station.....	575,000	1,749,000	1,048,000
Facility Planning and Design1/..	---	---	7,500,000
Total Plan.....	$715,450,300	$262,880,500	$74,700,000

1/Amounts appropriated in fiscal year 1964 and 1965 are reflected by location.

A geographic location of NASA installations is shown on the following page. Installations for which construction projects are requested in the fiscal year 1966 budget are identified.

NASA INSTALLATIONS



* Installations for which construction projects are requested in FY 1966 budget.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

ADMINISTRATIVE OPERATIONS

SUMMARY OF OBLIGATIONS BY INSTALLATION

	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966
MANNED SPACE FLIGHT			
John F. Kennedy Space Center, NASA	$34,959,000	$61,616,000	$62,697,000
Manned Spacecraft Center	68,634,000	91,201,000	89,658,000
Marshall Space Flight Center	124,443,000	140,458,000	137,387,000
SPACE SCIENCE AND APPLICATIONS			
Goddard Space Flight Center	62,466,000	85,923,000	69,591,000
Pacific Launch Operations Office	1,037,000	835,000	804,000
Wallops Station	9,715,000	11,442,000	9,800,000
ADVANCED RESEARCH AND TECHNOLOGY			
Ames Research Center	29,886,000	31,698,000	32,300,000
Electronics Research Center	730,000	3,600,000	7,622,000
Flight Research Center	9,514,000	9,750,000	9,600,000
Langley Research Center	52,642,000	57,258,000	61,783,000
Lewis Research Center	61,694,000	70,971,000	63,880,000
Space Nuclear Propulsion Office	1,472,000	1,725,000	1,838,000
SUPPORTING ACTIVITIES			
Northeastern Office	379,000	---	---
Western Operations Office	4,924,000	5,989,000	6,337,000
NASA Headquarters	49,115,000	73,255,000	56,103,000
TOTAL	$511,610,000	$645,721,000	$609,400,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ADMINISTRATIVE OPERATIONS

NUMBER OF POSITIONS BY LOCATION

	Fiscal Year 1964	Fiscal Year 1965	Fiscal Year 1966
MANNED SPACE FLIGHT			
John F. Kennedy Space Center, NASA	1,625	2,082	2,082
Manned Spacecraft Center	4,277	4,811	4,811
Marshall Space Flight Center	7,679	7,658	7,658
SPACE SCIENCE AND APPLICATIONS			
Goddard Space Flight Center	3,675	3,725	3,725
Pacific Launch Operations Office	22	22	22
Wallops Station	530	530	530
ADVANCED RESEARCH AND TECHNOLOGY			
Ames Research Center	2,204	2,205	2,205
Electronics Research Center	25	250	550
Flight Research Center	619	619	619
Langley Research Center	4,330	4,308	4,308
Lewis Research Center	4,859	4,847	4,847
Space Nuclear Propulsion Office	112	116	116
SUPPORTING OPERATIONS			
North Eastern Office	33	---	---
Western Operations Office	376	406	406
NASA Headquarters	2,133	2,221	2,221
TOTAL	32,499	33,800	34,100

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

ADMINISTRATIVE OPERATIONS

DISTRIBUTION OF BUDGET PLAN BY OBJECT
CLASSIFICATION BY INSTALLATION

(In dollars)

Object Classification	Total	J.F. Kennedy Space Center, NASA	Manned Spacecraft Center	Marshall Space Flight Center	Goddard Space Flight Center	Pacific Launch Operations Office	Wallops Station	Ames Research Center	Electronics Research Center	Flight Research Center	Langley Research Center	Lewis Research Center	Space Nuclear Propulsion Office	North-eastern Office	Western Operations Office	Headquarters
FISCAL YEAR 1964																
Personnel compensation	288,081,000	13,365,000	34,497,000	72,921,000	32,481,000	193,000	3,806,000	19,042,000	137,000	5,659,000	35,926,000	42,969,000	1,125,000	280,000	3,378,000	22,307,000
Personnel benefits	20,241,000	868,000	2,294,000	4,026,000	2,287,000	12,000	268,000	1,389,000	10,000	410,000	2,654,000	3,112,000	82,000	20,000	231,000	1,678,000
Travel & transp of pers	18,536,000	2,181,000	3,874,000	3,337,000	2,409,000	38,000	140,000	508,000	18,000	224,000	1,288,000	1,461,000	171,000	27,000	242,000	2,607,000
Transportation of things	5,400,000	350,000	1,289,000	583,000	1,458,000	7,000	65,000	59,000		31,000	450,000	627,000	11,000	1,000	13,000	456,000
Rents, communications, and utilities	47,230,000	2,575,000	5,114,000	11,780,000	10,790,000	111,000	485,000	4,605,000	---	362,000	4,718,000	4,378,000	---	28,000	315,000	1,969,000
Printing and reproduction	4,387,000	818,000	366,000	1,033,000	622,000	6,000	---	37,000	---	6,000	191,000	58,000	---	4,000	13,000	1,233,000
Other services	54,345,000	4,672,000	9,523,000	13,999,000	5,802,000	70,000	915,000	1,644,000	486,000	1,029,000	2,540,000	2,300,000	---	3,000	456,000	10,906,000
Services of other agencies	16,607,000	4,303,000	1,080,000	2,808,000	438,000	94,000	17,000	112,000	37,000	78,000	533,000	7,000	83,000	3,000	173,000	6,841,000
Supplies and materials	24,203,000	3,284,000	3,427,000	5,911,000	2,228,000	141,000	1,344,000	1,045,000	13,000	600,000	2,718,000	2,865,000	---	10,000	51,000	566,000
Equipment	22,236,000	1,753,000	5,442,000	3,814,000	3,356,000	55,000	1,017,000	614,000	29,000	1,007,000	998,000	2,542,000	---	3,000	51,000	555,000
Lands and structures	10,339,000	790,000	727,000	3,330,000	595,000	310,000	1,658,000	831,000	---	98,000	626,000	1,373,000	---	---	---	1,000
Insurance claims and indemnities	5,000	---	1,000	1,000	---	---	---	---	---	---	---	2,000	---	---	---	1,000
Totals	511,610,000	34,959,000	68,634,000	124,443,000	62,466,000	1,037,000	9,715,000	29,886,000	730,000	9,514,000	52,642,000	61,694,000	1,472,000	379,000	4,924,000	49,115,000
FISCAL YEAR 1965																
Personnel compensation	336,696,000	20,417,000	47,685,000	81,344,000	38,391,000	231,000	4,361,000	20,700,000	1,470,000	6,218,000	38,826,000	45,610,000	1,391,000	---	4,155,000	25,897,000
Personnel benefits	23,490,000	1,364,000	3,164,000	5,475,000	2,707,000	16,000	313,000	1,500,000	110,000	432,000	2,861,000	3,314,000	109,000	---	291,000	1,834,000
Travel & transp of pers	21,000,000	2,113,000	4,908,000	3,759,000	2,730,000	50,000	160,000	610,000	240,000	260,000	1,380,000	1,660,000	200,000	---	296,000	2,634,000
Transportation of things	5,675,000	872,000	1,160,000	550,000	1,195,000	12,000	83,000	58,000	121,000	40,000	440,000	650,000	10,000	---	24,000	460,000
Rents, communications, and utilities	53,191,000	3,973,000	7,967,000	13,231,000	9,936,000	90,000	626,000	4,725,000	389,000	337,000	5,424,000	3,987,000	---	---	448,000	2,058,000
Printing and reproduction	4,683,000	851,000	390,000	1,100,000	317,000	8,000	15,000	35,000	35,000	10,000	200,000	65,000	---	---	17,000	1,640,000
Other Services	80,807,000	19,912,000	12,072,000	20,052,000	4,850,000	166,000	1,233,000	1,355,000	394,000	985,000	2,517,000	2,563,000	15,000	---	567,000	14,126,000
Services of other agencies	12,230,000	5,148,000	665,000	2,918,000	334,000	74,000	50,000	105,000	110,000	---	90,000	45,000	---	---	50,000	2,641,000
Supplies and materials	22,968,000	1,700,000	3,889,000	6,100,000	1,796,000	85,000	1,234,000	1,234,000	154,000	540,000	2,600,000	3,150,000	---	---	65,000	421,000
Equipment	79,152,000	4,333,000	8,453,000	4,928,000	23,201,000	46,000	2,546,000	1,076,000	453,000	762,000	2,419,000	9,325,000	---	---	76,000	21,534,000
Lands and structures	5,811,000	932,000	847,000	1,000,000	466,000	57,000	820,000	300,000	124,000	165,000	500,000	600,000	---	---	---	---
Insurance claims and indemnities	18,000	1,000	1,000	1,000	---	---	1,000	---	---	1,000	1,000	2,000	---	---	---	10,000
Totals	645,721,000	61,616,000	91,201,000	140,458,000	85,923,000	835,000	11,442,000	31,698,000	3,600,000	9,750,000	57,258,000	70,971,000	1,725,000	---	5,889,000	73,255,000
FISCAL YEAR 1966																
Personnel compensation	345,207,000	21,879,000	49,997,000	81,675,000	38,544,000	234,000	4,361,000	20,729,000	4,368,000	6,265,000	38,896,000	45,635,000	1,424,000	---	4,378,000	26,822,000
Personnel benefits	24,193,000	1,465,000	3,328,000	5,531,000	2,716,000	16,000	313,000	1,503,000	332,000	435,000	2,889,000	3,338,000	111,000	---	304,000	1,912,000
Travel & transp of pers	21,000,000	1,538,000	5,417,000	3,825,000	2,740,000	40,000	160,000	600,000	270,000	260,000	1,370,000	1,650,000	200,000	---	303,000	2,627,000
Transportation of things	5,049,000	722,000	944,000	550,000	1,107,000	10,000	83,000	58,000	141,000	40,000	440,000	650,000	3,000	---	20,000	281,000
Rents, communications, and utilities	49,556,000	4,385,000	7,143,000	11,786,000	9,745,000	90,000	465,000	5,205,000	784,000	331,000	4,110,000	2,825,000	---	---	[illegible]	2,218,000
Printing and reproduction	4,869,000	871,000	390,000	1,150,000	342,000	8,000	15,000	35,000	65,000	10,000	200,000	65,000	---	---	17,000	1,701,000
Other services	96,054,000	23,937,000	15,034,000	21,435,000	6,923,000	160,000	1,633,000	1,488,000	762,000	1,044,000	2,866,000	2,849,000	100,000	---	672,000	17,151,000
Services of other agencies	11,969,000	4,620,000	665,000	2,944,000	445,000	80,000	50,000	112,000	153,000	---	90,000	50,000	---	---	38,000	2,724,000
Supplies and materials	23,140,000	1,579,000	3,889,000	6,100,000	1,974,000	85,000	1,234,000	1,234,000	376,000	540,000	2,600,000	3,050,000	---	---	65,000	414,000
Equipment	23,109,000	1,000,000	2,110,000	1,390,000	4,532,000	46,000	760,000	1,036,000	261,000	524,000	7,821,000	3,315,000	---	---	71,000	243,000
Lands and structures	5,235,000	700,000	740,000	1,000,000	525,000	35,000	725,000	300,000	110,000	150,000	500,000	450,000	---	---	---	---
Insurance claims and indemnities	19,000	1,000	1,000	1,000	---	---	1,000	---	---	1,000	1,000	3,000	---	---	---	10,000
Totals	609,400,000	62,697,000	89,658,000	137,387,000	69,591,000	804,000	9,800,000	32,300,000	7,622,000	9,600,000	61,783,000	63,880,000	1,838,000	---	6,337,000	56,103,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

COMPUTATION OF PERSONNEL COSTS BY INSTALLATION AND FISCAL YEAR

(In thousands of dollars)

FISCAL YEAR 1964 ACTUAL	TOTAL NASA	J. F. KENNEDY SPACE CENTER, NASA	MANNED SPACECRAFT CENTER	MARSHALL SPACE FLIGHT CENTER	GODDARD SPACE FLIGHT CENTER	PACIFIC LAUNCH OPERATIONS OFFICE	WALLOPS STATION	AMES RESEARCH CENTER	ELECTRONICS RESEARCH CENTER	FLIGHT RESEARCH CENTER	LANGLEY RESEARCH CENTER	LEWIS RESEARCH CENTER	SPACE NUCLEAR PROPULSION OFFICE	HEADQUARTERS	NORTHEASTERN OPERATIONS OFFICE	WESTERN OPERATIONS OFFICE
Personnel Compensation:																
Permanent positions	$289,440	$14,468	$37,237	$68,967	$33,986	$194	$3,586	$19,528	$277	$5,320	$35,966	$42,557	$1,249	$22,249	$305	$3,551
Pay above the stated annual rate	2,334	113	269	576	270	2	28	164	2	42	305	361	9	160	2	31
Lapses (deduct)	-25,316	-2,904	-7,116	-4,919	-3,059	-13	-235	-1,045	-143	-205	-1,606	-1,950	-136	-1,448	-39	-498
Net cost of permanent positions	$266,458	$11,677	$30,390	$64,624	$31,197	$183	$3,379	$18,647	$136	$5,157	$34,665	$40,968	$1,122	$20,961	$268	$3,084
Other personnel compensation	22,102	1,688	4,107	8,302	1,758	10	427	395	1	502	1,261	2,001	3	1,341	12	294
Total personnel compensation	$288,560	$13,365	$34,497	$72,926	$32,955	$193	$3,806	$19,042	$137	$5,659	$35,926	$42,969	$1,125	$22,302	$280	$3,378
Reimbursable	479	---	---	5	474	---	---	---	---	---	---	---	---	---	---	---
NASA funded	288,081	13,365	34,497	72,921	32,481	193	3,806	19,042	137	5,659	35,926	42,969	1,125	22,302	280	3,378
Total personnel benefits	$20,262	$868	$2,294	$4,926	$2,308	$12	$268	$1,389	$10	$410	$2,654	$3,112	$82	$1,678	$20	$231
Reimbursable	21	---	---	---	21	---	---	---	---	---	---	---	---	---	---	---
NASA funded	20,241	868	2,294	4,926	2,287	12	268	1,389	10	410	2,654	3,112	82	1,678	20	231
Total Personnel Costs	$308,822	$14,233	$36,791	$77,852	$35,263	$205	$4,074	$20,431	$147	$6,069	$38,580	$46,081	$1,207	$23,980	$300	$3,609
Reimbursable	500	---	---	5	495	---	---	---	---	---	---	---	---	---	---	---
NASA funded	308,322	14,233	36,791	77,847	34,768	205	4,074	20,431	147	6,069	38,580	46,081	1,207	23,980	300	3,609
FISCAL YEAR 1965 ESTIMATED																
Personnel Compensation:																
Permanent positions	$320,264	$19,652	$44,456	$74,262	$36,939	$208	$3,904	$20,220	$2,799	$5,671	$37,424	$43,611	$1,389	$25,652	---	$4,077
Pay above the stated annual rate	1,260	70	163	298	134	1	15	78	10	22	175	173	6	99	---	16
Lapses (deduct)	-9,592	-1,556	-2,488	-1,565	-376	-6	-81	-39	-1,411	-122	-216	-219	-10	-1,272	---	-231
Net cost of permanent positions	$311,932	$18,166	$42,131	$72,995	$36,697	$203	$3,838	$20,259	$1,398	$5,571	$37,383	$43,565	$1,385	$24,479	---	$3,862
Other personnel compensation	25,277	2,251	5,554	8,352	2,204	28	523	441	72	647	1,443	2,045	6	1,418	---	293
Total personnel compensation	$337,209	$20,417	$47,685	$81,347	$38,901	$231	$4,361	$20,700	$1,470	$6,218	$38,826	$45,610	$1,391	$25,897	---	$4,155
Reimbursable	513	---	---	3	510	---	---	---	---	---	---	---	---	---	---	---
NASA funded	336,696	20,417	47,685	81,344	38,391	231	4,361	20,700	1,470	6,218	38,826	45,610	1,391	25,897	---	4,155
Total personnel benefits	$23,533	$1,364	$3,164	$5,475	$2,750	$16	$313	$1,500	$110	$432	$2,861	$3,314	$109	$1,834	---	$291
Reimbursable	43	---	---	---	43	---	---	---	---	---	---	---	---	---	---	---
NASA funded	23,490	1,364	3,164	5,475	2,707	16	313	1,500	110	432	2,861	3,314	109	1,834	---	291
Total Personnel Costs	$360,742	$21,781	$50,849	$86,822	$41,651	$247	$4,674	$22,200	$1,580	$6,650	$41,687	$48,924	$1,500	$27,731	---	$4,446
Reimbursable	556	---	---	3	553	---	---	---	---	---	---	---	---	---	---	---
NASA funded	360,186	21,781	50,849	86,819	41,098	247	4,674	22,200	1,580	6,650	41,687	48,924	1,500	27,731	---	4,446
FISCAL YEAR 1966 ESTIMATED																
Personnel Compensation:																
Permanent positions	$323,702	$19,767	$44,674	$74,358	$36,936	$211	$3,904	$20,220	$5,716	$5,744	$37,424	$43,610	$1,415	$25,645	---	$4,078
Pay above the stated annual rate	1,284	75	208	258	137	1	15	78	22	22	175	173	6	99	---	15
Lapses (deduct)	-4,058	-300	-511	-863	-192	-1	-81	-10	-1,527	-44	-80	-90	-3	-355	---	-1
Net cost of permanent positions	$320,928	$19,542	$44,371	$73,753	$36,881	$211	$3,838	$20,288	$4,211	$5,722	$37,519	$43,693	$1,418	$25,389	---	$4,092
Other personnel compensation	24,995	2,337	5,626	7,925	2,376	23	523	441	157	543	1,377	1,942	6	1,433	---	286
Total personnel compensation	$345,923	$21,879	$49,997	$81,678	$39,257	$234	$4,361	$20,729	$4,368	$6,265	$38,896	$45,635	$1,424	$26,822	---	$4,378
Reimbursable	716	---	---	3	713	---	---	---	---	---	---	---	---	---	---	---
NASA funded	345,207	21,879	49,997	81,675	38,544	234	4,361	20,729	4,368	6,265	38,896	45,635	1,424	26,822	---	4,378
Total personnel benefits	$24,243	$1,465	$3,328	$5,531	$2,766	$16	$313	$1,503	$332	$435	$2,889	$3,338	$111	$1,912	---	$304
Reimbursable	50	---	---	---	50	---	---	---	---	---	---	---	---	---	---	---
NASA funded	24,193	1,465	3,328	5,531	2,716	16	313	1,503	332	435	2,889	3,338	111	1,912	---	304
Total Personnel Costs	$370,166	$23,344	$53,325	$87,209	$42,023	$250	$4,674	$22,232	$4,700	$6,700	$41,785	$48,973	$1,535	$28,734	---	$4,682
Reimbursable	766	---	---	3	763	---	---	---	---	---	---	---	---	---	---	---
NASA funded	369,400	23,344	53,325	87,206	41,260	250	4,674	22,232	4,700	6,700	41,785	48,973	1,535	28,734	---	4,682

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

DISTRIBUTION OF PERSONNEL POSITIONS BY INSTALLATION AND FISCAL YEAR

FISCAL YEAR 1964 ACTUAL	TOTAL NASA	J. F. KENNEDY SPACE CENTER, NASA	MANNED SPACECRAFT CENTER	MARSHALL SPACE FLIGHT CENTER	GODDARD SPACE FLIGHT CENTER	PACIFIC LAUNCH OPERATIONS OFFICE	WALLOPS STATION	AMES RESEARCH CENTER	ELECTRONICS RESEARCH CENTER	FLIGHT RESEARCH CENTER	LANGLEY RESEARCH CENTER	LEWIS RESEARCH CENTER	SPACE NUCLEAR PROPULSION OFFICE	HEADQUARTERS NASA	NORTHEASTERN OPERATIONS OFFICE	WESTERN OPERATIONS OFFICE
TOTAL EXCEPTED POSITIONS a/	415	14	35	56	40	-	1	26	-	6	36	35	3	158	2	3
General Schedule Positions:																
GS-16	4	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
GS-15	1,612	51	191	351	190	1	5	112	6	15	137	155	20	365	3	10
GS-14	2,463	102	314	658	347	4	8	146	5	29	219	294	20	271	5	41
GS-13	3,677	243	596	942	535	1	19	193	3	41	304	536	23	180	2	59
GS-12	3,663	302	560	996	480	3	25	153	2	58	357	512	7	123	2	83
GS-11	3,179	206	485	875	467	3	27	139	-	52	411	398	3	70	1	42
GS-10	23	1	-	1	-	-	3	2	-	-	-	12	-	4	-	-
GS-9	2,463	99	396	422	391	-	22	180	1	50	448	372	2	70	3	7
GS-8	51	3	-	4	8	-	-	-	-	2	2	9	-	22	-	1
GS-7	1,693	83	341	288	223	-	41	119	1	27	215	200	2	146	2	5
GS-6	670	44	54	72	79	2	4	35	1	11	69	58	4	223	-	14
GS-5	1,816	106	296	379	250	1	40	121	3	21	179	127	14	214	2	63
GS-4	1,971	150	371	507	226	5	32	119	1	25	153	206	11	122	8	35
GS-3	1,290	94	219	402	103	1	16	58	1	5	155	149	3	73	2	9
GS-2	155	3	5	68	5	1	12	7	1	-	23	16	-	11	-	3
TOTAL GENERAL SCHEDULE POSITIONS	24,730	1,487	3,828	5,969	3,304	22	254	1,384	25	336	2,672	3,044	109	1,894	30	372
TOTAL WAGE BOARD POSITIONS	6,839	91	308	1,477	266	-	261	791	-	263	1,571	1,772	-	39	-	-
TOTAL PERMANENT POSITIONS	31,984	1,592	4,171	7,502	3,610	22	516	2,201	25	605	4,279	4,851	112	2,091	32	375
OTHER TEMPORARY POSITIONS	515	33	106	177	65	-	14	3	-	14	51	8	-	42	1	1
GRAND TOTAL POSITIONS - FY 1964	32,499	1,625	4,277	7,679	3,675	22	530	2,204	25	619	4,330	4,859	112	2,133	33	376
FISCAL YEAR 1965 ESTIMATED																
TOTAL EXCEPTED POSITIONS a/	439	15	35	54	40	-	1	29	10	6	38	35	3	170	-	3
General Schedule Positions:																
GS-16	183	9	15	41	21	-	1	17	-	3	16	17	3	39	-	1
GS-15	1,694	62	222	390	190	1	4	97	16	13	129	155	16	384	-	15
GS-14	2,707	108	398	663	383	4	8	150	50	31	222	319	20	302	-	49
GS-13	4,217	382	736	1,040	554	3	27	219	50	49	318	537	33	207	-	62
GS-12	4,024	369	664	1,052	568	5	42	169	20	54	372	490	5	132	-	82
GS-11	3,454	269	594	899	502	1	31	151	14	56	421	398	3	71	-	44
GS-10	31	1	-	1	-	-	2	5	-	-	-	12	-	10	-	-
GS-9	2,495	131	479	412	380	-	21	145	4	40	443	358	-	74	-	8
GS-8	59	3	1	4	9	-	-	-	-	-	2	11	-	28	-	1
GS-7	1,591	116	332	279	155	-	21	105	1	20	191	212	4	149	-	6
GS-6	726	47	63	75	103	1	9	34	11	16	69	58	4	223	-	13
GS-5	1,833	141	311	391	170	3	49	110	38	22	175	129	16	213	-	65
GS-4	1,889	193	339	516	180	1	26	106	34	24	152	180	8	91	-	39
GS-3	999	91	174	223	112	-	8	52	2	8	135	146	1	35	-	12
GS-2	149	7	1	69	38	-	-	6	-	-	8	10	-	9	-	1
TOTAL GENERAL SCHEDULE POSITIONS	26,051	1,929	4,329	6,055	3,365	19	249	1,366	240	336	2,653	3,032	113	1,967	-	398
TOTAL WAGE BOARD POSITIONS	6,710	101	322	1,380	272	-	268	790	-	263	1,547	1,748	-	19	-	-
TOTAL PERMANENT POSITIONS	33,200	2,045	4,686	7,489	3,677	19	518	2,185	250	605	4,238	4,815	116	2,156	-	401
OTHER TEMPORARY POSITIONS	600	37	125	169	48	3	12	20	-	14	70	32	-	65	-	5
GRAND TOTAL POSITIONS - FY 1965	33,800	2,082	4,811	7,658	3,725	22	530	2,205	250	619	4,308	4,847	116	2,221	-	406
FISCAL YEAR 1966 ESTIMATED																
TOTAL EXCEPTED POSITIONS a/	439	15	35	54	40	-	1	29	11	6	38	35	3	169	-	3
General Schedule Positions:																
GS-16	183	9	15	41	21	-	1	17	-	3	16	17	3	39		1
GS-15	1,724	62	222	390	190	1	4	97	46	13	129	155	16	384	-	15
GS-14	2,767	108	398	663	383	4	8	150	110	31	222	319	20	302	-	49
GS-13	4,299	382	736	1,066	554	3	27	210	114	49	318	537	33	208	-	62
GS-12	4,101	369	664	1,081	568	5	42	182	55	54	372	490	5	132	-	82
GS-11	3,475	269	594	909	502	1	31	157	19	56	421	398	3	71	-	44
GS-10	31	1	-	1	-	-	2	5	-	-	-	12	-	10	-	-
GS-9	2,541	131	479	433	380	-	21	165	9	40	443	358	-	74	-	8
GS-8	59	3	1	4	9	-	-	-	-	-	2	11	-	28	-	1
GS-7	1,578	116	332	279	155	-	21	72	21	20	191	212	4	149	-	6
GS-6	738	47	63	76	103	1	9	33	21	16	69	58	6	223	-	13
GS-5	1,865	141	311	391	170	3	49	119	59	22	175	129	18	213	-	65
GS-4	1,932	193	339	528	180	1	26	106	69	24	152	180	4	91	-	39
GS-3	1,008	91	174	224	112	-	8	46	16	8	135	146	1	35	-	12
GS-2	150	7	1	69	38	-	-	7	-	-	8	10	-	9	-	1
TOTAL GENERAL SCHEDULE POSITIONS	26,451	1,929	4,329	6,155	3,365	19	249	1,366	539	336	2,653	3,032	113	1,968	-	398
TOTAL WAGE BOARD POSITIONS	6,610	101	322	1,280	272	-	268	790	-	263	1,547	1,748	-	19	-	-
TOTAL PERMANENT POSITIONS	33,500	2,045	4,686	7,489	3,677	19	518	2,185	550	605	4,238	4,815	116	2,156	-	401
OTHER TEMPORARY POSITIONS	600	37	125	169	48	3	12	20	-	14	70	32	-	65	-	5
GRAND TOTAL POSITIONS - FY 1966	34,100	2,082	4,811	7,658	3,725	22	530	2,205	550	619	4,308	4,847	116	2,221	-	406

a/Total Excepted Positions include two (2) Special Ungraded and twelve (12) P.L. 313 positions.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1966 ESTIMATES

ADMINISTRATIVE OPERATIONS

ANALYSIS OF REQUIREMENTS FOR PASSENGER-CARRYING MOTOR VEHICLES

The appropriation language provides for the purchase of 30 passenger motor vehicles, of which 6 are for augmentation to the fiscal year 1965 ending inventory and 24 are for replacement. All vehicles scheduled for replacement meet, or will meet, the criteria established by the General Services Administration for replacement of vehicles due either to age, mileage, annual maintenance costs, or a combination of these factors.

A summary analysis and planned procurement by class of vehicle in fiscal year 1966 is as follows:

	Total	Medium Sedans	Sedans	Station Wagons	Ambulances	Buses
On hand July 1, 1965..	183	1	47	113	11	11
Total to be procured:	30	-	7	15	-	8
(For replacement)...	(24)	-	(4)	(15)	(-)	(5)
(Disposed - not replaced).....	(3)	-	(2)	(1)	(-)	(-)
On hand June 30, 1966.	186	1	48	112	11	14

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RESEARCH AND DEVELOPMENT

FISCAL YEAR 1966 ESTIMATES

OFFICE OF MANNED SPACE FLIGHT GEMINI PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The Gemini program objectives are to develop an operational capability in Manned Space Flight and through this capability to conduct specific experiments and tests which support Apollo, Department of Defense programs and scientific investigations. In the Gemini program, the U.S. is developing the capability for flights up to 14 days' duration, rendezvous and docking, post docking maneuvers, extra-vehicular activity, and controlled re-entry.

The Gemini spacecraft systems are more sophisticated and versatile than those in the Mercury configuration, to accomplish progressively more complex mission objectives. Several subsystems for use in manned space flight are introduced for the first time in Gemini: ejection seats; fuel cells; on board propulsion; rendezvous radar; and inertial guidance system. The inertial guidance system used for rendezvous also provides an alternate capability in the event of failure in the launch vehicle primary guidance system.

To the degree that space, weight, and operational limitations permit, in-flight experiments will be conducted as part of a planned program to utilize the full capabilities of Gemini flights.

FY 1966 is a year of intensive delivery and operational activity. Manned Gemini missions are planned during each quarter of this period. Operations support of these manned missions includes astronaut training; pre-launch spacecraft testing and checkout at Cape Kennedy; and launch, flight, and recovery activities.

Scheduled flights will be used to evaluate systems and astronaut performance and will provide operational experience on various rendezvous modes. A rendezvous mission begins with the launch of a modified Agena D, which is used as the target vehicle. This target vehicle is placed in orbit by a standard Atlas. The spacecraft is then launched by a Gemini Launch Vehicle (GLV), a modified Titan II. Using radar for guidance, the astronauts bring the Gemini spacecraft within visual range of the Agena target. Electronic and visual aids are then used to mate the Gemini spacecraft and the Agena target vehicle to complete the docking maneuver.

A large number of experiments have been approved for inclusion in Gemini missions. Data gained from these experiments will significantly expand current knowledge of space, and permit a more realistic assessment of man's ability to perform in the space environment. Through FY 1963, a total of $343.9 million had been obligated for this program.

SUMMARY OF RESOURCES REQUIREMENTS:

	1964	1965	1966
Spacecraft.....	$280,520,000	$165,300,000	$122,700,000
Launch vehicles.....	122,700,000	115,400,000	88,500,000
Support.....	15,680,000	27,700,000	30,300,000
Total.....	$418,900,000	$308,400,000	$242,100,000

Distribution of Program Amount by Installation:

Manned Spacecraft Center.....	$418,900,000	$308,050,000	$241,700,000
NASA Headquarters.....	---	350,000	400,000

BASIS OF FUND REQUIREMENTS:

Spacecraft

	1964	1965	1966
Spacecraft.....	$280,520,000	$165,300,000	$122,700,000

Spacecraft components and subsystems are subjected to exhaustive tests to certify that design requirements will be met under all anticipated conditions. Items procured from vendors must pass a pre-delivery acceptance test before shipment to McDonnell. There, every component undergoes a separate pre-installation test before final incorporation into a spacecraft system. This test and inspection program will provide greater assurance of astronaut safety and mission success.

After assembly, each spacecraft is checked for approximately 86 working days at McDonnell to verify that the components and subsystems perform according to specifications under simulated flight conditions. Final check-out requires approximately 40 working days and is conducted at the Kennedy Space Center where the spacecraft and launch vehicle are mated.

Approximately 99 percent of the spacecraft development and manufacturing effort is being performed by industry. The McDonnell Corporation has subcontracted over 50 percent of its effort to major subsystem suppliers located throughout the country. In addition, hundreds of other subcontractors, vendors, and suppliers are providing various components.

Launch Vehicles

	1964	1965	1966
Launch vehicles.....	$122,700,000	$115,400,000	$88,600,000

Three separate vehicles are required for the Gemini program: the Gemini Launch Vehicle (GLV), the Atlas, and the Agena. The GLV is an Air Force Titan II intercontinental ballistic missile which has been modified for manned flight. The modifications include incorporation of redundant electrical power supply and flight control systems, a malfunction detection system to warn the astronauts of a failure requiring abort, replacement of the Titan II inertial guidance with the radio guidance system used successfully in Mercury, and removal of items needed only for the booster as an ICBM. The Air Force Space Systems Division, acting in a capacity similar to a NASA prime contractor, is scheduled to deliver four GLV during FY 1966.

The GLV is subjected to a test program comparable to that for the spacecraft. In addition to the development and qualification tests prescribed for components and subsystems peculiar to Gemini, the engines are fully tested prior to installation in the vehicle. Martin-Marietta, contractor for the vehicle, conducts a 26-day all-systems functional test in its Vertical Test Facility at Baltimore before shipment to Cape Kennedy. At the launch pad, the GLV again undergoes a comprehensive 51-day checkout to verify compatibility and flight readiness. This includes 26 days of checkout following mating with the spacecraft.

The Air Force is procuring Gemini Launch Vehicles under four major contracts, in addition to Martin-Marietta: Aerojet supplies the engines; General Electric produces the guidance system; Burroughs fabricates the computer; and Aerospace Corporation is responsible for systems engineering.

The Gemini Atlas is an Air Force Standard Atlas Launch Vehicle. Three Atlas vehicles will be delivered in FY 1966.

The Gemini target vehicle is an Agena modified to provide (1) additional maneuverability in orbit, (2) command communications compatible with the spacecraft and ground station network, and (3) a docking mechanism. The modifications include changes to the electrical power supply, telemetry, spacecraft command subsystems, and propulsion system. To accomplish rendezvous maneuvers, the main engine was modified to provide a five-time restart capability while in orbit. A secondary propulsion system has been added to enable smaller velocity changes and propellant orientation for main engine start.

The extent of the modifications to develop a more sophisticated vehicle for Gemini has required a severe testing program. The structural, qualification, systems development, and propulsion systems testing will be essentially completed in FY 1965.

The Air Force is also contracting for the Atlas/Agena. Principal firms involved are General Dynamics/Astronautics Division for the Atlas, and Lockheed Missiles and Space Company for the Agena.

The FY 1966 vehicle funding requirements provide incremental funding to the Air Force for delivery and partial operational support of vehicles to be launched in FY 1966 and FY 1967.

	Support		
	1964	1965	1966
Support.....	$15,680,000	$27,700,000	$30,800,000

The manned missions planned in FY 1966 place heavy emphasis on Crew Operations, Flight Operations, and Spacecraft and Launch Vehicle Support, thereby characterizing the nature of the Gemini program during the period.

Crew Operations funds provide for three types of effort: (1) astronaut training, (2) mission simulators, and (3) specialized in-flight devices.

Astronaut Training - Gemini astronaut training includes academic instruction; water, jungle, and desert survival; zero-gravity indoctrination; and flight in high-performance jet aircraft.

Mission Simulators - Each individual astronaut receives at least 125 hours of simulator training., The simulators are modified from time to time to update the configuration and procedures for progressively more sophisticated missions.

Specialized in-flight devices, such as camera mounts, sextants, timers, tools, and exercising equipment, will be developed and procured. These items are required for performing experiments and carrying out flight plans.

Flight Operations during FY 1966 will continue to stress planning, support, and actual flight test from lift-off to recovery. In long-duration missions, capability to sustain manned flight for a period equal to or longer than will be required in lunar missions will be demonstrated.

Another objective in FY 1966 is mastery of the operational aspects of space rendezvous and docking maneuvers. The first two flights scheduled for FY 1966 are long-duration missions. During the latter flight the astronauts will practice rendezvous using a pod equipped with radar transponder and lights, ejected from the spacecraft to simulate the Agena.

Later in the year, missions will involve actual rendezvous and docking of the spacecraft with an orbiting Agena target vehicle, using alternative guidance techniques to determine the optimum mode of rendezvous.

Flight Operations activities embrace three main areas: (1) mission planning, (2) flight control, and (3) recovery.

Mission planning entails organizing and coordinating the group activities necessary to conduct manned missions successfully - network tracking and data handling, trajectory design and analysis, and real-time computer program design and implementation.

Flight control to support the FY 1966 missions is essentially the management of heterogeneous groups responsible for vehicle and life systems, vehicle dynamics, crew safety, network operations required to support manned space flight, and mission control.

Recovery activities for the manned missions are concerned with re-entry and recovery of astronauts and spacecraft. Primary and secondary recovery areas are assigned for each mission; however, unforeseen circumstances may require a recovery anywhere along the flight path. Therefore, ships, aircraft, and para-rescue teams are required for contingency recovery areas.

Recovery support is provided most effectively and economically by agencies of the Department of Defense (DOD), using a world-wide communications network. To conduct these operations, DOD provides ships, aircraft, and men to support each recovery. Typical support forces are the same for both rendezvous and long-duration flights; however, costs are higher for long-duration flights, since the recovery forces are on station for longer periods.

Requirements for this DOD support, the largest element in the Flight Operations budget, depend directly on the number of flights scheduled for a given year. Ship and aircraft costs are calculated on the average deployment times and other factors associated with each type of mission. The FY 1966 funding requirement also takes into account the effect of minimal delays in launch operations, re-cycle times, and total re-deployment of all recovery support forces.

Spacecraft and Launch Vehicle Support funds provide procurement and qualification testing of components and subsystems. Included is the procurement of life support systems and related extra-vehicular equipment. During FY 1966, the following types of items will be purchased: food and waste management systems, bioinstrumentation, pressure suits, personal hygiene equipment, and extra-vehicular equipment.

Astronauts will perform in-flight experiments on all FY 1966 Gemini missions. These experiments have been evaluated to define expected technical contribution, feasibility (from the standpoint of installation in a particular spacecraft), and cost in terms of dollars and weight. The objectives of these experiments are:

Medical experiments will yield data on psychological and physiological reactions to stress, and on man's performance capabilities during space flight.

Engineering experiments performed during FY 1966 will measure the space radiation environment just outside the orbiting spacecraft, and measure the direction and amplitude of the Earth's magnetic field relative to the spacecraft.

Scientific experiments will provide data in a number of fields, including effects of weightlessness on cell tissue, and the nature of interplanetary dust.

In addition to the experiments outlined above, NASA is conducting technological experiments for the DOD which will evaluate the astronauts' ability to observe objects on Earth and in outer space, and to navigate their spacecraft during periods in which there is little ground control.

OFFICE OF MANNED SPACE FLIGHT APOLLO PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The ultimate goal of the Manned Space Flight program is to provide a broad national capability for manned space exploration, which will achieve and maintain a position of leadership for the United States. A specific objective in acquiring this capability is to land man on the Moon and return him safely to Earth within this decade. The Apollo Program will meet the specific objective as well as provide a broad base of operational capability in manned space flight and the associated technology; a valuable complex of development, manufacturing, test, and operational facilities; and an experienced Government and industrial team.

To accomplish the objective of landing astronauts and their scientific equipment on the Moon and returning them safely to Earth, two launch vehicles must be developed and qualified for manned flight. In addition, the Apollo Program requires the development of a highly reliable spacecraft, capable of supporting three men in space for periods up to two weeks, docking in space, landing on the lunar surface and safely re-entering the Earth's atmosphere.

The Apollo Program is divided into unmanned flights, manned earth orbital flights, and manned lunar flights. Unmanned Apollo Saturn IB test flights will verify the performance of the launch vehicle; the structural integrity and compatibility of the spacecraft and adapter in relation to the launch vehicle; the satisfactory firing and restarting of the spacecraft engines and the safe recovery of the spacecraft command module; and the capability of the guidance and navigation system to perform re-entry at earth orbital speeds.

Manned earth orbital flights on the Saturn IB will include test of the command and service modules and the lunar excursion module. The command module will be manned in the long duration missions lasting up to 14 days. Both crew and equipment will be exposed to the rigors of space environment. An unmanned lunar excursion module will be remotely controlled and evaluated for the purpose of checking operation of the Lunar Excursion Module (LEM) system and performance of the descent and ascent engines after space vacuum and temperature exposure. Rendezvous and docking of the command and service module spacecraft with the unmanned LEM will be accomplished. In subsequent manned earth orbital testing, rendezvous and docking operations will be perfected. The guidance system and rendezvous trajectories will be checked; docking maneuvers will be demonstrated; and the necessary ground network support system will be verified.

The Saturn V will be used initially in unmanned orbital qualification flights. Unmanned re-entry at 36,000 feet per second will be demonstrated to verify the command module heat shield.

Manned earth orbital flights, on the Saturn V, will be conducted with a fully loaded lunar space vehicle in simulation of the lunar mission. All phases of crew operations and equipment performance will be validated. Subsequently, manned lunar flights and the first manned lunar landing will be conducted.

SUMMARY OF RESOURCES REQUIREMENTS:

	1964	1965	1966
Spacecraft.....	$876,575,000	$992,450,000	$1,118,840,000
Saturn I.....	187,077,000	55,450,000	4,400,000
Saturn IB.....	146,817,000	261,150,000	274,700,000
Saturn V.....	763,382,000	965,006,000	1,236,500,000
Engine development.....	166,000,000	153,400,000	140,700,000
Apollo mission support.	133,101,000	179,322,000	222,245,000
Total.....	$2,272,952,000 a/	$2,606,778,000	$2,997,385,000

a/ Includes $72,494,000 of the FY 1965 appropriation related to the FY 1964 supplemental.

Distribution of Program Amount by Installation:

John F. Kennedy Space Center, NASA.....	$49,481,000	$48,172,000	$68,945,000
Manned Spacecraft Center.....	933,486,000	1,080,800,000	1,221,940,000
Marshall Space Flight Center.....	1,257,179,000	1,429,406,000	1,651,300,000
Goddard Space Flight Center.....	206,000	275,000	500,000
Ames Research Center.	75,000	75,000	200,000
Langley Research Center.....	---	1,200,000	2,000,000
Lewis Research Center	2,975,000	600,000	300,000
NASA Headquarters....	29,293,000	46,050,000	51,950,000
Western Operations Office.....	257,000	200,000	250,000

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BASIS OF FUND REQUIREMENTS:

Spacecraft

	1964	1965	1966
Command and service modules..	$545,874,000	$525,000,000	$550,000,000
Lunar excursion module.....	135,000,000	226,000,000	270,000,000
Guidance and navigation.....	91,499,000	80,000,000	108,700,000
Integration, reliability, and checkout.....	60,699,000	44,400,000	69,300,000
Spacecraft support.....	43,503,000	117,050,000	120,840,000
Total.....	$876,575,000	$992,450,000	$1,118,840,000

Through FY 1963 a total of $438.4 million had been obligated.

Command and Service Modules

In December 1961, the Space and Information Systems Division of the North American Aviation Corporation (NAA) was selected as prime contractor to design, develop, and fabricate the command and service modules of the Apollo spacecraft. In addition, NAA was assigned responsibility for design and fabrication of the spacecraft-launch vehicle adapter, integration of test, scientific, and other government furnished equipment into the spacecraft, assembly and test of the spacecraft, and support of spacecraft preparation for flight tests.

In FY 1965, the program definition of the detailed design requirements for the Block I and the Block II command and service module will be completed. Six developmental spacecraft have been delivered and the final two will be delivered in FY 1965 to continue ground development tests and flight tests on Saturn I and Little Joe II launch vehicles. Two of these spacecraft will be used for micrometeoroid experiments on Saturn I. Two will be used for flight abort systems development on Little Joe II at White Sands Missile Range, New Mexico (WSMR). The remaining developmental spacecraft will augment the ground test program covering tests for flotation and handling, land and water impact, parachute drop tests, dynamic tests and system compatibility and integration tests.

Also in FY 1965, the first Block I production service module for ground propulsion tests will be delivered.

During FY 1966, a heavy ground test program will be in progress on delivered ground-development and Block I production spacecraft. Five additional Block I production spacecraft will be delivered in FY 1966 to

support this ground test effort. They will be used for pad abort tests at WSMR, structure tests, acoustic tests, spacecraft integration testing, and ground simulation tests of the temperature and vacuum conditions expected in space. Extensive testing of the spacecraft's propulsion system will continue at the White Sands Missile Range (WSMR).

In FY 1966, the first Block I flight spacecraft for the Saturn IB will be delivered and flight tested. This unmanned flight test will yield important information on the re-entry heat shield structure of the spacecraft. Two additional Block I flight spacecraft will have been completed for future scheduled spacecraft development tests on the Saturn IB. By the end of FY 1966 the remaining Block I flight spacecraft will be in various stages of manufacturing.

During FY 1966, manufacture of the Block II spacecraft will be initiated. These are the spacecraft that will be used for rendezvous missions on Saturn IB and for lunar mission simulations and lunar missions on Saturn V.

Lunar Excursion Module

Lunar excursion module (LEM) development was started by the Grumman Aircraft Engineering Corporation (GAEC) in December 1962. During FY 1964, the preliminary design effort was completed. Mockup reviews were held to determine crew visibility and mobility, and cockpit and equipment arrangements. Configurations for the landing gear, propellant tanks, front face, docking, and electrical power system were selected. Single cell development testing was started on the LEM fuel cell design and descent engine firings were accomplished. By the end of the year, four heavy-weight propulsion rigs were delivered for use in the test program.

During FY 1965, the program is undergoing a sharp build-up in development test activity. The LEM configuration was essentially frozen following a NASA/GAEC review of a hard metal mockup. Major subsystems components are under development.

A LEM test article (LTA) will be delivered to Marshall Space Flight Center for vibration tests with a Saturn test vehicle. A second LEM test article will be delivered to North American Aviation for electronic systems integration. By the end of the year, fabrication will have started on four additional test articles and the first LEM flight vehicle.

During FY 1966, design and engineering and component development tests will be completed and the qualification test program on prototype flight hardware will be started. Dynamic tests will continue at Marshall Space Flight Center on the LEM/Saturn V configuration, using the LTA vehicle delivered during FY 1965. Two additional LTA vehicles will be delivered

for the test program: one for static structural tests with the LEM/S-IVB adapter; and one for vehicle static and dynamic structural testing. The remaining three LTA vehicles will complete manufacturing and will enter installation and checkout. Manufacturing will continue on the first LEM vehicle for orbital flight. Five additional flight vehicles will be in production.

Guidance and Navigation

The Apollo guidance and navigation system will determine the position, velocity, and trajectory of the spacecraft and control the spacecraft's engines and re-entry lift for the precise maneuvers necessary during all phases of flight.

The Instrumentation Laboratory of the Massachusetts Institute of Technology is responsible for system development, fabrication of initial prototypes, and technical assistance to NASA in the direction of the industrial manufacture of production systems.

In preparation for the transition from the developmental phase to the production phase, a realignment of the guidance and navigation contractors has been accomplished during FY 1965. This contractor realignment assigns the NASA prime contract effort to AC Spark Plug and subcontract tasks to the Raytheon Company and the Kollsman Instrument Company. This team of production contractors will provide essentially identical guidance and navigation equipment for both the command module and the lunar excursion module.

During FY 1964, subcomponents of the command module guidance and navigation system were extensively tested. Five of the functional guidance and navigation systems were completed and underwent a variety of mechanical, electrical, thermal, and vibration tests.

In FY 1965, qualification and reliability testing of Block I Guidance and Navigation (G&N) hardware for the command module was continued. Eight command module Block I G&N systems, including two flight-qualified systems, will be delivered in support of the ground and flight testing program. During FY 1965, design of the Block II guidance and navigation system was established, a feature of which was the integration of the guidance and navigation system with the spacecraft's stabilization and control system. This integration provided for two independent guidance, navigation and control systems, primary and back up, with an over-all systems weight saving of almost 100 pounds. In addition, development of command module Block II and LEM equipment will be continued, and construction of experimental and developmental models will be started.

During FY 1966, ten flight-qualified command module Block I, and five command Module Block II G&N systems, are to be delivered for Apollo ground and flight test program. Eight developmental and functional guidance and navigation systems will be delivered in FY 1966 in support of LEM ground and flight test programs.

Integration, Reliability and Checkout

The Automatic Checkout Equipment (ACE) for the Apollo Spacecraft is being designed, developed, produced, installed, and operated by General Electric. In addition, equipment contracts have been negotiated with the Control Data Corporation and Radiation, Inc., in support of the General Electric contract.

The basic design of ACE ground stations was completed in FY 1964. Two stations are operational at North American Aviation's Downey Plant, California. In FY 1965, three additional ground stations will be operational. In FY 1966, five additional ACE ground stations will become operational.

In addition to the ACE hardware mission, the General Electric Company is responsible for the engineering support to Manned Spacecraft Center in the areas of ground support equipment; test programs; reliability and quality assurance; documentation; simulation and training programs; mission planning and analysis; and interface control.

FY 1966 plans include a continuation of the same tasks and emphasize Reliability and Quality Assurance coverage, including trend analysis of failure reports.

Spacecraft Support

Apollo Spacecraft support activities include the requirements for Little Joe II launch vehicles, testing support, logistic support, experiments, space medicine, and instrumentation and scientific equipment.

The Convair Division of General Dynamics was selected in May 1962 to design, develop and fabricate six Little Joe II launch vehicles. Subsequently, two vehicles were added to the contract. Seven of the vehicles have been delivered as of October 1964 and the remaining vehicle is scheduled for delivery during the third quarter of FY 1965. The Little Joe II is used to obtain necessary flight test data on the spacecraft abort and propulsion systems. Funds in FY 1966 will be used to support the test operations at White Sands Missile Range.

In the testing support area, funds are required to conduct the direct test and evaluation programs at Manned Spacecraft Center facilities, Houston, and other government testing laboratories. These tests are an integral part of spacecraft development. For example, the Arnold Engineering Development Center supports the testing of the LEM Propulsion System, Reaction Control System, and ascent and descent engines. Testing support includes the procurement of Government furnished equipment, testing hardware and supplies, guidance, navigation and control equipment, and related studies and analyses.

Included in logistic support are costs of transportation of spacecraft between Installations, reimbursement to the Department of Defense for inspection services, procurement of fuels and propellants for use at White Sands Missile Range, Manned Spacecraft Center, Kennedy Space Center, Arnold Engineering Development Center and at contractor sites.

The Apollo Experiments program was initiated in late FY 1964. FY 1965 represents the first full year of operation and the funds support the cost of program organization and initiation of work on the first of the Apollo flights to carry experiments.

FY 1966 Apollo Program funds are also planned for experiment development, procurement of flight hardware, integration, and operation of medical and engineering earth orbital experiments, and integration and operation of scientific and technological earth orbital experiments. Apollo Program effort in the planning and integration of lunar experiments into the space vehicles will be initiated.

Major effort in the space medicine area in FY 1966 will be devoted to the design and development of in-flight medical experiments for Apollo. These experiments will be primarily designed to measure man's response to the space flight environment, measuring the subtle medical changes. Should conditions dictate these data will be utilized to develop appropriate flight systems for the long duration Apollo flights.

Other areas of biomedical interest in Apollo include cardiovascular system studies, crew performance and radiobiology. In the last area, studies will be directed toward a method for more precise definition of the radiation exposure limits for various Apollo flights. Under cardiovascular systems, studies will be made of the effectiveness of weightlessness countermeasures in weightlessness simulation. Crew performance will include X-ray studies of limb movements of the Apollo suit and the establishment of baseline physiological data for in-flight monitoring purposes.

Funds requested for instrumentation and scientific equipment will be used to develop and procure the specialized flight research and test

instrumentation equipment required during the spacecraft developmental flight testing. Typical instrumentation includes signal conditioners, sensors, transducers, telemetry, transmitters, transmitting antennas, and ground support equipment. Scientific equipment includes special cameras, magnetometers, seismographs, and radiation measuring devices.

During FY 1965, emphasis was on the design, procurement, fabrication test and qualification of instrumentation needed for nine Apollo spacecraft tests and five LEM vehicle tests. Deliveries of instrumentation hardware were made to North American Aviation and Grumman Aircraft for installation and checkout in developmental spacecraft. FY 1966 funds will be employed to continue the design, procurement, fabrication and testing of flight R&D instrumentation. This instrumentation is scheduled for four major lunar excursion module tests.

Saturn I

	1964	1965	1966
S-I stage	$59,774,000	$9,300,000	$700,000
S-IV stage	82,624,000	19,500,000	1,500,000
Vehicle instrument unit	9,004,000	1,900,000	---
Ground support equipment	3,527,000	1,000,000	---
H-1 engine procurement	3,141,000	---	---
RL-10 engine procurement	3,700,000	---	---
Vehicle support	25,307,000	23,750,000	2,200,000
Total	$187,077,000	$55,450,000	$4,400,000

Through FY 1963 a total of $547.2 million had been obligated.

The Saturn program has been marked by a series of successful launches. The Block I phase of the program, which provided for flight tests of the first stage configuration, was completed in FY 1964 with the fourth successful flight. Two Block II vehicles, composed of live first and second stages, were successfully launched during FY 1964. Another successful Block II launch was conducted last September and the last three flights are scheduled during FY 1965 and FY 1966. These last three flights, which will place micrometeoroid detection systems into orbit, will complete the Saturn I series of launches.

The Saturn I program has made a significant contribution to the development of launch vehicles with substantially increased payload capability. The first stages of the Saturn I and IB vehicles have similar basic structural configurations and propulsion systems.

The first stage, S-I, was developed and produced by the Marshall Space Flight Center and the Chrysler Corporation. The second stage, S-IV, was

developed and produced by the Douglas Aircraft Company. The Rocketdyne Division of North American Aviation and Pratt & Whitney Aircraft developed and produced the H-1 and RL-10 engines, respectively, for the first and second stages. Through FY 1963 a total of $547.2 million had been obligated. FY 1966 funds provide for engineering services, materials, propellants, launch pad refurbishment, data reduction, post flight analysis, and completion of final reports.

Saturn IB

	1964	1965	1966
S-IB stage	$49,106,000	$67,600,000	$75,300,000
S-IVB stage	32,743,000	47,000,000	73,300,000
Vehicle instrument unit	12,985,000	40,000,000	39,900,000
Ground support equipment	23,622,000	36,700,000	9,700,000
H-1 engine procurement	6,548,000	12,400,000	9,700,000
J-2 engine procurement	6,360,000	11,400,000	14,000,000
Vehicle support	15,453,000	41,050,000	47,800,000
Saturn IB/Centaur design studies	---	5,000,000	5,000,000
Total	$146,817,000	$261,150,000	$274,700,000

Through FY 1963 a total of $22.0 million had been obligated.

The two-stage Saturn IB is essentially an uprated version of the highly successful Saturn I. The Saturn IB is required as a test vehicle for Saturn V components, for basic development of the S-IVB stage which will be the third stage of Saturn V, and to provide the capability for earth-orbital flight testing of Apollo spacecraft. The first two launches will take place during FY 1966. The first stage, the S-IB, is a modified version of the first stage of the Saturn I, and is being developed by the Chrysler Corporation. The S-IB will be powered by an uprated set of eight H-1 engines, produced by the Rocketdyne Division of North American Aviation, and capable of developing approximately 1.6 million pounds of thrust. The Douglas Aircraft Company is developing the second stage, the S-IVB. This stage is similar in basic design to the S-IV stage of the Saturn I, with increased propellant capacity and replacement of the cluster of six RL-10 engines with a single J-2 engine, produced by Rocketdyne. Payload capability for the first five Saturn IB flight vehicles will be about 32,000 pounds, while the payload capability for all remaining Saturn IB vehicles will be approximately 35,000 pounds.

S-IB Stage

Development of the S-IB Stage was started in FY 1963. FY 1964 development had progressed to the point where two flight stages were in manufacturing

and long lead-time hardware for two additional flight stages was procured. During FY 1965, the first two flight stages will be static tested; fabrication and assembly of the third flight stage will be completed; and assembly of the fourth flight stage will begin. In addition, parts qualification testing to assure systems reliability will be continued and long lead-time hardware for five additional flight stages will be procured.

Major effort in FY 1966 will be centered on ground and flight testing. During FY 1966, the first two flight stages will be launched; two additional flight stages will be delivered; and fabrication, assembly and checkout will be completed on the fifth and sixth flight stages. By the end of the fiscal year, checkout operations for the seventh flight stage and assembly operations on the eighth flight stage will begin. Effort on the remaining flight stages will be initiated by the end of the fiscal year. FY 1966 funds will also be utilized to support launch activity at Kennedy Space Center.

S-IVB Stage

Developmental effort for the S-IVB Stage is being funded in the Saturn V project. Funds requested for the S-IVB Stage include the engineering design effort and modifications required to adapt the stage for use in the Saturn IB; the actual hardware used in the project; and the cost of accelerating development to make the stage available for the Saturn IB flight schedule. Battleship testing began in the last part of FY 1964. Fabrication of stages for the dynamic, structural, and facility checkout ground tests and production of the first three flight stages were also under way. The fabrication, assembly and checkout of the remaining ground test stages will be completed in FY 1965. In addition, fabrication, assembly, and checkout of the first and second flight stages will be completed and fabrication and assembly of the third and fourth flight articles will be in process. Procurement of long lead-time items for six additional flight stages will also be initiated during this fiscal year.

FY 1966 activity will be highlighted by launch of the first two flight stages, delivery of two additional flight stages to the Kennedy Space Center, and fabrication, assembly, and checkout of the fifth flight stage. In addition, fabrication and assembly of the sixth flight stage will be completed and checkout will be under way. During FY 1966 the seventh flight stage will be ready for checkout and the eighth and ninth flight stages will be in assembly. Effort on the remaining three flight stages will be initiated. FY 1966 funds will also be used for contractor personnel and spare parts to support launch activity at Kennedy Space Center and for support of stage testing at Sacramento, California.

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Vehicle Instrument Unit

The instrument unit contains the primary guidance, control telemetry, and measuring systems for the vehicle. The Saturn IB instrument unit has the same layout and components as the Saturn V instrument unit. FY 1964 funds provided for continuing design and development of Saturn IB peculiar equipment and procurement of long lead-time items for the first three Saturn IB units. During FY 1965, the first flight unit will be completed and assembled and fabrication of the second and third flight units will be under way. In addition, long lead-time procurement will begin for four additional flight units. During FY 1966, two instrument units will be used on Saturn IB flights. Two more flight units will be completed and delivered to Kennedy Space Center and the fifth unit will be in checkout. Efforts will continue on the sixth flight unit in the area of fabrication and assembly, while the seventh flight unit will be in the fabrication stage.

Ground Support Equipment

Based on a decision reached in March 1963, an automatic checkout system is being provided for the Saturn IB as a test unit for Saturn V checkout procedures. FY 1963 funding initiated development of a checkout prototype (breadboard). During FY 1964, the design effort was intensified and procurement was initiated. Additional engineering development and component testing for automatic checkout and associated equipment is being accomplished during FY 1965. In addition, electronic components for the breadboard for Launch Complexes 34 and 37B at the Kennedy Space Center are being delivered and procurement of the instrument unit checkout station will be completed. Outfitting of the west side of the static test stand at Marshall Space Flight Center will also be completed.

During FY 1966, the Mechanical Support Equipment (MSE) and Electrical Support Equipment (ESE) will be furnished for Launch Complex 37B. Additional engineering development and automatic checkout systems test units for complete automation will be continued for both the prototype and the launch complexes. Engineering effort will be provided throughout FY 1966 by the General Electric Corporation on the ESE and the Chrysler Corporation/ Space Division on the MSE.

H-1 Engine Procurement

FY 1964 funding provided for delivery of twelve engines and for procurement of long lead-time hardware for deliveries in FY 1965. The FY 1965 program included 42 engines to be delivered, and procurement of long lead-time hardware for engines to be delivered in FY 1966. FY 1966 funding covers delivery of 38 engines and procurement of long lead-time hardware for engines to be delivered in FY 1967. Estimates for all fiscal years include spares, support hardware and services, as well as propellants for acceptance testing.

J-2 Engine Procurement

FY 1964 funding provided for procurement of long-lead hardware for deliveries in FY 1965. FY 1965 funds cover eight engines to be delivered in FY 1965 and procurement of long lead-time hardware for engines to be delivered in FY 1966. FY 1966 funding covers seven engines to be delivered, and procurement of long lead-time hardware for engines to be delivered in FY 1967. Estimates for all fiscal years include spares, support hardware and services, as well as propellants for acceptance testing.

Vehicle Support

Vehicle support includes funds necessary to provide studies, services or equipment that are common to more than one stage or system of the vehicle. FY 1966 funding provides for engineering services; tooling and special test equipment; wind tunnel, dynamics and reliability tests; and fabrication services. The FY 1966 request will also fund communications, transportation, logistic support, propellants, expendable supplies, equipment, and launch pad refurbishment. Special studies will be supported in areas such as component failure analysis, Saturn guidance equation development, post-flight evaluation procedures, and stage and payload separation. Additional ground telemetry equipment, instrumentation, telemetry and GSE mating equipment will also be procured. In addition, FY 1966 funds will provide for contract administration, audit, quality assurance and inspection services performed by other Government agencies.

Saturn IB/Centaur Design Studies

The integration of the Centaur stage into the Saturn IB launch vehicle will provide an Earth-lunar transfer capability of 12,000 to 14,000 pounds and a Mars or Venus trajectory payload capability of approximately 9,500 pounds that will serve a variety of purposes, such as highly-eccentric, multiple-launch orbiting geophysical observatories, advanced technological satellites, and lunar and planetary missions. Fiscal years 1965 and 1966 funds will be used for design studies and supporting plans for use in initiating the hardware development involved in the subsequent test and production effort.

Saturn V

	1964	1965	1966
S-IC stage	$256,816,000	$235,356,000	$273,300,000
S-II stage	165,189,000	174,606,000	237,500,000
S-IVB stage	135,730,000	141,600,000	177,195,000
Vehicle instrument unit	54,522,000	81,000,000	84,243,000
Ground support equipment	16,281,000	62,716,000	87,677,000
F-1 engine procurement	41,000,000	68,100,000	99,000,000
J-2 engine procurement	29,150,000	57,965,000	87,800,000
Vehicle support	64,694,000	143,663,000	189,785,000
Total	$763,382,000	$965,006,000	$1,236,500,000

Through FY 1963 a total of $400.2 million had been obligated.

The Saturn V is a three-stage launch vehicle with the capability of placing a payload of approximately 280,000 pounds into low earth orbit and a payload of approximately 95,000 pounds into a translunar trajectory.

The Saturn V Project was approved in January 1962, following an extensive series of studies on vehicle configurations for the manned lunar landing program. The Boeing Company, Aerospace Division, was selected as the contractor for the first stage (S-IC); North American Aviation Inc., Space and Information Systems Division (S&ID), for the second stage (S-II); Douglas Aircraft Company, Missiles and Space Division, for the third stage (S-IVB); and International Business Machines, Federal Systems Division, for the Instrument Unit. The F-1 Engine used on S-IC Stage and J-2 Engine used on S-II and S-IVB Stages are being developed and manufactured by North American Aviation Inc., Rocketdyne Division. Work with North American was initiated in October 1961, with Douglas in December 1961, with Boeing in February 1962 and with IBM in May 1963. The F-1 and J-2 Engines are provided to the stage contractors as government furnished equipment.

S-IC Stage

The Marshall Space Flight Center, with Boeing's assistance, will assemble the first ground test stage and the first two flight stages at Huntsville, Alabama.

During FY 1962 and continuing into FY 1963, major effort was placed on design, facility planning, research studies and acquisition of tooling and test equipment. Component testing was started in FY 1963 and fabrication was initiated on the first ground test stages. FY 1964 activity

included the start of assembly of the All-Systems Stage, Structural Test Stage, and Dynamic Test Stage and the initiation of hot firing propulsion system tests with the F-1 Engine. In FY 1965, the assembly of all ground test stages is well underway, as well as the assembly of the first three flight stages. In addition, two major ground test programs, the All-Systems and the Structural, will begin in FY 1965. FY 1966 will be marked by continuation of All-Systems and Structural testing, initiation of Saturn V Dynamic testing, and start of checkout of Launch Complex 39 at Kennedy Space Center with the Facilities Checkout Stage. Manufacturing checkout on the first two flight stages is scheduled for completion and the first flight stage will enter the acceptance test phase. In addition, assembly of additional flight stages will be undertaken at the Michoud Plant in Louisiana.

S-II Stage

In fiscal years 1962 and 1963, the major S-II efforts were concerned with preliminary and detail designs, procurement of special tooling and test equipment, procurement of components for design verification and qualification testing, long lead-time hardware procurement for early ground test stages and start of assembly of the Battleship and Structural Test Stages. During FY 1964, fabrication and assembly continued on the Battleship and Structural Test Stages; and assembly of the All-Systems, Dynamic and Facilities Checkout Stages was initiated. During FY 1965, the Battleship Stage was completed and tests were begun. Structural Test Stages will also be completed and the Structural Test Program and assembly of the first flight stage will be initiated. FY 1966 will see the completion of the assembly of the All-Systems, Dynamic and Facilities Checkout Stages, the start of the All-Systems Stage and Dynamic Vehicle Test Programs and the facilities checkout of Launch Complex 39 at Kennedy Space Center. The first two flight stages will complete manufacturing checkout at Seal Beach, California and the first flight stage will enter the acceptance test phase at the Mississippi Test Facility. In addition, assembly of additional flight stages will be undertaken.

S-IVB Stage

Although the S-IVB Stage will also be used on the Saturn IB Vehicle, the common development costs are being funded by the Saturn V Program. As with the S-IC and S-II Stages, funding during FY 1962 and FY 1963 was used to provide design, facilities planning and tooling and procurement of long lead-time hardware. Qualification testing was also started during that period. In addition, fabrication of the Battleship and Structural Test Stages was started. During FY 1964 assembly of the Battleship and Structural Test Stages was completed and the Structural test program was initiated. Structural assembly of the All-Systems, Dynamic and Facilities Checkout Stages was also begun in FY 1964. In FY 1965, the decision was made to

modify the ground test program by deleting the All-Systems Stage requirement and using the hardware as a Facility Checkout Stage. These ground test stages are scheduled to be completed in time to support the Saturn IB requirements. The Battleship test program has also been initiated. Ground Support Equipment for automatic checkout of S-IVB stages is to be completed, and assembly of the first two flight stages has been started in FY 1965.

FY 1966 will see the initiation of Saturn V Dynamic Testing at the Marshall Space Flight Center and checkout of Launch Complex 39 at Kennedy Space Center with the Facilities Checkout Stage. Also during FY 1966, manufacturing checkout of the first two flight stages is scheduled for completion at Huntington Beach, California, in preparation for acceptance test at the Douglas Sacramento, California, Test Site. Assembly of additional flight stages will also be undertaken during FY 1966.

Vehicle Instrument Unit

The vehicle instrument unit includes a structural system, environmental system, guidance system, control system, electrical system, and telemetry and measuring systems. The Saturn V instrument unit is being developed by the Marshall Space Flight Center; flight units will be assembled by International Business Machines (IBM). The major guidance components are provided by the Bendix and IBM corporations. Fiscal year 1962 and 1963 funds provided for initial design, component testing and a continuation of guidance system research and development, based on experience with the Saturn I project. In FY 1964, design and engineering of components continued and structural fabrication of the first three ground test units, system test, and facilities checkout were completed. The procurement, fabrication, and acceptance testing of components is being continued during FY 1965. Structural and vibration testing is under way. The assembly of the facilities checkout structure, flight systems, and vibration test units is also scheduled for completion. During FY 1966, vibration and structural testing will be completed and flight systems testing will be initiated. Saturn V Dynamic testing with the Dynamic Test Unit and checkout of Launch Complex 39 at Kennedy Space Center with the Facilities Checkout Instrument Unit will also be started. Assembly of the first two flight units will begin and the first flight unit is scheduled to be completed during FY 1966.

Ground Support Equipment

Ground Support Equipment (GSE) consists of non-facility hardware required to functionally check out assembled Saturn V vehicles. Fiscal year 1964 and 1965 funds were used for design and initiation of long lead-time procurements of mechanical and electrical checkout equipment for use at Launch Complex 39. In addition, fabrication of a prototype set of equipment (Breadboard) was begun and checkout equipment was procured for

the first facility checkout at Complex 39. Funds were also used to develop and procure special test equipment and components, such as hardware for the Umbilical/Swing Arm Test Facility.

In FY 1966, the Saturn V breadboard is scheduled to become operational and delivery, installation, and checkout of equipment is scheduled to be completed at Launch Complex 39 for the first Saturn V launch operation. The General Electric Company is under contract for design, fabrication, and support of the vehicle electrical support equipment. The first delivery is scheduled for October 1965, and FY 1966 is planned as the peak year for manufacture, delivery, and checkout of electrical support equipment for Launch Umbilical Towers and Launch Control Centers numbers 1 through 3. In the mechanical support equipment area, the Boeing Company will follow through on a make-or-buy basis to assure the complete provisioning and integration of all vehicle mechanical support equipment. The Boeing Company will also operate the Saturn V Equipment Management System to provide a master equipment records system for all Vehicle Ground Support Equipment. The Radio Corporation of America will complete the delivery of necessary computer systems, together with initiation of maintenance and support operations. FY 1966 will also mark the final delivery by Sanders Associates of the display systems required for Launch Complex 39 checkout operations.

F-1 Engine Procurement

FY 1965 funding provides for delivery of 17 engines and procurement of long lead-time hardware. FY 1966 estimate provides for delivery of 23 engines and procurement of additional long-lead hardware. These funds also cover procurement of spares, support hardware, services and propellants for acceptance testing of the engines scheduled for delivery.

J-2 Engine Procurement

FY 1965 funding provides for delivery of 21 engines and procurement of long lead-time hardware. The FY 1966 estimate provides for delivery of 41 engines and procurement of additional long-lead hardware. Funds in both fiscal years also cover spares, support hardware, support services and propellants for acceptance testing of the engines scheduled for delivery.

Vehicle Support

Vehicle support funds are required to provide services and equipment that are common to more than one stage of the vehicle. Fiscal years 1964 and 1965 funding includes instrumentation, recording and data reduction equipment for the Saturn V Dynamic Test Stand at Marshall Space Flight Center; developmental and operational transportation costs which include use of marine vessels and aircraft for movement of stages and outsize cargo; activation of the Mississippi Test Facility; operation of the Slidell Facility; range safety and tracking devices; propellants, equipment and

engineering support associated with vehicle checkout at Kennedy Space Center; computation services; engineering services; quality control and inspection, contract administration, audit and property administration services by other Government agencies; a wide spectrum of developmental testing including categories such as (1) determination of bending modes and resonant frequencies of Saturn V, (2) liquid hydrogen and liquid oxygen propellant feed systems, (3) welding techniques. Also included in vehicle support is an extensive Systems Engineering and Systems Integration effort which insures proper interface control of all stages, systems and structures.

In FY 1966 testing of S-IC and S-II Stages will begin at the Mississippi Test Facility necessitating increases in plant and technical support activities at that location. Vehicle support will also include funding of propellants used in the testing of these stages. Particular emphasis will be placed on the activation and operations of the Dynamic Test Stand at Marshall Space Flight Center. Transportation requirements will increase consistent with the delivery of more stages. Systems Engineering and Systems Integration functions will be intensified to their planned peaks. Other efforts will include vehicle flight control systems studies; reliability programs; acoustical environmental determination; ground wind load tests; intensified qualification testing and vehicle propellant blast hazard testing.

Engine Development

	1964	1965	1966
H-1 engine.....	$11,531,000	$4,800,000	$4,800,000
RL-10 engine.....	15,022,000	14,400,000	1,900,000
F-1 engine.....	61,954,000	54,400,000	52,500,000
J-2 engine.....	48,284,000	46,202,000	45,500,000
Propellants and related engine support.....	29,209,000	33,598,000	36,000,000
Total.....	$166,000,000	$153,400,000	$140,700,000

Through FY 1963 a total of $319.0 million had been obligated.

Funds in this project provide for the development of engines to be used in the Apollo Program. Procurement of the engines included in the Saturn class vehicles is funded under the appropriate launch vehicle project.

H-1 Engine

The H-1 engine, which is being developed by the Rocketdyne Division of North American Aviation, Inc., is used in clusters of eight per stage to propel the first stages of the Saturn I and Saturn IB vehicles. This engine produces up to 200,000 pounds of thrust using liquid oxygen and RP-1 (kerosene) as propellants.

Development of the H-1 engine was initiated by the Department of Defense in September 1958 as a 165,000 pound-thrust improved version of the Thor-Jupiter engine. The responsibility for development of this engine was transferred to the NASA in 1960. The 165,000 pound thrust engine was used successfully in the first four Saturn I launches. A 188,000 pound thrust engine, up-rated for used in the Block II Saturn I vehicle, has been used in three successful Saturn I flights and will be used in the remaining three flights. A 200,000 pound thrust version is being developed and will be used in all Saturn IB vehicles. Although the H-1 engine has been flown successfully at the 165,000 and 188,000 pound thrust levels, certain components required modification to assure reliable performance at higher thrust levels. In particular, the nickel thrust chamber tubes have been replaced by stainless steel tubes to compensate for reduced service life caused by the increase in thrust and chamber pressure required by the up-rating of the engine.

Development of a 200,000 pound thrust version of the engine for the Saturn IB is necessary to insure attainment of the required payload capability. This additional development effort began in FY 1964 and has continued in FY 1965. The FY 1964 effort included a complete stress analysis of critical engine components at increased flight loads created by the higher engine thrust operating level, and a program of engine tests to determine operating limits. Only those components found to be marginal by the stress analysis and 200,000 pound thrust level testing were redesigned. The FY 1965 up-rating effort consists of a development and testing program, involving approximately 1,000 ground tests and requiring 18 engines through complete engine **qualification** at the 200,000 pound thrust level by the end of the fourth quarter of fiscal year 1965. In FY 1966, the development program will consist of launch support, testing, flight evaluation, and support of the production program. This effort includes maintaining the capability for design and development, approximately 250 ground tests, and retrieving, evaluating, and reporting data evolved from the Saturn I and IB flights.

RL-10 Engine

The RL-10 engine is being developed by Pratt & Whitney Aircraft for use in the second stage (S-IV) of the Saturn I vehicle and the Centaur stage of the Atlas-Centaur vehicle. The S-IV Stage uses a cluster of six

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engines and the Centaur a cluster of two engines. Each engine, using liquid hydrogen and liquid oxygen as propellants, develops 15,000 pounds of thrust.

Development of the RL-10 A-3 engine was initiated by NASA in 1961, and was a follow-on program to the RL-10 A-1 engine program initiated by the Air Force in 1958. The RL-10 A-3 engine successfully completed its Preliminary Flight Rating Tests (PFRT) in July 1962 and its Qualification Tests in September 1964. RL-10 engines have flown successfully in three Saturn flights and three Centaur flights.

In FY 1964, the Centaur Program Office, located at Lewis Research Center, Ohio, requested that the RL-10 engine be modified to provide an increased specific impulse that would enable Centaur to meet its payload requirements. This effort, initiated in April 1964, requires the development of a recontoured thrust chamber, an increased performance injector, and a modified turbopump. FY 1965 activity will include completion of initial design and fabrication, and initial testing of prototype hardware.

The RL-10 engine development effort in FY 1966 is primarily devoted to providing an increased specific impulse for Centaur payload requirements. The Manned Space Flight FY 1966 request will be used to support the last Saturn I launch and provide for post-flight evaluation of Saturn I flight data.

F-1 Engine

The F-1 engine, which is being developed by the Rocketdyne Division of North American Aviation at Canoga Park, California, will be used in a cluster of five engines in the first stage of the Saturn V vehicle. Each engine is capable of producing 1,500,000 pounds of thrust using liquid oxygen (LOX) and kerosene (RP-1) as propellants.

Development of the F-1 engine was begun in January 1959 when a contract was awarded to Rocketdyne for development, through Preliminary Flight Rating Tests (PFRT), of a 1,500,000 pound thrust LOX-RP-1 rocket engine. In June 1961, the test firing of the first F-1 engine was accomplished. Since that time, F-1 engines have achieved rated thrust and duration (150 seconds) runs well over 100 times. During the latter part of calendar year 1962 combustion instability reached serious proportions. This instability problem was attributed to difficult detailed design problems associated with extremely large injectors and turbopumps. A task force composed of NASA, Department of Defense, University, and Industry experts was assigned to attack this problem and recommend solutions. This effort has resulted in several injector designs which produced stable combustion. However, a substantial program of testing must still be accomplished to ensure that other

engine requirements, such as performance, durability, and pressure drop, are not compromised by an injector of satisfactory stability. The final release of the design of the Flight Rating Test (FRT) engine was made in the first quarter of FY 1964, and testing is scheduled for completion in the third quarter of FY 1965.

In FY 1965 and again in FY 1966, approximately 350 separate engine system ground tests will be performed. These tests are part of the approximately 1,500 planned engine system tests that must be performed to qualify the engine for manned flight. Major efforts programmed for FY 1966 include: completion of component qualification; continued demonstration of the engine's ability to recover from induced combustion instability and perform at a specific impulse compatible with vehicle requirements; and release of final design of a qualification engine. To maintain this extensive testing program in fiscal year 1966, building of five new engines, rebuilding of 14 engines, and production of the equivalent of 10 engines in test components are scheduled.

J-2 Engine

The J-2 engine is being developed by the Rocketdyne Division of North American Aviation at Canoga Park, California, for use in upper stages of the Saturn IB and Saturn V vehicles. This engine, using liquid hydrogen and liquid oxygen as propellants, is designed to develop 200,000 pounds of thrust. In the Saturn IB vehicle, one J-2 engine will be used in the second stage (S-IVB). In the Saturn V vehicle, a cluster of five J-2 engines will be used in the second stage (S-II) and one J-2 engine in the third stage (S-IVB).

Development of the J-2 engine began in September 1960 with the award of the development contract to Rocketdyne. In October 1962, the engine achieved its first full thrust (250-second duration) run. The first 500-second duration run necessary to meet the finalized requirements of the Saturn IB and V vehicles was successfully conducted on November 27, 1963. Other accomplishments during FY 1964 included demonstration of gimbal capability, nominal performance, the propellant utilization system and the first PFRT-type engine test.

During FY 1965, approximately 500 ground tests will be performed. Additional accomplishments include completion of PFRT and demonstration of engine restart. Start and cutoff impulse and thrust alignment and vibration limitations will also be demonstrated by the end of the fiscal year.

In FY 1966, approximately 500 ground tests will be performed. Testing for qualification of the fuel turbopump, gas generator, LOX turbopump, engine controls and engine flight instrumentation, started in FY 1965

and is scheduled to be completed in FY 1966. The J-2 engine qualification Test Program will be conducted during FY 1966. In the process of accomplishing these tests, eight new engines will be built and 12 engines will be rebuilt.

Propellants and Related Engine Support

Propellants and ancillary fluids required by the contractors in their test programs are procured and provided as Government furnished material. The primary products used are liquid oxygen, liquid hydrogen, kerosene, liquid nitrogen and helium. Based on a NASA/DOD agreement, the Air Force procures and delivers all required propellants, with the exception of liquid hydrogen. NASA procures liquid hydrogen from private producers. The FY 1966 Engine Development Test Program will require approximately 205,000 tons of liquid oxygen, 13,000 tons of liquid hydrogen, 8 million gallons of kerosene, 44,000 tons of liquid nitrogen, and 50 million cubic feet of helium. Engine support funds in FY 1966 will provide for services, supporting research and equipment associated with contractor effort. Engine support will also fund contract administration, audit, property administration and quality and inspection services by other Government agencies.

Apollo Mission Support

	1964	1965	1966
Systems engineering.....	$28,877,000	$41,000,000	$41,000,000
Launch operations and instrumentation.....	22,759,000	20,572,000	37,245,000
Mission control systems.....	47,530,000	38,500,000	36,400,000
Apollo space operations.....	3,663,000	25,350,000	37,000,000
Supporting development.....	30,272,000	53,900,000	70,600,000
(Apollo extension systems)...	---	(14,000,000)	(48,000,000)
Total.....	$133,101,000	$179,322,000	$222,245,000

Through FY 1963 a total of $107.1 million had been obligated.

Apollo mission support provides for the supporting development and program-wide technical effort; and equipment and technical and engineering effort for the development and maintenance of the launch and flight operations capability necessary to accomplish the Manned Lunar Landing program.

Systems Engineering

This activity covers program-wide technical review and analysis, in addition to technical support needed for the successful accomplishment of Apollo. This effort gives assurance that program functional and performance requirements are compatible with mission objectives. FY 1965

and prior fiscal year funding provided for efforts which supported mission description and planning, test objectives and integration, program and systems specification, guidance and navigation studies, including trajectory analysis, communications and tracking networks, checkout effectiveness, and documentation. FY 1966 funding provides for an extension of most of the analyses. Emphasis will shift to reliability studies, including mission safety analysis, mathematical model development and failure effects analysis, as the hardware program progresses. The principal systems engineering contractors are Bellcomm and General Electric.

Launch Operations and Instrumentation

Funds for Launch Operations provide for contractor supported services in the Merritt Island Launch Area (MILA), including major items of equipment required to support these contractors. In addition, the funds also cover reimbursements to the Air Force for support services. Fiscal Years 1965 and 1966 requirements are based on an accelerated program to support Saturn V and the Manned Lunar Landing Program, and Saturn IB launches from Complex 34. Apollo activities at the Kennedy Space Center are increasing as construction of facilities at MILA progresses toward completion.

FY 1965 funds provided for Launch Instrumentation improvements to support the Saturn launch vehicle development program. Telemetry, tracking, facility and environmental measurement, and other instrumentation systems were expanded and improved. For example, additional tracking receivers were implemented to achieve greater system accuracy, and the data reduction system was augmented to provide near real-time performance.

During FY 1966, continued expansion and improvement of Launch Instrumentation systems are required because of increasing complexity of launch vehicles and the activation of additional launch facilities. Specific improvements include increased efficiency and reliability in handling digitized telemetry data, development of a close-in prototype tracking system, expansion of the timing distribution system, development of a large-screen display system, expansion of the flight TV system to dual-pad capability, and expansion of facility and environmental instrumentation. Funds are also required for equipment operation, maintenance and rental, and for prototype fabrication.

Mission Control Systems

Mission Control Systems include development, operation, and maintenance of the Mission Control Center (MCC) at the Manned Spacecraft Center and associated interfaces at the Kennedy Space Center. It also provides for the technical integration of the MCC with the worldwide Manned Space Flight Network and for the compatibility testing of spacecraft electronic systems with the entire Ground Operational Support System (GOSS).

Construction of the MCC building is complete. Four large digital computers have been installed and checked out, and are being used for mission monitoring, computer program testing, and operational planning. An additional computer system is to be installed in FY 1965. This equipment must be further augmented in FY 1966 to provide sufficient capability for the simulation, operational, and programming activities required for Gemini and Apollo missions. Technical systems have been installed and will be used for mission monitoring during FY 1965. The integrated checkout of the systems within the MCC and its interface with the worldwide network for single vehicle earth-orbital Gemini missions will be completed during FY 1965.

FY 1966 funds are required to perform integrated MCC checkout for Gemini rendezvous and earth-orbital Apollo missions, to accomplish necessary modifications to equipment as a result of mission experience, for testing of the Apollo Launch Data System (interface equipment at Cape Kennedy), for continued rental of computing and teletype equipment, and for operation and maintenance during scheduled missions. FY 1966 funds are also needed for the compatibility testing of Saturn IB/Apollo Spacecraft electronic systems with the MCC and the Manned Space Flight Network.

Apollo Space Operations

These funds provide for flight crew, pre-flight and flight operations support for the Apollo program.

Flight Crew Operations support all phases of crew training and the integration of crew activities with the engineering design of the Apollo spacecraft and related mission planning activities. Accomplishments planned during FY 1966 include delivery and checkout of the command module mission simulator and procurement of two lunar landing training vehicles (in the LEM configuration). FY 1966 funds will also be used for flight training and pilot qualification and for modification of the Gemini docking trainer into the Apollo configuration.

Pre-flight operations consist of the preparation, checkout and prelaunch activities for the Apollo spacecraft and the auxiliary systems relating to the launch.

In FY 1965, activation of checkout facilities at MILA will be continued to insure adequate checkout capability for the first Apollo spacecraft to be launched from Cape Kennedy on a Saturn IB vehicle in FY 1966. Activation of checkout facilities for the Apollo spacecraft will require the major portion of the funds requested for FY 1966.

Flight operations include mission planning and analysis, flight control, and recovery operations.

Mission planning and analysis covers the development and optimization of all operational trajectories for Apollo space flight missions. Funds are needed in FY 1966 to continue contract support in the development of real-time computer programs for the Apollo missions; development of mathematical techniques required for trajectory programs; and modification of computer equipment and continuation of mission analyses begun in prior years.

Flight Control includes the development of detailed flight control plans, training of flight controllers at the Manned Spacecraft control centers and at Manned Space Flight Network remote stations for ground monitoring; and, as necessary, control of the Apollo missions. FY 1966 funds are required for continuation of contractor support personnel for flight monitoring; remote-site operation; determination of flight control procedures and flight controller training; and purchase of auxiliary flight controller equipment.

Recovery operations include planning and operational supervision of all recovery support services for the Apollo missions. FY 1966 funds will support the Department of Defense recovery forces required for Apollo flights. These DOD services include deployment of ships, aircraft and communications equipment and providing a capability of spacecraft location in the event of contingency landings. In addition, funds are required for the test, evaluation, and procurement of retrieval and location equipment issued to Department of Defense recovery forces and modification of existing equipment.

Supporting Development

Supporting Development consists of individually selected engineering tasks primarily supporting the Apollo program. Included are studies and hardware developments which provide increased assurance of meeting the performance and reliability requirements of Apollo missions, including both early manned lunar landing missions and alternate missions using the Apollo hardware. Supporting Development tasks are related to the spacecraft, launch vehicle, propulsion, and launch operations hardware programs of the Manned Space Flight Centers, and provide alternate and improved systems, subsystems, components and materials which can be phased in on a scheduled basis.

Alternate system developments provide for substitute hardware, of other designs meeting approved specifications, which can directly replace present systems where development problems in the mainstream program have been encountered or may occur. Improved system developments provide for hardware designs offering increased performance which may be required to complete an approved mission objective.

FY 1966 Supporting Development tasks will continue current efforts to develop alternate and improved systems and subsystems for the early lunar landing configuration of the Apollo spacecraft and the Saturn IB and V launch vehicles, stages, instrument units, and ground support equipment. Typical tasks are: Alternate Structures for use in Saturn IB and Saturn V vehicles; Improved Propellant Tank Manufacturing Techniques; Thermal Protection Materials Improvement; Improvement of Saturn Retro Motors; Development of Alternate Welding and Weld Inspection Techniques for Saturn IB and Saturn V Vehicle Structures; Miniaturization of Control System Circuits and Components.

Supporting Development funds for FY 1966 will also be utilized for identification and advanced development of long lead-time Apollo spacecraft modifications of subsystems and components, of in-flight and lunar surface experiments, and for final design which would be necessary prior to undertaking flight hardware and experiments development.

Apollo Extension Systems would utilize the capabilities inherent in the Apollo program to extend the fund of knowledge and operational experience by the exploration and scientific investigation of near-earth space and the moon itself. To utilize this capability and implement space exploration objectives, detailed program definition is being accomplished. This preliminary effort paves the way for undertaking those advanced development activities which will be required for timely Apollo program extensions.

Advanced development and final design activities during FY 1966 are to be devoted particularly to modifications of electrical power, reaction control and life support subsystems and components necessary to extend their capability to 4 to 6 weeks in earth orbit and up to 2 weeks lunar surface staytime. Early identification and advanced development of experiments is essential to the preparation of flight mission plans. Categories of experiments already being identified for advanced development funding are those related to the investigation of zero gravity and artificial gravity; to meteorology; to geological and geophysical experiments related to the earth and to the lunar surface; to astrophysics; and to the performance of tests, in the space environment, of systems, subsystems and components for future missions. Particular emphasis during FY 1966 will be placed on the advanced development of the actual devices proposed for the conduct of experiments during the early mission opportunities. Mockups and prototypes and, in some cases, flight articles of experiment packages will be fabricated to establish their relationship to crew activities and their location in the spacecraft and to determine their power, weight and volume requirements which are important considerations in arriving at final subsystems, components and experiments design.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1966 ESTIMATES

OFFICE OF MANNED SPACE FLIGHT — ADVANCED MISSIONS PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The objective of the Advanced Missions Program is to examine advanced manned space flight mission concepts. Included are: logical extensions of the national space capability through analysis of present hardware systems for growth potential; development of requirements for future systems; provision of guidance for research and technology activities; provision of technical information and cost data upon which future program decisions can be based; and initiation of the definition, preliminary design and specification of probable future missions.

SUMMARY OF RESOURCES REQUIREMENTS:

	1964	1965	1966
Advanced missions program.....	$21,200,000	$26,000,000	$10,000,000
Distribution of Program Amount by Installation:			
John F. Kennedy Space Center, NASA.....	$400,000	$450,000	$400,000
Manned Spacecraft Center.....	3,650,000	8,200,000	1,400,000
Marshall Space Flight Center..	9,245,000	7,950,000	5,300,000
Langley Research Center.....	2,017,000	1,700,000	1,700,000
NASA Headquarters.....	5,798,000	7,700,000	1,200,000
Western Operations Office.....	90,000	---	---

BASIS OF FUND REQUIREMENTS:

	1964	1965	1966
Advanced studies.....	$21,200,000	$26,000,000	$10,000,000

Advanced studies enable NASA to direct its future manned space flight program planning. Specific areas of investigation include: manned earth orbital, lunar, and planetary missions. During FY 1965, major emphasis is placed on program definition studies of Apollo Extension Systems (AES). These studies are designed to exploit the technology and capability being developed in the Apollo Program to extend the orbital and lunar stay-time beyond current Apollo requirements. The AES will utilize only basic Apollo-type hardware. The FY 1966 requirements reflect a major reduction from the FY 1965 level because of the evolvement of extended Apollo systems from the definition and preliminary design phase to a selective study and advanced component development phase.

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Manned earth orbital mission studies completed to date have established the feasibility of earth orbiting space stations. Two concepts have been selected for further definition. One is based on the utilization of Apollo systems to conduct extended earth orbital missions, and the other is based on the development of a modular space station capable of serving a variety of needs over an extended period.

The FY 1966 effort will be directed primarily in two areas. The first is to continue to identify and evaluate potential experimental payloads for manned flights which could be used to obtain beneficial returns from space exploration. These payload studies include methods of remotely sensing the condition of the earth's atmosphere for use in weather prediction; methods of observing the earth's surface for use in cartography and in resource utilization planning; and optical and radio telescopes for use in astronomy and astrophysics. The second area of effort is continued study and refinement of space station concepts to accomplish extended earth orbital missions. With the definition of Apollo extensions, the relationship between these missions and extended earth orbital missions can be studied particularly in terms of in-flight testing of subsystems, components and operations in the process of defining a true space station.

Manned lunar mission studies have been directed toward identifying and defining the most effective systems to support lunar exploration missions following the initial Apollo landings. Studies are now underway to define systems to support initial lunar orbital missions and surface reconnaissance operations following the manned lunar landing and to explore systems suited to more extensive lunar operations and scientific exploitation of the moon.

Through the use of the extended Apollo systems, it will be possible to demonstrate capabilities (1) to acquire scientific lunar data from a manned lunar orbiting spacecraft using specialized cameras, non-photographic sensors and orbit-to-surface probes; and (2) to conduct extensive geological and geophysical surveys of selected areas on the moon to provide a phased expansion of the data obtained from earlier NASA missions. The principal system being investigated for subsequent, more extensive operations, is the Lunar Exploration System for Apollo. (LESA). LESA is a flexible system which, in its growth capability, could provide a lunar base. It is conceived as a modular set of lunar surface hardware which can be tailored quickly to support a wide range of lunar exploration missions. The system includes surface vehicles, shelters, nuclear power plant, appropriate support equipment, and regenerative systems to reduce supply requirements. From the family of LESA modules, sets of equipment could be assembled to meet the needs of several astronauts for lunar surface missions of either short or long duration.

Manned planetary mission studies to date have established the feasibility of a number of mission modes and system concepts, however the complexity of these missions and the extensive resources required for such an undertaking make it imperative that a comprehensive study program be accomplished during the next few years before program initiation is considered. The planetary mission studies in FY 1966 will place primary emphasis on more

detailed analysis of system feasibility and concepts. Studies of scope, objectives, schedules and cost will be necessary to select the most promising concepts for detailed engineering analysis in later years.

In addition to the studies of manned missions in earth orbit, to the moon, and to the nearby planets, a number of studies will be made to define potential launch vehicles for use in each of the mission areas. These vehicle systems include improved versions of vehicles presently under development, larger vehicles utilizing the major new propulsion systems under development, and vehicles embodying reusable concepts.

OFFICE OF ASSISTANT ADMINISTRATOR FOR TECHNOLOGY UTILIZATION

TECHNOLOGY UTILIZATION PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The primary objective of the Technology Utilization Program is to provide for the widest practical and appropriate dissemination to industry of information concerning NASA activities and their results. The NASA program offers U. S. industry unique opportunities to improve existing industrial techniques and to develop new products and methods. It is the purpose of Technology Utilization to assist in identifying quickly these many opportunities and to insure their expeditious dissemination for the benefit of American industry, and ultimately the individual U. S. citizen. Technology Utilization also includes projects to study and evaluate those factors which will improve our understanding of the implications of the space program.

SUMMARY OF RESOURCES REQUIREMENTS:

	1964	1965	1966
Identification: Technology searches and surveys.....	$1,090,000	$1,300,000	$1,400,000
Evaluation of innovations.....	580,000	700,000	700,000
Regional information dissemination projects.....	950,000	1,850,000	1,900,000
Analysis of technology transfer; research and development management; the long range implications of the space program.....	880,000	900,000	1,000,000
Total.....	$3,500,000	$4,750,000	$5,000,000

Distribution of Program Amount by Installation:

NASA Headquarters.....	$3,500,000	$4,750,000	$5,000,000

BASIS OF FUND REQUIREMENTS:

One of the important elements of the technology utilization program is the identification and reporting of new technology resulting from NASA activities. This is accomplished primarily by NASA personnel but in certain circumstances by specialists from research institutes, universities and industry. The identification and reporting of new technology also includes a state-of-the-art survey effort. This effort is organized around broad scientific

areas and disciplines. Surveys are now underway in a number of fields including inorganic coatings, tape recording and data processing, microelectronics, antennas, and membrane phenomena. To evaluate reported innovations for originality and potential value to industrial users, the technology utilization program utilizes the services of a number of industrial research institutions. Commercially oriented reports of these developments are then prepared and published in a number of formats. In FY 1966 the identification and evaluation efforts will be pursued at about the same levels as FY 1965.

In addition to the normal method of dissemination via libraries and mailing lists, seven pilot projects in regional information dissemination are being supported. These dissemination centers, in most instances, are operated by universities. Center personnel review, interpret and convert new technology to the industrial needs of participating organizations. Using the latest NASA capabilities (printed index journals, microfiche, computer tapes and programs, etc.) these centers provide pertinent technological information on a selective basis to industrial users. The Midwest Research Institute (MRI) pilot project was initiated in early FY 1962. MRI has employed a broad approach to dissemination serving more than 1000 firms. From this experience, MRI is now developing more intensive working relationships with selected firms using back-up computer support from the Aerospace Research Applications Center (ARAC) at Indiana University. The Aerospace Research Applications Center is now nearing the end of its second year of operation. This center charges companies a membership fee for the services the center offers. The three primary services are the Retrospective Search Service, the Selective Dissemination Service, and the Industrial Applications Service. All but two of the original 29 member companies have renewed their memberships and the center has considerably expanded its enrollment in the second year. During FY 1964, five centers in addition to MRI and ARAC were established. These are at Wayne State University (Detroit), the University of Pittsburgh, University of Maryland, the North Carolina Science and Technology Research Center and Southeastern State College (Durant, Oklahoma). All seven centers are pilot programs designed to implement those elements appropriate to the industrial needs of their respective areas. In addition to these seven centers, it is planned that several new pilot programs will be started with FY 1966 funds.

Beginning in fiscal years 1962 and 1963, a number of universities received grants for research in the management of research and development. At the University of California (Berkeley) an attempt is underway to establish a computer simulation of the process of scientific inquiry including literature search, information retrieval and analogous reasoning. At the Massachusetts Institute of Technology studies on complex problem solving, interpersonal conflict, multiple task assignments and decision making have been initiated. Other studies underway include research in contracting systems and procedures, project management, cost estimation and budgeting.

The impact of the space program upon the national economy particularly with respect to its effect upon the different geographic, industrial, and civilian sectors of the economy; upon national economic growth; and upon the alloca-

tion of scientific and engineering manpower has been studied within the Technology Utilization Program. A study recently started at the University of California (Los Angeles) is attempting to analyze the shifting geographic patterns of primary first-tier and second-tier contracting. Another study funded at Washington University (St. Louis) attempts to analyze the national impact of alternative assumptions concerning the level and composition of governmental spending streams with particular emphasis being laid upon the nature of the expenditures.

NASA expenditures have had a major impact on the economy of the Cape Kennedy area, especially on the functioning and development of local governmental units, school boards, planning boards, and utility services. This impact is being studied in both an empirical and a qualitative sense to learn the types and magnitude of the problems created by the space center build-up. In another case, NASA expenditures have stimulated rapid growth of a major scientific laboratory in Boulder, Colorado. Many changes in the economic base of the community, population, and local attitudes have resulted. A study now underway at the University of Colorado will analyze these changes in considerable depth throughout the community.

It is to be emphasized that the Technology Utilization Program at its present stage is still very much an experimental program. Future plans, therefore, call for careful review of every phase of the present Technology Utilization Program in order to determine the effectiveness of the current approaches which are being pursued. Future plans also call for feasibility studies of the numerous additional ideas generated by the Program, ideas which offer promising new avenues whereby new science and technology emanating from the space program can be more readily transferred to the non-space community.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

JOHN F. KENNEDY SPACE CENTER, NASA

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Summary	CF 4-2
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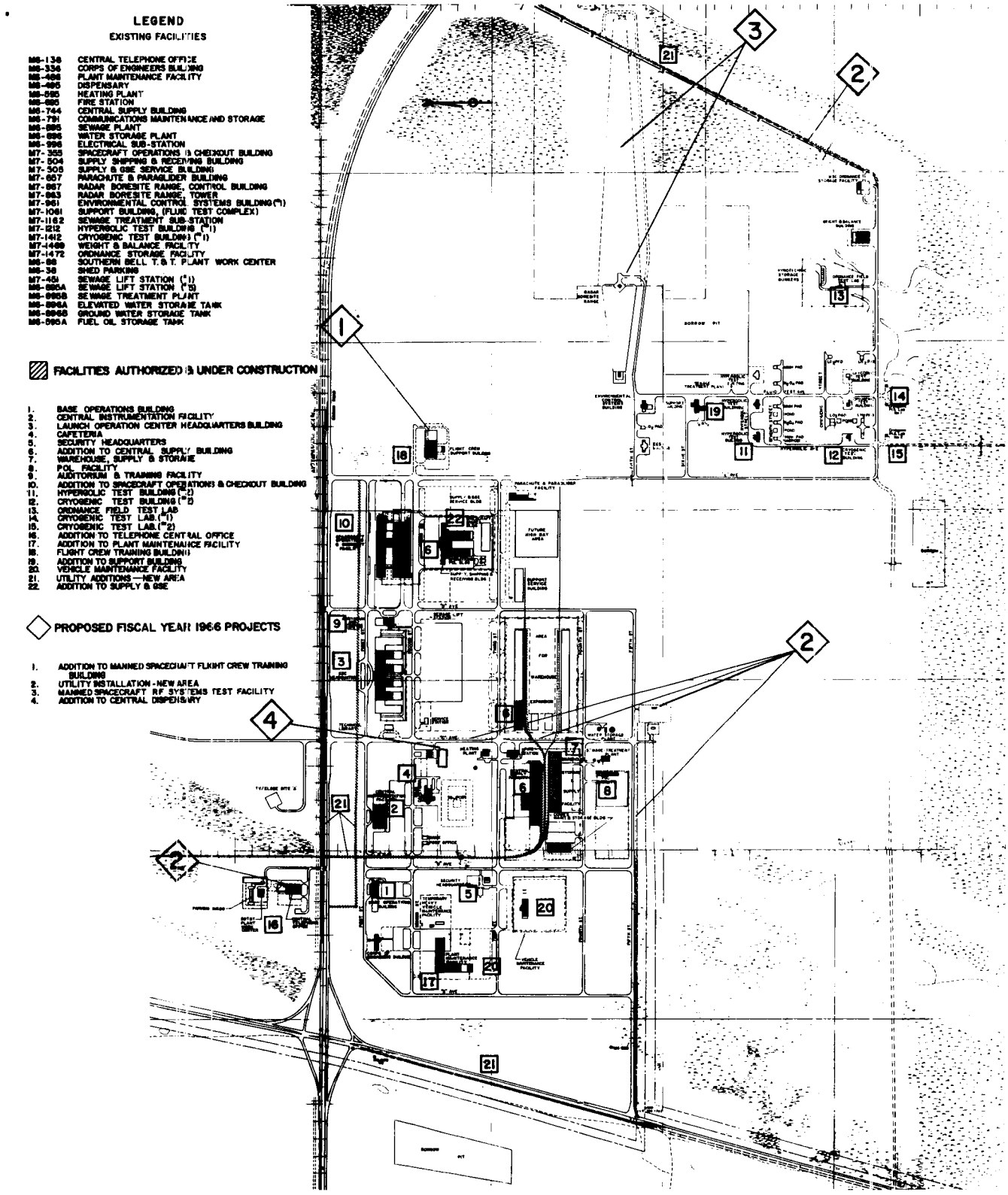
RF systems test facility	CF 4-3
Flight crew training building extension	CF 4-7
Extension to the medical facility	CF 4-10
Utility installations - New area	CF 4-13
Office of Space Science and Applications Project:	
Modification to launch complex 17	CF 4-17

JOHN F. KENNEDY SPACE CENTER

FISCAL YEAR 1966 ESTIMATES

LOCATION PLAN



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

(Dollars in thousands)

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

The mission of the John F. Kennedy Space Center, NASA, is to conduct overall planning and supervision of the integration, test, checkout and launch of NASA space vehicle systems at the Air Force Eastern Test Range 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	2,082	2,082
CONTRACTOR AND OTHER PERSONNEL	5,797	8,793	10,602
TOTAL ALL PERSONNEL	7,422	10,875	12,684

LAND	NO. ACRES
NASA-OWNED	88,743
OTHER GOVERNMENT AGENCY-OWNED	-
NON-FEDERAL *(Leases, easements)*	3,340
TOTAL LAND	92,083

TOTAL CAPITAL INVESTMENT *(Including NASA-Owned Land) (as of June 30, 1964)* $ 298,069.0

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YEAR	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
RF Systems Test Facility	MSF	69.0	1,374.0	-0-	1,443.0
Flight Crew Training Building Extension	MSF	2,453.0	1,425.0	-0-	3,878.0
Extension to the Medical Facility	MSF	390.4	598.0	-0-	988.4
Utility Installations - New Area	MSF	220.5	3,898.0	-0-	4,118.5
Modifications to Launch Complex No. 17	SSA	77.0	1,300.0	-0-	1,377.0
ALL OTHER PROJECTS		820,147.0			
TOTALS		823,356.9	8,595.0		

NASA FORM 1029 (REV. NOV 64) PREVIOUS EDITIONS ARE OBSOLETE.

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

RF SYSTEMS TEST FACILITY

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

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

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

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

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

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,216,000
Basic structure	Sq. Ft.	2,000	$29.90	59,800
Air conditioning	LS	---	23,400	23,400
RF absorbent material	LS	---	87,400	87,400
Site development	LS	---	875,000	875,000
Utilities	LS	---	170,400	170,400
Equipment				$158,000
Positioning equipment	LS	---	100,000	100,000
Intercommunication systems	LS	---	38,000	38,000
Cable	LF	3,500	5.71	20,000
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$1,374,000

PROJECT PURPOSE:

To provide a boresight range required for calibration and validation of the X-band radar used for rendezvous of the Apollo Command Module with the Lunar Excursion Module.

PROJECT DESCRIPTION:

This project will provide for design and construction of a manned spacecraft boresight range, which will consist of a fixed tower and an addition to the existing Gemini Radar Boresight Range Control Building. A flat level area between the fixed tower and the control building will be approximately 3,000 feet long, 150 feet wide at the fixed tower, and 500 feet wide at the control building. The surface levelness cannot vary by more than $\pm\frac{1}{2}$ inch. A concrete slab, approximately 20 feet square, will be located in front of the control building to support the positioning equipment for the Apollo spacecraft.

The fixed tower will be approximately 50 feet high and will accommodate positioning equipment for adjustment of the radar transmitter to the desired position.

The two story L-shaped addition to the existing control building will have an area of approximately 2,000 square feet. The structure will be of masonry construction, with a special rubberoid outer covering to provide proper absorbent qualities. The first floor will house an equipment room and air conditioning equipment. The second floor will house control and data read-out equipment for the testing and calibration of the radar.

PROJECT JUSTIFICATION:

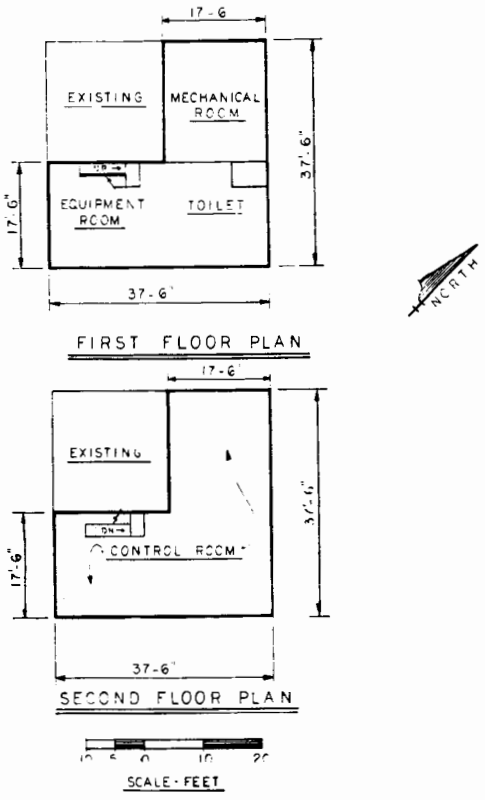
The X-band rendezvous radar system used to guide the Apollo Lunar Excursion Module to rendezvous with the Command Module, must be precisely calibrated or boresighted with each spacecraft prior to launch. The boresight accuracy, which must be within $\pm$ 2 milliradians, requires a range 3,000 feet long for proper calibration of the X-band systems. The existing Gemini Boresight Range, which operates in the L-band frequency region, is 1,000 feet long and not adequate for this purpose. This range cannot be extended because of existing structures and utilities. Boresighting of the Apollo radar system must be performed at Merritt Island as an integral part of pre-flight checkout operations to prevent possible misalignment due to transportation.

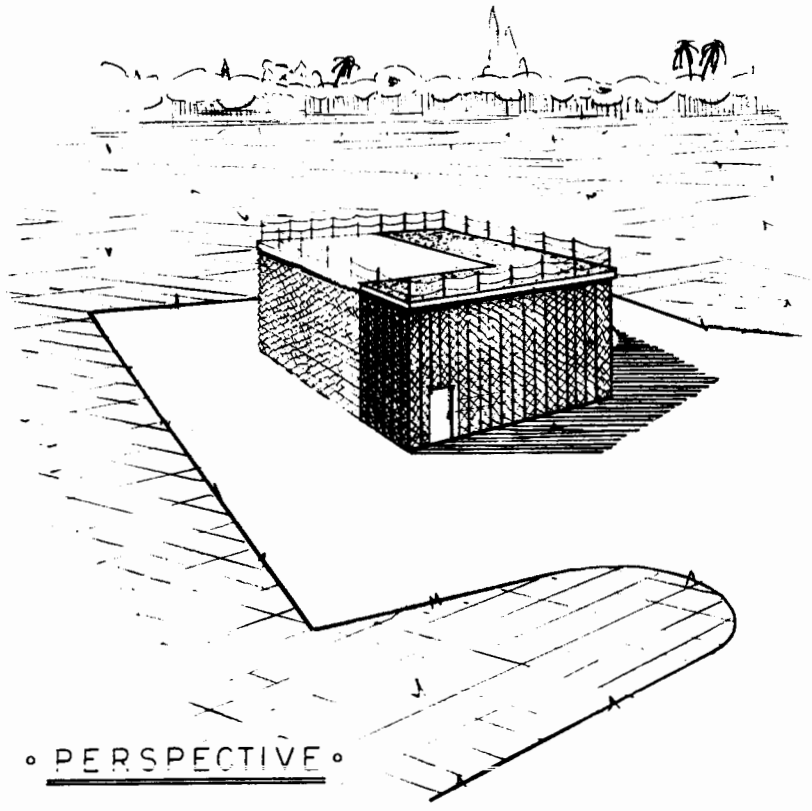
ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1966 ESTIMATES

RF SYSTEMS TEST FACILITY

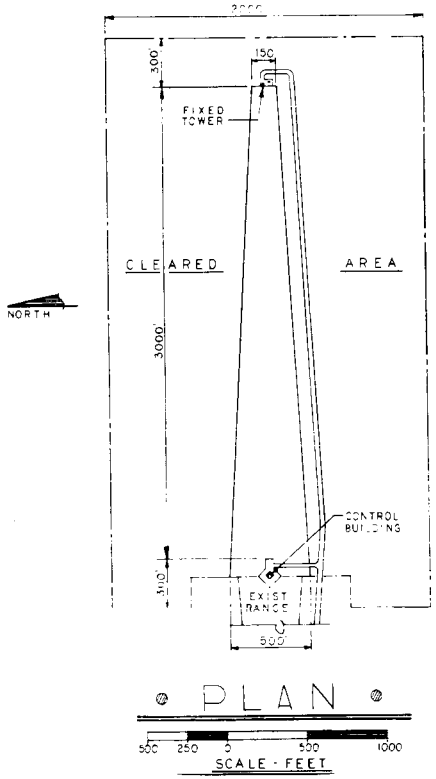


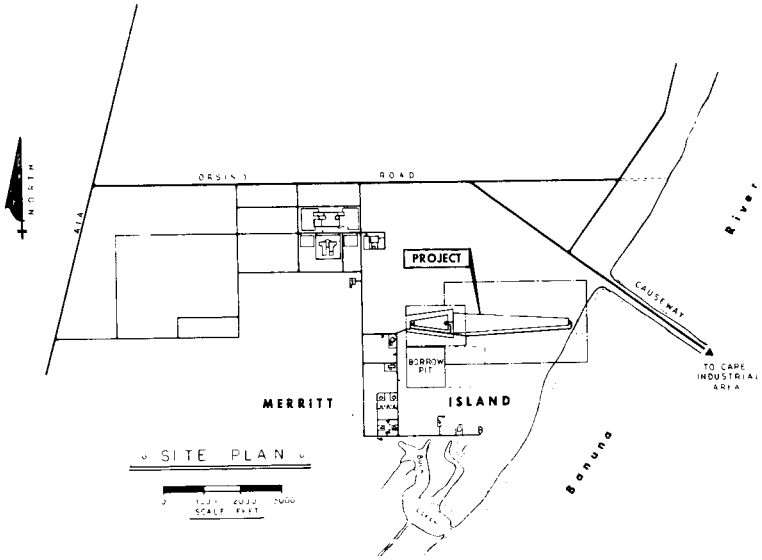


JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1966 ESTIMATES

RF SYSTEMS TEST FACILITY





CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

FLIGHT CREW TRAINING BUILDING EXTENSION

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

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

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

TYPE OF CONSTRUCTION PROJECT: Extension

FUNDING:

FY 1965 and Prior Years	$2,453,000
FY 1966 Estimate	1,425,000
Total Funding Through FY 1966	$3,878,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$989,300
Basic building structure	Sq. Ft.	17,640	$26.54	468,200
Air conditioning	LS	---	222,800	222,800
Emergency generator	LS	---	138,600	138,600
Site development	LS	---	35,000	35,000
Utilities	LS	---	124,700	124,700
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 and laboratory equipment	LS	---	45,700	45,700
Systems to connect power supplies, air conditioning and cabling systems for ground support equipment	LS	---	315,000	315,000

	Unit of Measure	Quantity	Unit Cost	Total Cost
Design	---	---	---	---
Fallout Shelter	---	---	---	-0-
		TOTAL		$1,425,000

PROJECT PURPOSE:

This facility will provide additional space required for increasing flight crew training capability for Apollo manned launches.

PROJECT DESCRIPTION:

This project provides for an extension to both the existing Flight Crew Training Building and the related equipment building. The two-story extension to the Flight Crew Training Building will be constructed of reinforced concrete and masonry curtain walls and will contain approximately 16,800 square feet. Approximately 5,500 square feet of high-bay area (30 feet high) will be used to house two mission simulators, and approximately 3,300 square feet of low-bay area (11 feet high) will be used for supporting computers, peripheral equipment and consoles. Approximately, 8,000 square feet will be utilized for shops, computer programming and service areas. The one-story extension of the equipment building will have masonry walls and will provide approximately 800 square feet of space.

PROJECT JUSTIFICATION:

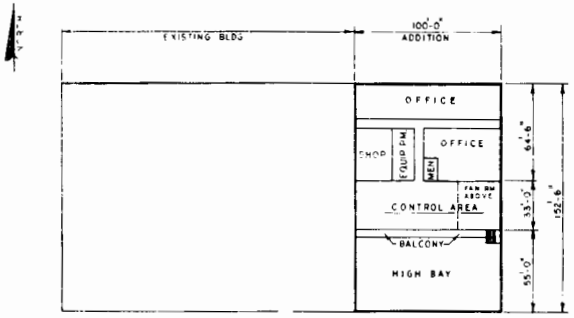
The three-man astronaut crew and its three-man back-up crew will undergo intensive pre-flight training at Cape Kennedy for the three-month period before each mission. The existing Apollo flight crew training equipment for the Command Module and Lunar Excursion Module consists of a set of two part-task trainers, which will be use for one month, and a set of two mission simulators, which will be used for the full three-month period. The extension to the present Flight Crew Training Building will provide space and related equipment for one additional set of two mission simulators to allow another crew with its back-up to train simultaneously. Only through this simultaneous training of crews can the planned launch schedule be met.

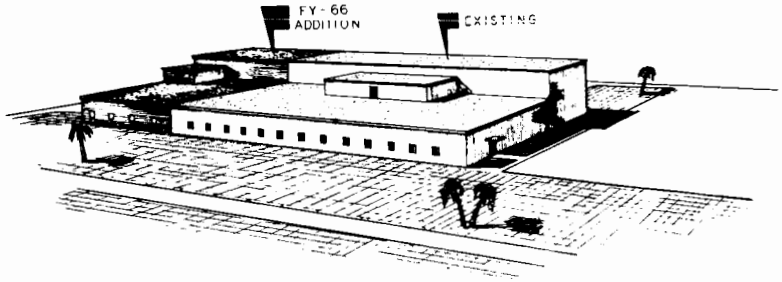
ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

JOHN F. KENNEDY SPACE CENTER, NASA

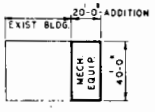
FISCAL YEAR 1966 ESTIMATES

FLIGHT CREW TRAINING BUILDING EXTENSON



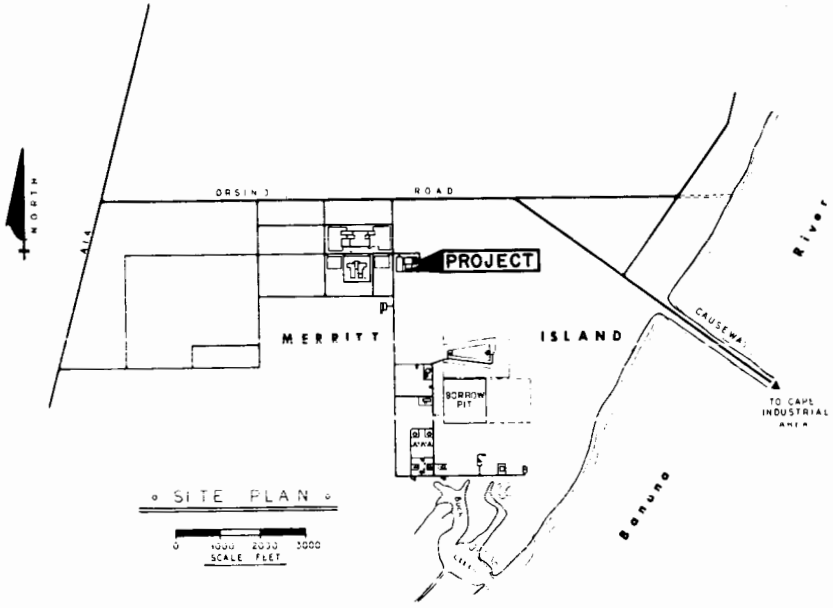


◦PERSPECTIVE◦



◦FLOOR PLANS◦

30 15 0 30 60
SCALE-FEET



◦SITE PLAN◦

0 1000 2000 3000
SCALE FEET

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

EXTENSION TO THE MEDICAL FACILITY

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

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

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

TYPE OF CONSTRUCTION PROJECT: Extension

FUNDING:

FY 1965 and Prior Years	$390,400
FY 1966 Estimate	598,000
Total Funding Through FY 1966	$988,400

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$336,000
Basic building structure	Sq. Ft.	8,650	$29.80	257,800
Special structural requirements	LS	---	13,200	13,200
Special plumbing requirements	LS	---	6,000	6,000
Special electrical requirements	LS	---	10,500	10,500
Special doors (X-ray proof)	LS	---	3,600	3,600
Site development	LS	---	26,900	26,900
Utilities	LS	---	18,000	18,000
Equipment				$262,000
Medical equipment	LS	---	262,000	262,000

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	Unit of Measure	Quantity	Unit Cost	Total Cost
Design	---	---	---	---
Fallout Shelter	---	---	---	-0-
		TOTAL		$598,000

PROJECT PURPOSE:

To provide additional space necessary to house a complete medical facility, where such functions as emergency treatment, normal health maintenance, and an environmental health program can be performed.

PROJECT DESCRIPTION:

This project provides for minor modifications to the existing dispensary building and the construction of approximately 8,700 square feet of additional office, laboratory and medical support space. The extension will be a one story masonry building.

PROJECT JUSTIFICATION:

The implementation of a satisfactory occupational medical program is essential to the maintenance of a safe working environment, the preservation of health, and the prompt treatment of on-the-job illnesses and injuries. Effective execution of such a program requires a facility which is adequate in size and properly equipped.

The facility presently available (a 4,600 square foot building), is inadequate to provide the normal health maintenance and emergency treatment functions for the current Civil Service and contractor personnel requiring service. As a result space has been improvised through the use of trailers.

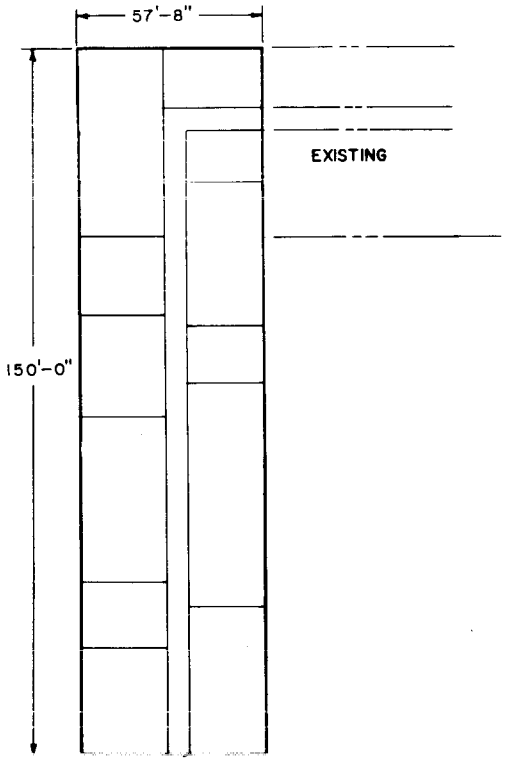
As the number of personnel to be served increases to approximately 13,000, additional space will be required to perform the normal health functions as well as to conduct the associated environmental health program. The basic activities requiring housing in support of this latter function are Industrial Hygiene, Radiation Control, and Sanitary Engineering. Each requires laboratory facilities and equipment for such diverse activities as collection and analysis of fumes and dust, survey and analysis of radioactive hazards, testing of water and sewage, and control of corrosion and pollution.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

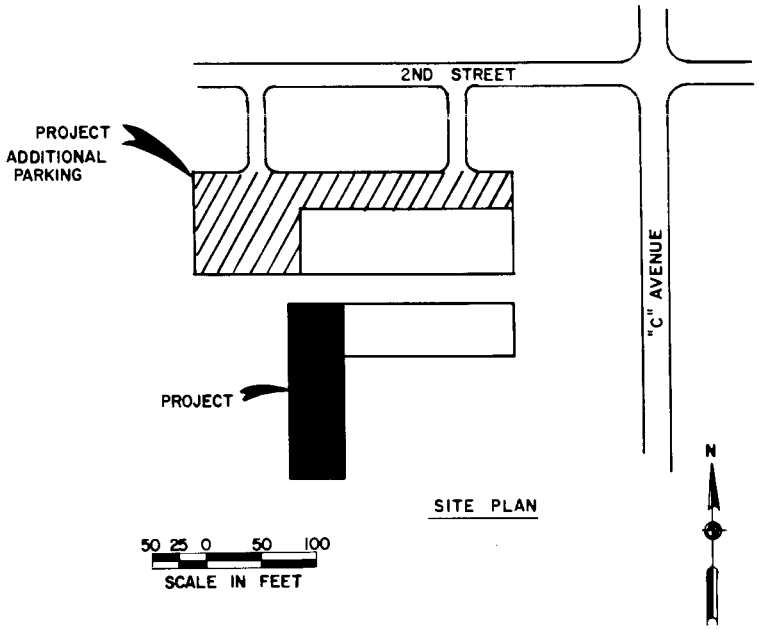
JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1966 ESTIMATES

EXTENSION TO THE MEDICAL FACILITY



FLOOR PLAN



SITE PLAN

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

UTILITY INSTALLATIONS - NEW AREA

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

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

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

TYPE OF CONSTRUCTION PROJECT: Extension

FUNDING:

FY 1965 and Prior Years	$220,500
FY 1966 Estimate	3,898,000
Total Funding Through FY 1966	$4,118,500

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$508,000
Basic building structure	Sq. Ft.	5,500	$23.53	129,400
Air conditioning	LS	---	63,200	63,200
Tie-in and modifications to existing structure	LS	---	16,100	16,100
Utilities	LS	---	11,200	11,200
Site development	LS	---	22,200	22,200
Road	Sq. Yd.	8,300	5.30	44,000
Primary substation transformer	LS	---	165,700	165,700
Electric power line	LF	5,500	10.22	56,200
Equipment				$3,390,000
Wideband transmission equipment	LS	---	330,000	330,000

	Unit of Measure	Quantity	Unit Cost	Total Cost
Wideband monitoring equipment	LS	---	218,000	218,000
Audio distribution equipment	LS	---	459,000	459,000
Technical control audio equipment	LS	---	454,000	454,000
Technical control wideband equipment	LS	---	327,000	327,000
Technical control support equipment	LS	---	110,000	110,000
Cable	LS	---	1,492,000	1,492,000
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$3,898,000

PROJECT PURPOSE:

To provide necessary additions to existing electrical distribution, communications, and road systems consistent with the development of the John F. Kennedy Space Center, NASA.

PROJECT DESCRIPTION:

Electric Power: Approximately 5,500 linear feet of three conductor aerial cable will be installed 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. A 10,000 KVA transformer and the necessary protection devices will be installed in the main substation.

Communications: A 5,500 square foot masonry addition to the Central Telephone Office will be constructed, which will extend the full length on the north and west sides of the present building. Outside communication and instrumentation cabling will be provided for all facilities scheduled for completion during this time frame. Work includes design, procurement, and installation of equipment and cable with major equipment components being technical control and wide band transmission equipment.

Roads: Approximately 4,000 linear feet of varying widths of roadway in the MILA Industrial Area will be provided. This work will complete provisions for four-lane traffic on "C" Avenue from Second Street south to Fifth Street, and on Fifth Street from "B" Avenue east to "C" Avenue.

PROJECT JUSTIFICATION:

The expansion of the utility and road systems is required to increase service capability to meet the orderly development of the Merritt Island Launch Area.

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 provide the flexibility needed to prevent loss of test data and interruption of operations in the event of power outage during test and checkout operations. Installation of a transformer is necessary because completion of the FY 1965 addition to the Operations and Checkout Building will increase the demand on the existing main substation by approximately 7,000 KVA, which is beyond the capability of the present system.

Communications

(a) The completion of new construction during the Fiscal Year 1966-67 time period and concurrent personnel increases will impose requirements for additional communications equipment. New equipment and facilities cannot be accommodated in the existing Central Telephone Office Building. For example, space is now available for ten switchboard positions, but thirteen positions will be needed by 1967. Moreover, space is needed for required additional switching equipment, a cryptographic vault, and additional wide-band terminal and repeater equipment.

(b) Additional communication and instrumentation cabling will be required to provide video, audio, and data transmission in support of facilities which will become operational during this period. The cabling is needed to provide internal communication, as well as additional communication between Merritt Island Launch Area, Cape Kennedy Air Force Station, and Patrick Air Force Base.

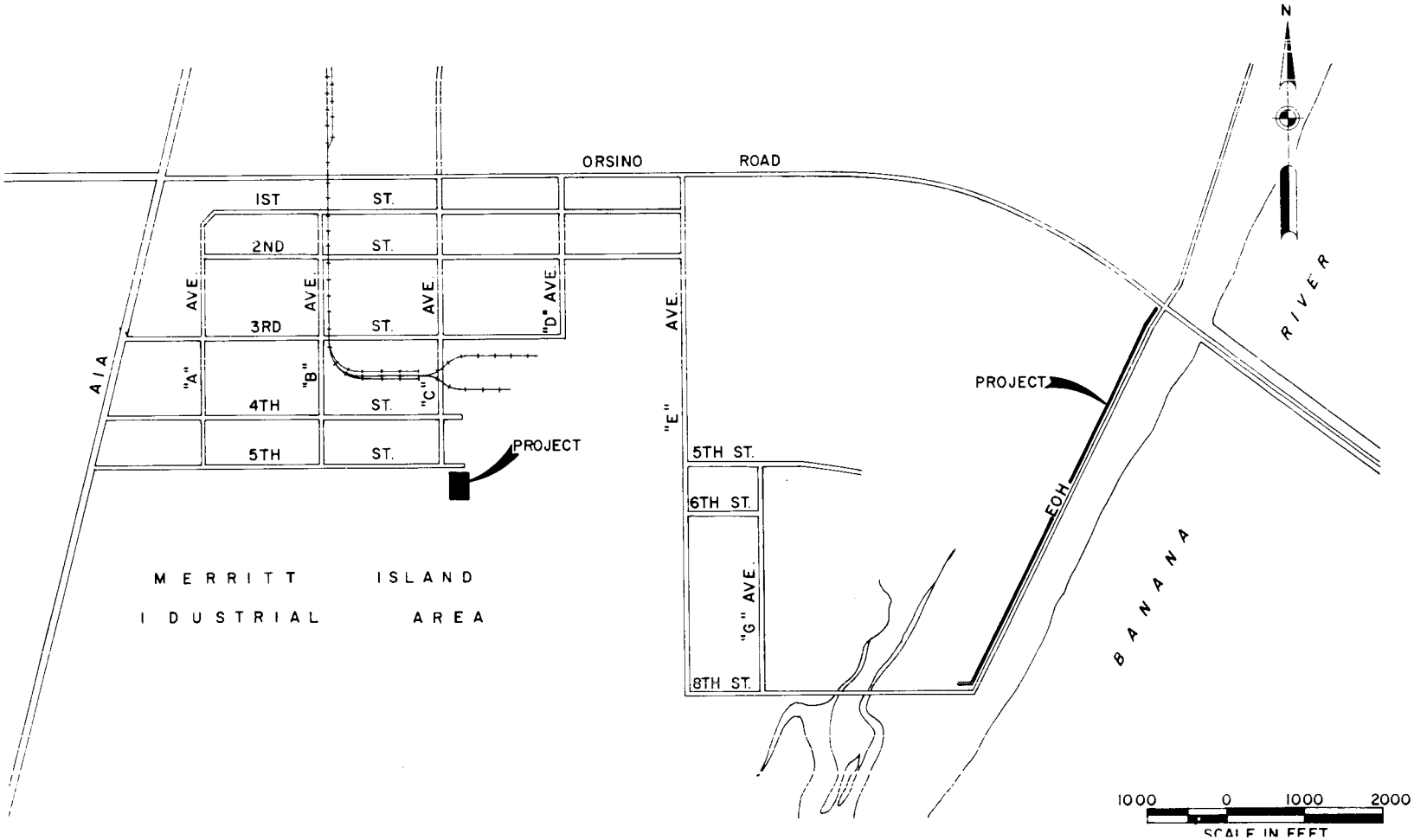
Roads - The build-up of the Merritt Island Industrial Area and concentration of personnel necessitates the addition of two lanes to both Fifth Street and "C" Avenue. More than 5,000 vehicles per day will use these major arteries. Accepted standards dictate that traffic of this magnitude requires four lanes for safe and efficient operation.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1966 ESTIMATES

UTILITY INSTALLATION—NEW AREA



SITE PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

MANNED SPACECRAFT CENTER

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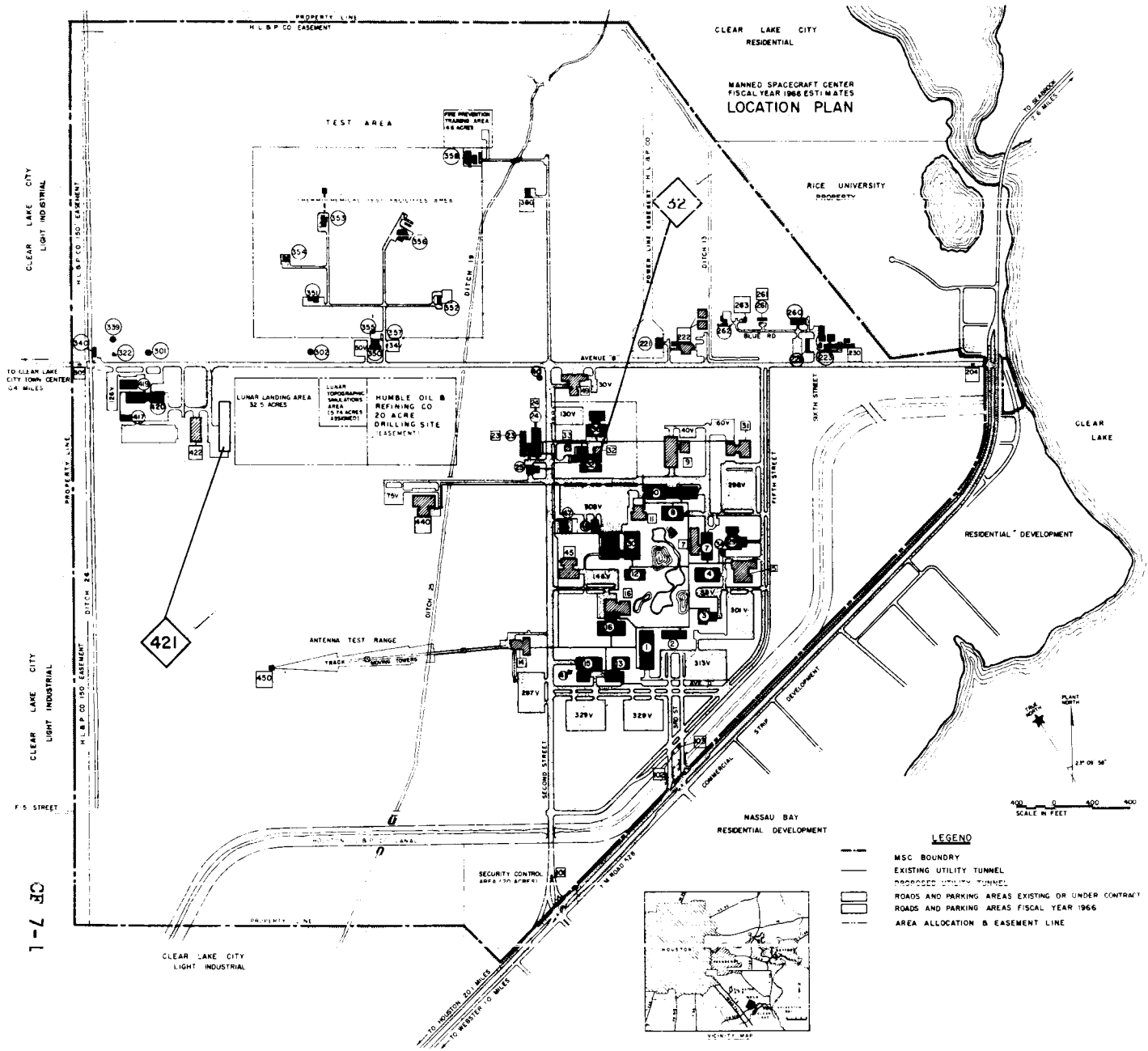
Office of Manned Space Flight Projects:	
Modifications to the environmental testing laboratory	CF 7-3
Center support facilities	CF 7-11



① EXISTING FACILITIES (FY-62, 63)

1 AUDITORIUM FY 62
2 PROJECT MANAGEMENT FY 62
3 CENTRAL CAFETERIA FY 62
4 FLIGHT OPERATIONS OFFICE FY 62
7 LIFE SYSTEMS LABORATORY FY 62
8 TECHNICAL & ENGINEERING SERVICES OFFICE FY 62
10 TECHNICAL SERVICES SHOP FY 62
12 CENTRAL DATA OFFICE FY 62
13 SYSTEMS EVALUATION LABORATORY FY 62
15 INSTRUMENTATION & ELECTRONIC SYSTEMS LAB FY 62
16 SPACECRAFT RESEARCH OFFICE & LABORATORY FY62
23 CENTRAL H & C COOLING TOWER FY 62, 63
24 CENTRAL HEATING & COOLING PLANT FY 62, 63
25 FIRE STATION FY 62
29 FLIGHT ACCELERATION FACILITY FY 63
30 INTEGRATED MISSION CONTROL FY 63
32 SPACE ENVIRONMENT SIMULATION LABORATORY FY 62
34 FLIGHT ACCELERATION MOTOR-GENERATION BUILDING FY 63
36 ESC CONTRACTOR SUPPORT FACILITY FY 62
40 ELEVATED WATER TANK FY 62
41 GAS STORAGE FY 62
47 SOUTHWESTERN BELL TELEPHONE BUILDING
48 EMERGENCY POWER BUILDING (IMCC) FY 63
221 ELECTRICAL SUBSTATION FY 62
223 SEWAGE TREATMENT PLANT FY 62
226 FIELD CONSTRUCTION OFFICE
260 TRANSLATION & DOCKING SIMULATION FACILITY FY 63
261 RADIOLOGICAL FACILITY FY 63
262 ARC JET, RADIANT HEATING & ACOUSTIC TEST FACILITY FY 63
301 WATER WELL FY 62
302 WATER WELL FY 62
322 WATER TREATMENT FY 62
339 GROUND WATER STORAGE TANK FY 62
340 GAS METERING STATION FY 62
350 THERMOCHEMICAL TEST FACILITY FY 63
351 THERMOCHEMICAL SPACE CHAMBER FY 63
352 ELECTRO-EXPLOSIVE DEVICES FY 63
353 REACTION CONTROL TEST FACILITY FY 63
354 SPACE POWER SYSTEMS TEST FACILITY FY 63
355 CHEMICAL STORAGE BUILDING FY 63
356 COMPONENTS TEST FACILITY FY 63
357 THERMOCHEMICAL TEST AREA GATE HOUSE FY 63
358 THERMOCHEMICAL PROPELLANT WASTE TREATMENT FY 63
417 GARAGE FY 62
419 SUPPORT OFFICE FY 62
420 SUPPORT SHOP & WAREHOUSE FY 62

5 FACILITIES AUTHORIZED OR UNDER CONTRACT

5 MISSION SIMULATION & TRAINING FACILITY FY 64
7 LIFE SYSTEMS LABORATORY FY 65
9 TECHNICAL SERVICES FACILITY FY 65
11 BRANCH CAFETERIA FY 65
14 ANECHOIC CHAMBER TEST FACILITY FY 64
16 SPACECRAFT RESEARCH OFFICE & LABORATORY FY 64
23 CENTRAL H & C COOLING TOWER FY 64, 65
24 CENTRAL HEATING & COOLING PLANT FY 64, 65
31 LUNAR MISSION & SPACE EXPLORATION FACILITY FY 65
32 SPACE ENVIRONMENT SIMULATION LABORATORY FY 65
33 ULTRA HIGH VACUUM CHAMBER FACILITY FY 64
45 PROJECT ENGINEERING FACILITY FY 64
49 VIBRATION & ACOUSTIC TEST FACILITY FY 64
101 GUARDHOUSE FY 64
102 GUARDHOUSE FY 64
103 GUARDHOUSE FY 64
104 GUARDHOUSE FY 64
204 GUARDHOUSE FY 64
222 ATMOS ENTRY SIMULATION FACILITY FY 64
223 SEWAGE TREATMENT PLANT FY 64
230 CREW SYSTEMS BIOLOGICAL FACILITY FY 64
261 RADIOLOGICAL FACILITY FY 64
263 HEALTH PHYSICS LABORATORY FY 64
305 GUARDHOUSE FY 64
380 HAZARDOUS MATERIAL STORAGE FACILITY FY 64
422 LOGISTIC SUPPORT WAREHOUSE FY 65
440 ELECTRONIC SYSTEMS COMPATABILITY FACILITY FY 65
450 ANTENNA SERVICE BUILDING & TOWER FY 64

32 PROPOSED FISCAL YEAR 1966 PROJECTS

32 MODIFICATIONS TO ENVIRONMENTAL TESTING LABORATORY

421 MISSION SUPPORT WAREHOUSE

FACILITIES DIVISION MSP 0662 IC 16-64

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

(Dollars in thousands)

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

INSTALLATION MISSION

The mission of the Manned Spacecraft Center is 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)*	4,277	4,811	4,811
CONTRACTOR AND OTHER PERSONNEL	1,519	2,907	3,720
TOTAL ALL PERSONNEL	5,796	7,718	8,531

LAND	NO. ACRES
NASA-OWNED	1,600
OTHER GOVERNMENT AGENCY-OWNED	-
NON-FEDERAL *(Leases, easements)*	477
TOTAL LAND	2,077
TOTAL CAPITAL INVESTMENT *(Including NASA-Owned Land) (as of June 30, 1964)*	$ 131,045.0

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1962 THRU CURRENT YEAR	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Modifications to the Environmental Testing Laboratory	MSF	41,830.0	3,600.0	-0-	45,430.0
Center Support Facilities	MSF	56.0	800.0	-0-	856.0
ALL OTHER PROJECTS		133,658.0			
TOTALS		175,544.0	4,400.0		

NASA FORM 1029 (REV. NOV 64) PREVIOUS EDITIONS ARE OBSOLETE.

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

MODIFICATIONS TO THE ENVIRONMENTAL TESTING LABORATORY

AUTHORIZATION LINE ITEM: Manned Spacecraft Center

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Clear Lake, Harris County, Texas

COGNIZANT NASA INSTALLATION: Manned Spacecraft Center

TYPE OF CONSTRUCTION PROJECT: Alteration

FUNDING:

FY 1965 and Prior Years	$41,830,000
FY 1966 Estimate	3,600,000
Total Funding Through FY 1966	$45,430,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$243,400
Building	Sq. Ft.	6,075	$26.26	159,500
Site preparation	LS	---	12,200	12,200
Utilities	LS	---	71,700	71,700
Equipment				3,356,600
Data acquisition system	LS	---	210,500	210,500
Mechanical pumping system	LS	---	278,600	278,600
Diffusion pumping and backing system	LS	---	292,800	292,800
Hot gaseous nitrogen recirculation system	LS	---	630,500	630,500
Cooling water system	LS	---	91,200	91,200
Leak detection	LS	---	102,500	102,500
Instrumentation	LS	---	277,200	277,200
Helium refrigeration system	LS	---	1,473,300	1,473,300

	Unit of Measure	Quantity	Unit Cost	Total Cost
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$3,600,000

PROJECT PURPOSE:

To provide the Environmental Chambers with an increased simulation capability, with improved operating efficiency, and with additional safety features for the astronauts.

PROJECT DESCRIPTION:

This project will provide for extensions to the Pump Equipment Wing (approximately 2,800 square feet) and Refrigeration Equipment Wing (approximately 3,300 square feet) to accommodate additional equipment for the vacuum pumping systems. A hard line data link system will be constructed between the Environmental Testing Laboratory and the Integrated Mission Control Center (IMCC), Central Data Facility and the Vibration and Acoustic Laboratory.

Other modifications to the chambers will include the addition of a closed-loop orbital simulator, a gas leak detection system, a 40,000 foot hold-mode, and a hot gaseous nitrogen recirculation system. To support these modifications, the air conditioning and cooling water systems will be expanded.

PROJECT JUSTIFICATION:

Modification of the environmental chambers is required to achieve optimum space simulation and to provide additional safety for the astronauts. A closed-loop orbital simulator for computer programming the intensities of the solar simulators and positions of the lunar plane must be provided to obtain accurate simulations and test data. To permit more realistic simulations, the Environmental Testing Laboratory, ground operational flight control equipment and real time data reduction equipment must be interconnected to form an operating system. The hard line data link system will perform this function.

At present, the chamber is evacuated from atmospheric pressure to maximum vacuum without a stop. A capability to hold the chamber at 40,000 feet must be provided to afford the astronauts greater safety. This feature will permit the chamber and all instrumentation to be checked prior to proceeding to the hard vacuum region (10^{-7}mmHg).

To achieve greater efficiency of operation, additional vacuum pumping must be provided to decrease the unproductive vacuum pumpdown time. The planned addition will reduce this unproductive time from 12 hours to 4 hours.

The installation of a hot gaseous nitrogen recirculation system is required to increase the chamber operating efficiency. The hot gaseous nitrogen recirculation system will decrease the cryopanel warm-up from 24 hours to 4 hours, thereby, permitting the chamber to be repressurized much sooner, upon completion of a test. The cryopanels must be warmed to near ambient temperature before repressurizing the chamber in order to prevent the contamination of the cryogenic system.

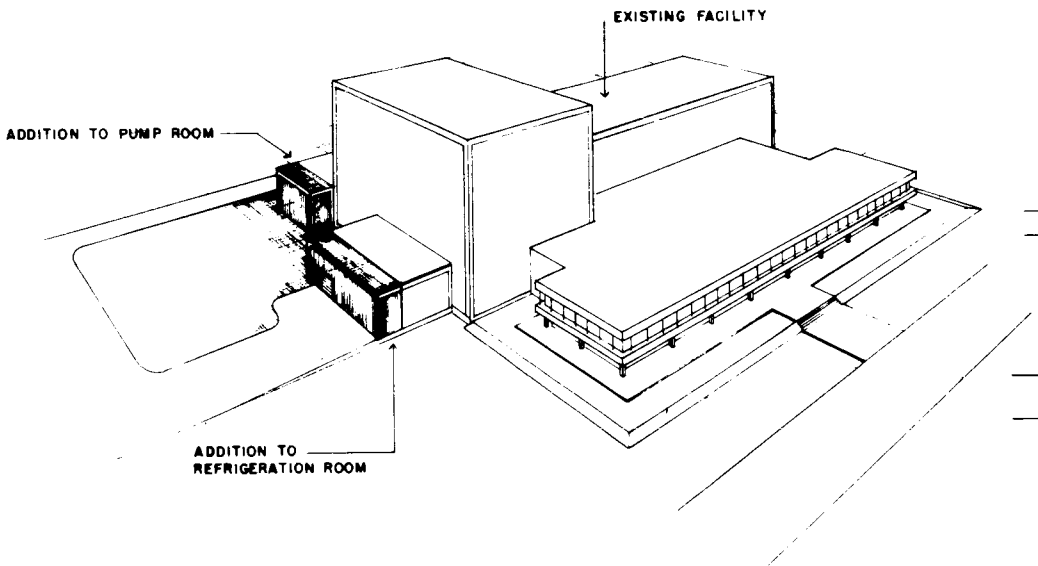
The manual leak detection methods now employed are time consuming and present potential delays to the test program. The planned automatic leak detection system will correct these deficiencies.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

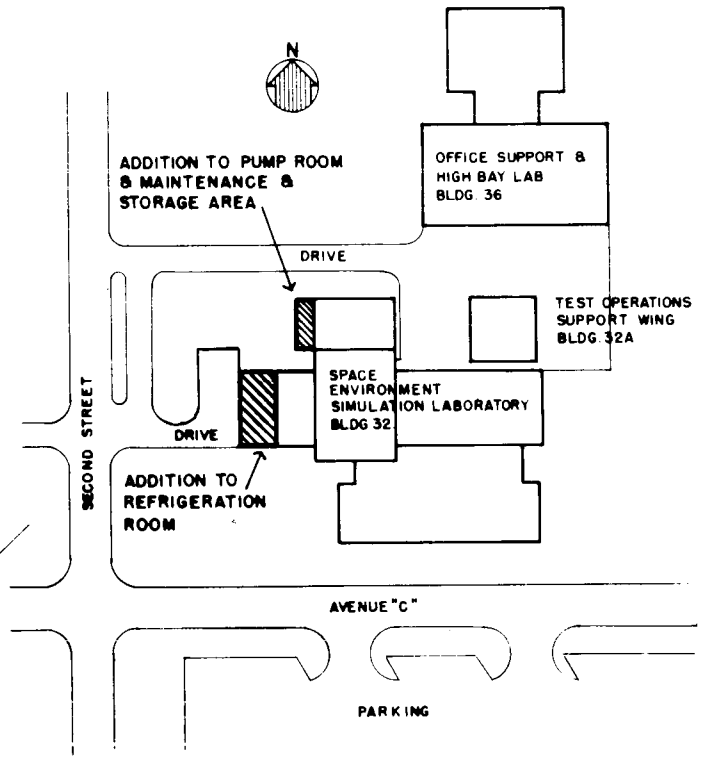
MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

MODIFICATIONS TO THE ENVIRONMENTAL TESTING LABORATORY



PERSPECTIVE



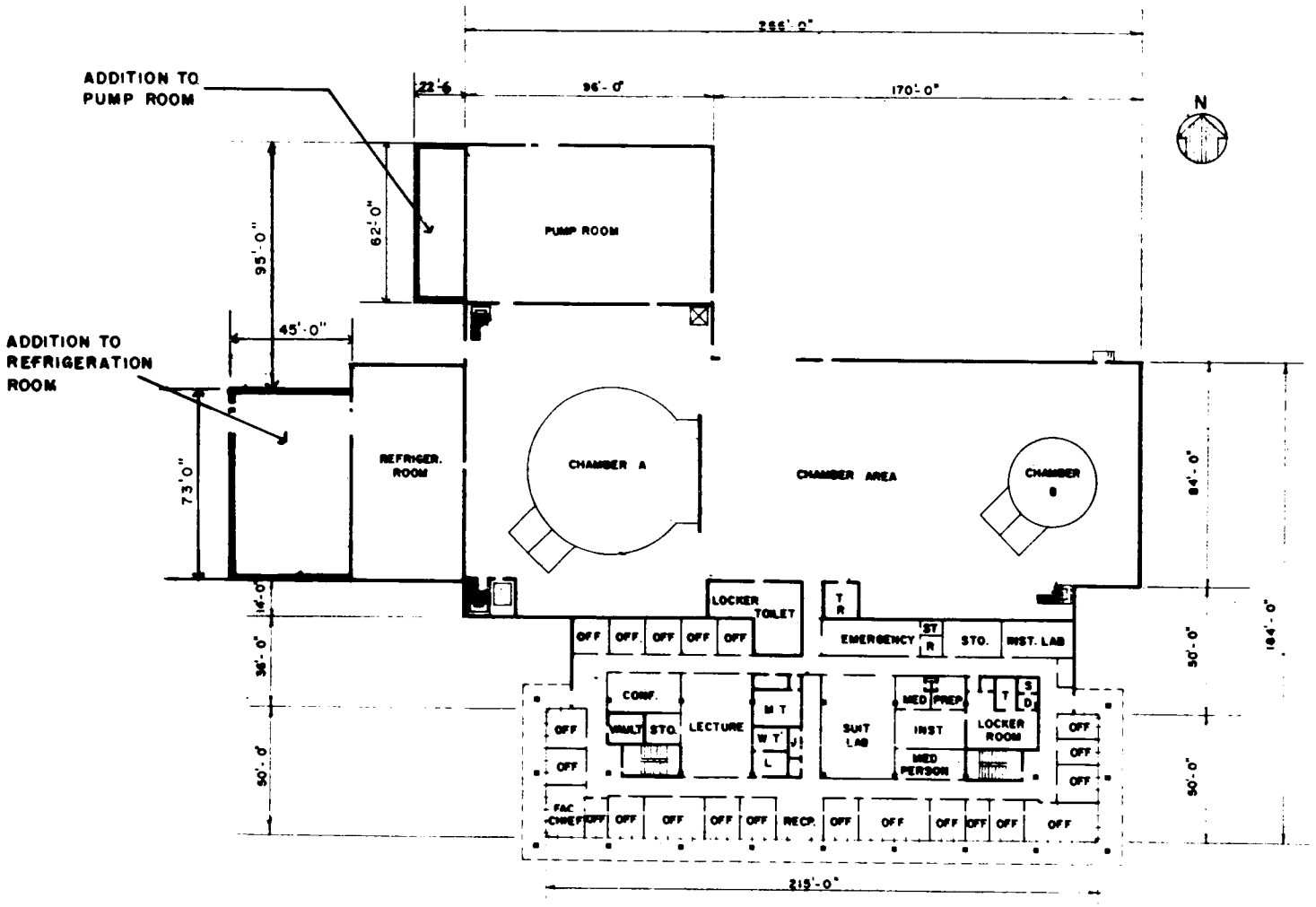
PARTIAL SITE PLAN

50 0 100 200
SCALE IN FEET

MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

MODIFICATIONS TO THE ENVIRONMENTAL TESTING LABORATORY

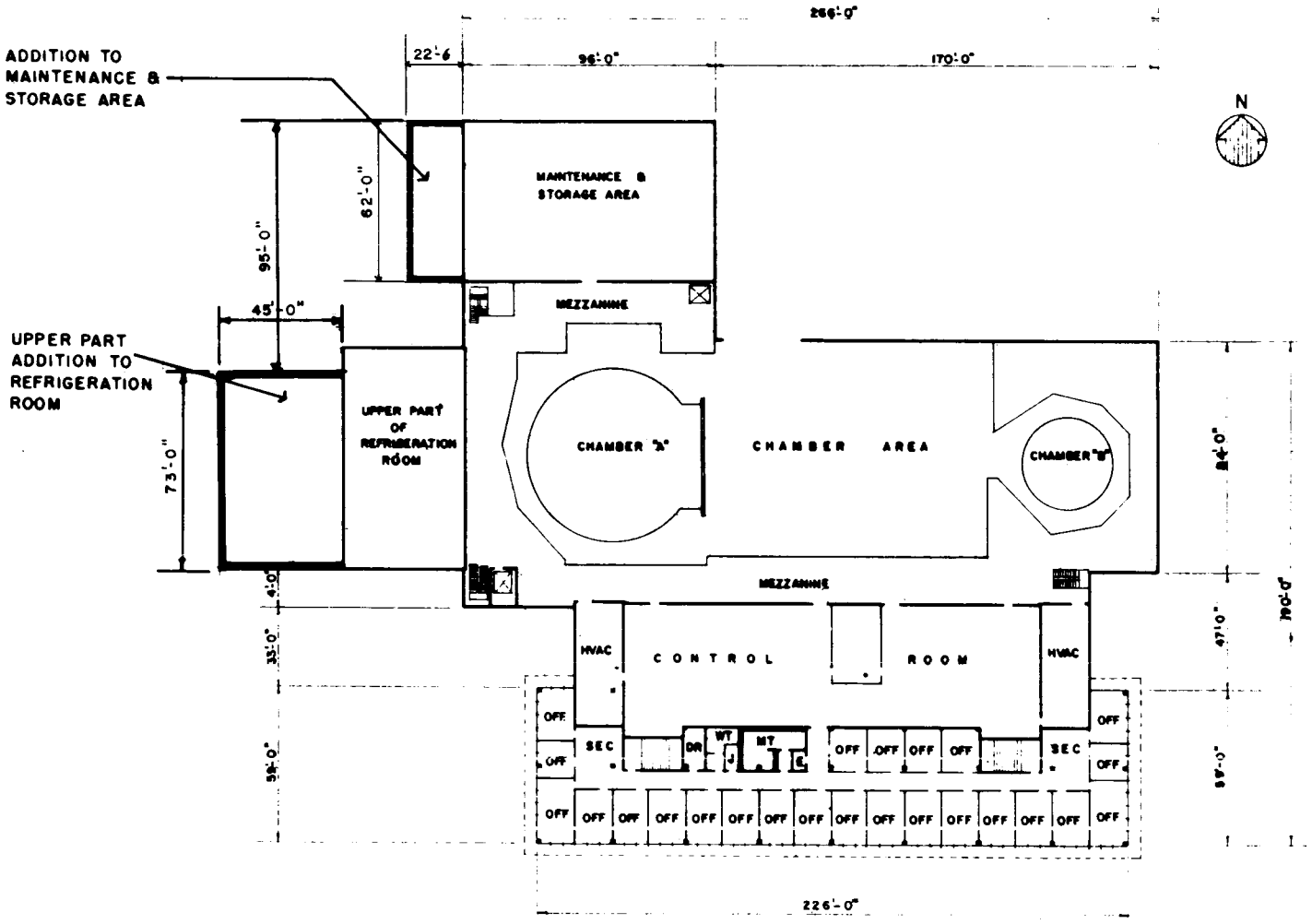


FIRST FLOOR PLAN

MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

MODIFICATIONS TO THE ENVIRONMENTAL TESTING LABORATORY



SECOND FLOOR PLAN

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

CENTER SUPPORT FACILITIES

AUTHORIZATION LINE ITEM: Manned Spacecraft Center

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Clear Lake, Harris County, Texas

COGNIZANT NASA INSTALLATION: Manned Spacecraft Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1965 and Prior Years	$56,000
FY 1966 Estimate	800,000
Total Funding Through FY 1966	$856,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$800,000
Warehouse	Sq. Ft.	60,876	$10.45	636,200
Site development	LS	---	---	100,300
Utilities	LS	---	---	63,500
Equipment	---	---	---	---
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$800,000

PROJECT PURPOSE:

The purpose of this project is to provide the necessary additional warehouse space for receiving, storing and issuing spacecraft components, spare

761-934 O - 65 - 12

parts and general supplies in support of the Manned Spacecraft Center development and test programs.

PROJECT DESCRIPTION:

This project will provide for the construction of a warehouse building with an area of approximately 61,000 square feet. The building will be a single story, high-bay structure, 20 feet high, and will be constructed of steel frame and precast concrete wall panels. An area of approximately 32,000 square feet will have a controlled environment for storage of spacecraft spare parts.

PROJECT JUSTIFICATION:

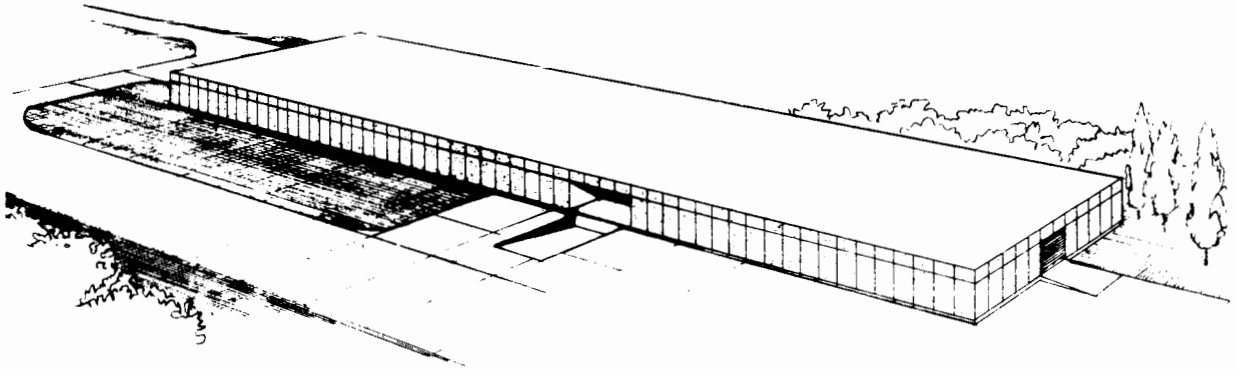
The construction of warehouse space has been planned as part of the phased construction to meet the requirements of the engineering and administrative operations as the Apollo development and test program is intensified. Fiscal Year 1962 and Fiscal Year 1965 Construction of Facility programs provided approximately 52,100 square feet of warehouse space at the Clear Lake site. The Fiscal Year 1966 facility will provide an additional 61,000 square feet. Approximately 70,000 individual line items will be handled in support of the development and test program. These 70,000 items will require approximately 98,000 square feet of storage area. The balance of the space is required for receiving, storing and issuing general supply items such as tools, film, piping, transformers, wire, and administrative supplies.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

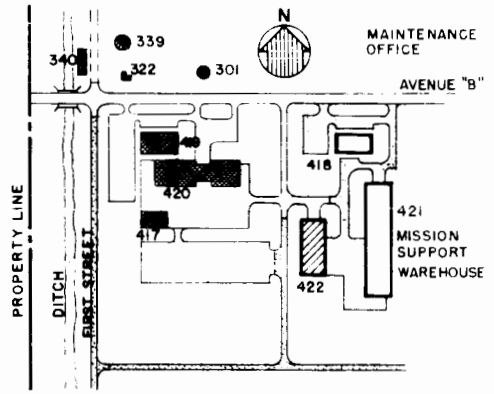
MANNED SPACECRAFT CENTER

FISCAL YEAR 1966 ESTIMATES

CENTER SUPPORT FACILITIES



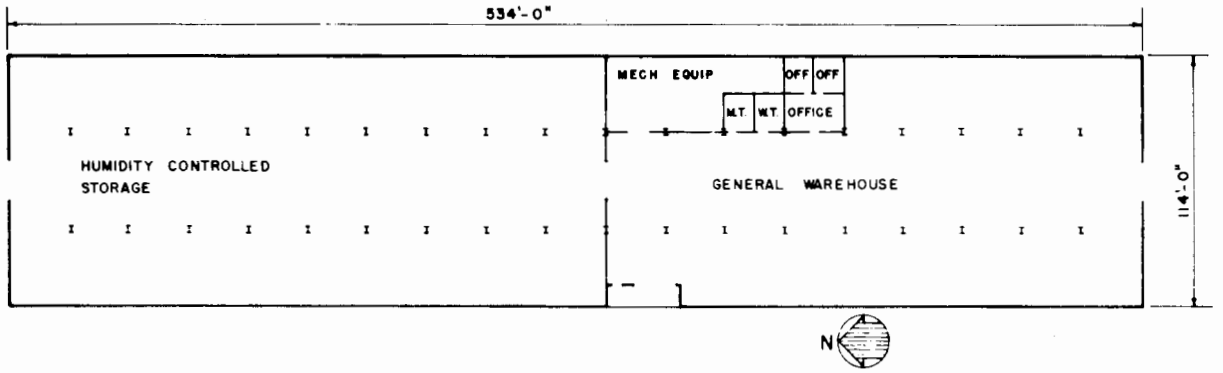
PERSPECTIVE



PARTIAL SITE PLAN

200 0 400 800
SCALE IN FEET

LEGEND
- 1962 PROGRAM
- 1965 PROGRAM
- 1966 PROGRAM



PLAN-MISSION SUPPORT WAREHOUSE

20 0 40 80
SCALE IN FEET

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

MARSHALL SPACE FLIGHT CENTER

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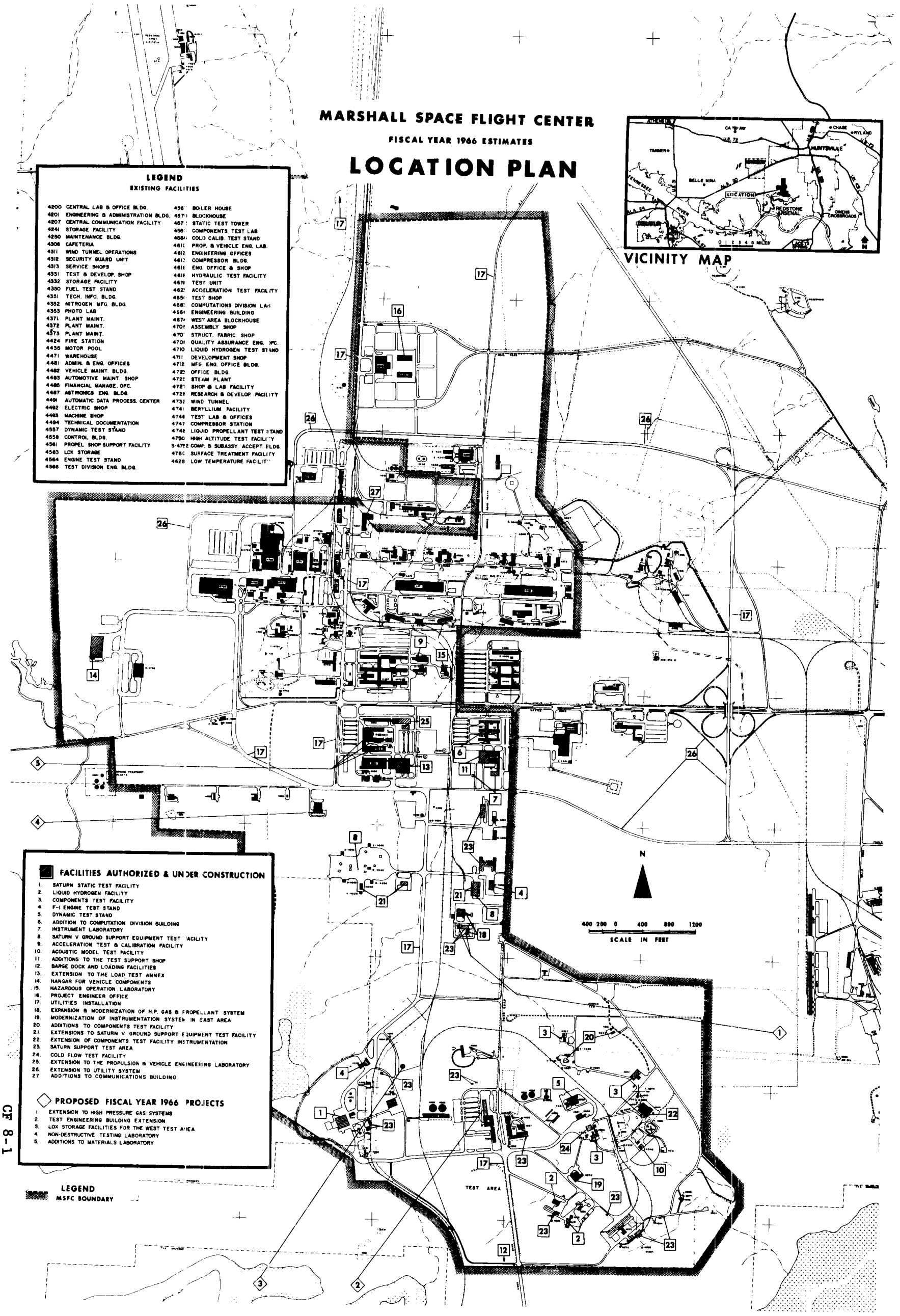
Additions to materials laboratory	CF 8-6
Test engineering building extension	CF 8-10
Extension to high pressure gas system	CF 8-13
LOX storage facility	CF 8-19


MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1966 ESTIMATES
LOCATION PLAN
VICINITY MAP
LEGEND
EXISTING FACILITIES
4200 CENTRAL LAB & OFFICE BLDG.
4201 ENGINEERING & ADMINISTRATION BLDG.
4207 CENTRAL COMMUNICATION FACILITY
4241 STORAGE FACILITY
4250 MAINTENANCE BLDG.
4308 CAFETERIA
4311 WIND TUNNEL OPERATIONS
4312 SECURITY GUARD UNIT
4313 SERVICE SHOPS
4331 TEST & DEVELOP. SHOP
4332 STORAGE FACILITY
4350 FUEL TEST STAND
4351 TECH. INFO. BLDG.
4352 NITROGEN MFG. BLDG.
4353 PHOTO LAB
4371 PLANT MAINT.
4372 PLANT MAINT.
4373 PLANT MAINT.
4424 FIRE STATION
4435 MOTOR POOL
4471 WAREHOUSE
4481 ADMIN. & ENG. OFFICES
4482 VEHICLE MAINT. BLDG.
4483 AUTOMOTIVE MAINT. SHOP
4486 FINANCIAL MANAGE. OFC.
4487 ASTRONICS ENG. BLDG.
4491 AUTOMATIC DATA PROCESS. CENTER
4492 ELECTRIC SHOP
4493 MACHINE SHOP
4494 TECHNICAL DOCUMENTATION
4557 DYNAMIC TEST STAND
4558 CONTROL BLDG.
4561 PROPEL. SHOP SUPPORT FACILITY
4563 LOX STORAGE
4564 ENGINE TEST STAND
4566 TEST DIVISION ENG. BLDG.
4567 BOILER HOUSE
4571 BLOCKHOUSE
4572 STATIC TEST TOWER
4580 COMPONENTS TEST LAB
4584 COLD CALIB. TEST STAND
4610 PROP. & VEHICLE ENG. LAB.
4612 ENGINEERING OFFICES
4613 COMPRESSOR BLDG.
4616 ENG. OFFICE & SHOP
4618 HYDRAULIC TEST FACILITY
4619 TEST UNIT
4621 ACCELERATION TEST FACILITY
4654 TEST SHOP
4666 COMPUTATIONS DIVISION LAB
4669 ENGINEERING BUILDING
4674 WEST AREA BLOCKHOUSE
4705 ASSEMBLY SHOP
4707 STRUCT. FABRIC. SHOP
4708 QUALITY ASSURANCE ENG. OFC.
4710 LIQUID HYDROGEN TEST STAND
4711 DEVELOPMENT SHOP
4712 MFG. ENG. OFFICE BLDG.
4722 OFFICE BLDG.
4723 STEAM PLANT
4727 SHOP & LAB FACILITY
4728 RESEARCH & DEVELOP. FACILITY
4732 WIND TUNNEL
4741 BERYLLIUM FACILITY
4746 TEST LAB & OFFICES
4747 COMPRESSOR STATION
4748 LIQUID PROPELLANT TEST STAND
4750 HIGH ALTITUDE TEST FACILITY
S-4752 COMP. & SUBASSY. ACCEPT. BLDG.
4760 SURFACE TREATMENT FACILITY
4628 LOW TEMPERATURE FACILITY
FACILITIES AUTHORIZED & UNDER CONSTRUCTION
1. SATURN STATIC TEST FACILITY
2. LIQUID HYDROGEN FACILITY
3. COMPONENTS TEST FACILITY
4. F-I ENGINE TEST STAND
5. DYNAMIC TEST STAND
6. ADDITION TO COMPUTATION DIVISION BUILDING
7. INSTRUMENT LABORATORY
8. SATURN V GROUND SUPPORT EQUIPMENT TEST FACILITY
9. ACCELERATION TEST & CALIBRATION FACILITY
10. ACOUSTIC MODEL TEST FACILITY
11. ADDITIONS TO THE TEST SUPPORT SHOP
12. BARGE DOCK AND LOADING FACILITIES
13. EXTENSION TO THE LOAD TEST ANNEX
14. HANGAR FOR VEHICLE COMPONENTS
15. HAZARDOUS OPERATION LABORATORY
16. PROJECT ENGINEER OFFICE
17. UTILITIES INSTALLATION
18. EXPANSION & MODERNIZATION OF H.P. GAS & PROPELLANT SYSTEM
19. MODERNIZATION OF INSTRUMENTATION SYSTEM IN EAST AREA
20. ADDITIONS TO COMPONENTS TEST FACILITY
21. EXTENSIONS TO SATURN V GROUND SUPPORT EQUIPMENT TEST FACILITY
22. EXTENSION OF COMPONENTS TEST FACILITY INSTRUMENTATION
23. SATURN SUPPORT TEST AREA
24. COLD FLOW TEST FACILITY
25. EXTENSION TO THE PROPULSION & VEHICLE ENGINEERING LABORATORY
26. EXTENSION TO UTILITY SYSTEM
27. ADDITIONS TO COMMUNICATIONS BUILDING
PROPOSED FISCAL YEAR 1966 PROJECTS
1. EXTENSION TO HIGH PRESSURE GAS SYSTEMS
2. TEST ENGINEERING BUILDING EXTENSION
3. LOX STORAGE FACILITIES FOR THE WEST TEST AREA
4. NON-DESTRUCTIVE TESTING LABORATORY
5. ADDITIONS TO MATERIALS LABORATORY
LEGEND
MSFC BOUNDARY
N
400 200 0 400 800 1200
SCALE IN FEET
TEST AREA
HUNTSVILLE
REDSTONE ARSENAL
LOCATION
TANNER
BELLE MINA
CHASE
RYLAND
OWENS CROSSROADS
ACTS SPRING
0 1 2 3 4 5 MILES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES

(Dollars in thousands)

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 mission of the Marshall Space Flight Center is 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)*	7,355	7,220	7,195
CONTRACTOR AND OTHER PERSONNEL	5,454	5,986	6,088
TOTAL ALL PERSONNEL	12,809	13,206	13,283

LAND	NO. ACRES
NASA-OWNED	1,786
OTHER GOVERNMENT AGENCY-OWNED	-
NON-FEDERAL *(Leases, easements)*	64
TOTAL LAND	1,850
TOTAL CAPITAL INVESTMENT *(Including NASA-Owned Land) (as of June 30, 1964)*	$ 223,843.0

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1961 THRU CURRENT YEAR	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Non-Destructive Testing Laboratory	MSF	59.0	708.0	-0-	767.0
Additions to Materials Laboratory	MSF	72.0	1,107.0	-0-	1,179.0
Test Engineering Building Extension	MSF	1,478.0	616.0	-0-	2,094.0
Extension to High Pressure Gas Systems	MSF	117.0	1,415.0	-0-	1,532.0
LOX Storage Facilities for West Test Area	MSF	76.0	930.0	-0-	1,006.0
ALL OTHER PROJECTS		147,033.0			
TOTALS		148,835.0	4,776.0		

NASA FORM 1029 (REV. NOV 64) PREVIOUS EDITIONS ARE OBSOLETE.

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

NON-DESTRUCTIVE TESTING LABORATORY

AUTHORIZATION LINE ITEM: Marshall Space Flight Center

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Huntsville, Madison County, Alabama

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1965 and Prior Years	$59,000
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				$445,900
Basic building structure	Sq. Ft.	8,780	$28.26	248,100
Special structural requirements	LS	---	37,000	37,000
Air conditioning	LS	---	34,900	34,900
Integral equipment (Such as special doors)	LS	---	41,000	41,000
Site development	LS	---	25,600	25,600
Utilities	LS	---	59,300	59,300
Equipment				$262,100
Laboratory equipment	LS	---	262,100	262,100

	Unit of Measure	Quantity	Unit Cost	Total Cost
Design	---	---	---	---
Fallout Shelter	---	---	---	-0-
		TOTAL		$708,000

PROJECT PURPOSE:

To provide for the construction of a laboratory for development of non-destructive materials testing and inspection techniques.

PROJECT DESCRIPTION:

The facility will be constructed as a single story, concrete block structure, with a gross area of approximately 8,800 square feet. The interior area will be divided into laboratories with minimal office space and necessary mechanical equipment. The structure will include four cells with radiation shielding and interior walls constructed of monolithic reinforced concrete. A radiation monitoring system, access and interlock system, and automatic shutdown equipment will also be included. 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 will be provided as part of the total integrated facility.

PROJECT JUSTIFICATION:

Non-destructive testing is a technique used to detect and measure defects in materials without impairing the usefulness or degrading the properties of the materials tested. Although it is considered to be one of the most meaningful forms of testing available to space vehicle development, the state-of-the-art in both industry and Government lags far behind the development and application of new materials. The penalty to the space program is either the imposition of additional safety factors, with attendant increase in weight, or a compromise in reliability.

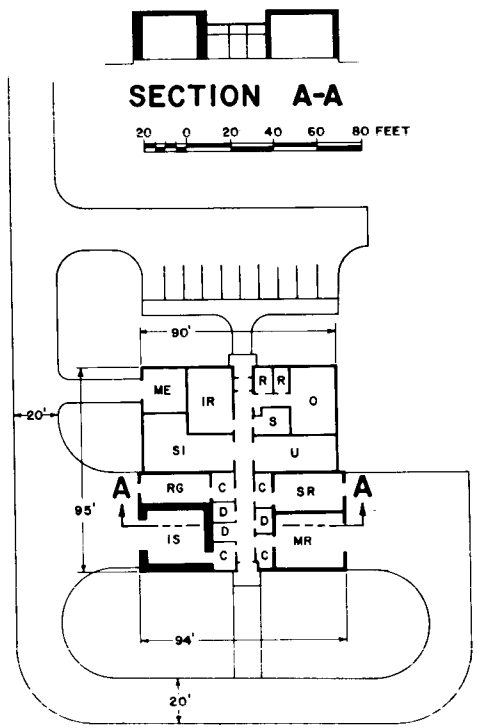
All known methods for non-destructive testing require further development through a combination of such techniques as X-ray, isotropic radiography, ultra-sonic testing, eddy current testing, infrared inspection, and chemical surface inspection. The performance of these techniques requires the integration of personnel and associated equipment within a single properly isolated facility, since high energy and radiation sources are generally involved. Existing laboratory space available for this function is currently limited to a small room in the Materials Laboratory. Without this facility, the important function of developing non-destructive testing techniques cannot be performed.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

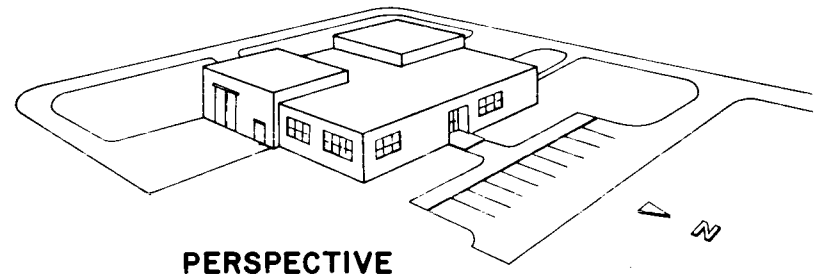
MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

NON-DESTRUCTIVE TESTING LABORATORY



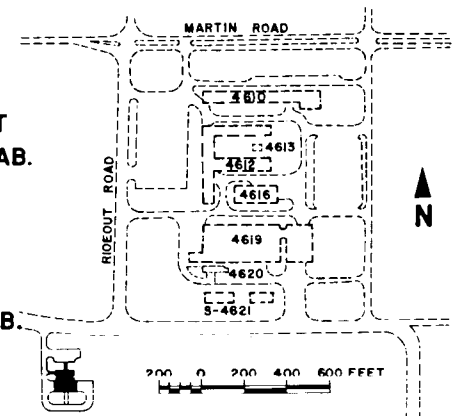
PLAN



PERSPECTIVE

LEGEND

- C CONTROL ROOM
- D DARK ROOM
- IR INFRARED ROOM
- IS RADIOISOTOPE LAB.
- ME MECHANICAL EQUIPMENT
- MR MOTION RADIOGRAPHY LAB.
- O OFFICE
- R REST ROOMS
- RG RADIOGRAPHY LAB.
- S STORAGE
- SI SURFACE INSPECTION LAB.
- SR SEARCHRAY LAB.
- U ULTRASONIC AND EDDY CURRENT LAB.



SITE PLAN

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

ADDITIONS TO MATERIALS LABORATORY

AUTHORIZATION LINE ITEM: Marshall Space Flight Center

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Huntsville, Madison County, Alabama

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Extension

FUNDING:

FY 1965 and Prior Years	$72,000
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				$922,000
Basic building structure	Sq. Ft.	22,534	$23.83	537,000
Integral equipment including crane and elevator	LS	---	30,900	30,900
Special structural requirements	LS	---	9,400	9,400
Special electrical requirements	LS	---	10,400	10,400
Air conditioning	LS	---	292,000	292,000
Site development	LS	---	7,300	7,300
Utilities	LS	---	35,000	35,000
Equipment				$185,000
Laboratory	LS	---	185,000	185,000

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	Unit of Measure	Quantity	Unit Cost	Total Cost
Design	---	---	---	---
Fallout Shelter	---	---	---	-0-
		TOTAL		$1,107,000

PROJECT PURPOSE:

This facility will provide the additional laboratory space required for the supervision of research and development contracts in materials technology supporting the Apollo flight program.

PROJECT DESCRIPTION:

The project will provide for the construction of three additions to the Materials Laboratory Building and for the procurement, fabrication, installation, and checkout of associated laboratory equipment. The additions to the east side of the existing structure will include: a single-story L-shaped structure approximately 5,500 square feet to house a wet instrument chemical laboratory; a single-story structure 130 feet by 50 feet, approximately 6,500 square feet, to house developmental welding and chemical metallurgy laboratories; and a two-story addition 100 feet by 51 feet, approximately 10,500 square feet, connected to the center wing of the Materials Laboratory Building to house physics, engineering and environmental laboratories.

Construction features will be compatible with the existing building (concrete slab; concrete block) and partitioned into laboratory and office space.

PROJECT JUSTIFICATION:

The existing Materials Division Laboratory was constructed by the Army in support of materials engineering activities for the Redstone and Jupiter programs. With the transfer of the facility to NASA and the advent of the Saturn programs, the progressively increasing responsibility and workload of the Materials Division has necessitated a twofold increase in personnel and a commensurate increase in the amount and size of test and laboratory equipment. Space availability, however, remained static throughout these major expansions of personnel and equipment. The result is an overcrowded facility, and an inability to install the necessary laboratory apparatus. The additions to this laboratory are designed to alleviate currently overcrowded conditions and permit the relocation of expensive and sensitive items of laboratory equipment into adequate surroundings.

The Materials Division provides direct support to all center elements in the area of materials technology. The Division also supervises and evaluates the work of supporting research technology contractors, as well

as the materials programs conducted by prime contractors. This includes developmental engineering, design, evaluation, testing, inspection, and failure analysis of materials used on launch vehicles. The Division also maintains a program of surveillance, testing, and inspection throughout the life of each vehicle with a view towards continuous incorporation of improvements which will assure the highest degree of vehicle reliability.

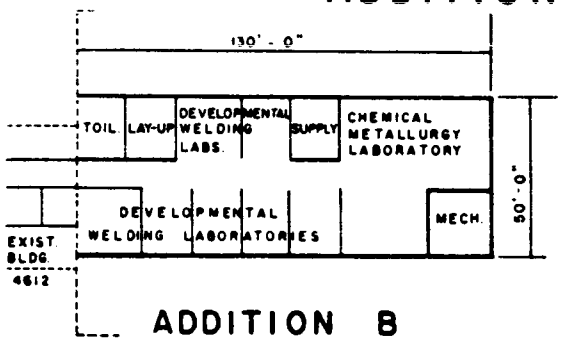
Development work with new materials is also a vital function in order to achieve a general upgrading of the vehicle. The newer titanium alloys, beryllium and beryllium composite materials, superalloys, magnesium-lithium alloys, polymeric materials, ceramic materials, and specialty materials including lubricants, fluids, and electrical materials are examples of this effort. Work with new techniques, such as improved welding and joining methods, cryogenic and high temperature insulation schemes, filament windings, material reinforcements, improved energy conversion and regulation methods are examples of efforts in this area. In addition, since many vehicle and ground support equipment problems develop because of material or component failures, it is essential that a comprehensive program and capability be maintained to diagnose failures and recommend remedial action. For example, the laboratory is currently investigating weld design allowables and tolerances in an effort to reduce the weight of launch vehicle stages without impairing structural integrity. Some of the laboratory's past contributions include: (1) the development of a special external insulation material which can reduce the weight of the S-II stage by 1,500 pounds; and (2) the development of a new type of lubricant suitable for both space environment and the extremely high load conditions prevalent on the launch pads.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

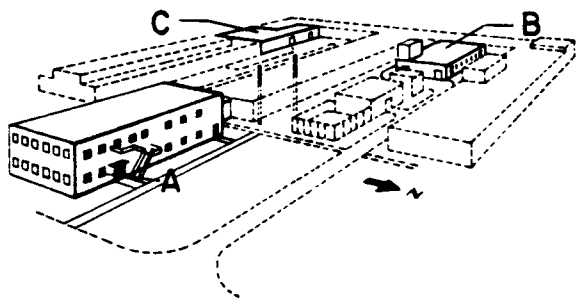
ADDITIONS TO MATERIALS LABORATORY

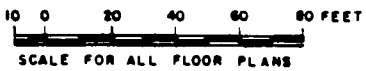


ADDITION B

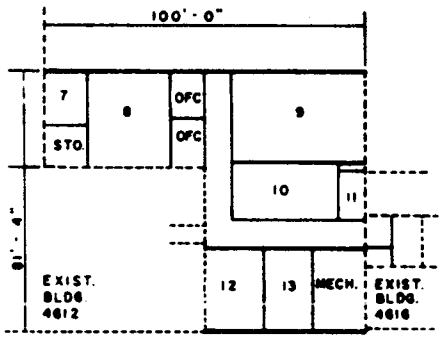
LEGEND

1. HIGH FREQUENCY MATERIALS LABORATORY
2. ELECTRICAL MATERIALS LABORATORY
3. LUBRICATION LABORATORY
4. SOLID STATE LABORATORY
5. PHYSICAL PROPERTIES LABORATORY
6. THERMO-PHYSICS LABORATORY
7. ANALYTICAL BALANCE ROOM
8. WET CHEMISTRY LABORATORY
9. INSTRUMENTAL CHEMISTRY LABORATORY
10. EMISSION SPECTROSCOPY LABORATORY
11. DARK ROOM
12. ABSORPTION SPECTROSCOPY LABORATORY
13. INFRARED SPECTROSCOPY LABORATORY

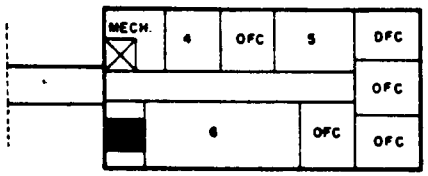




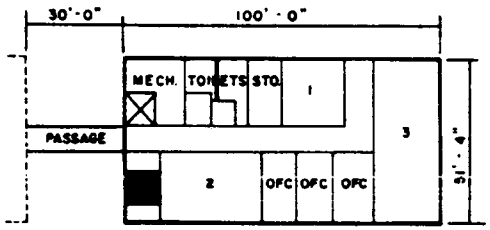
SCALE FOR ALL FLOOR PLANS



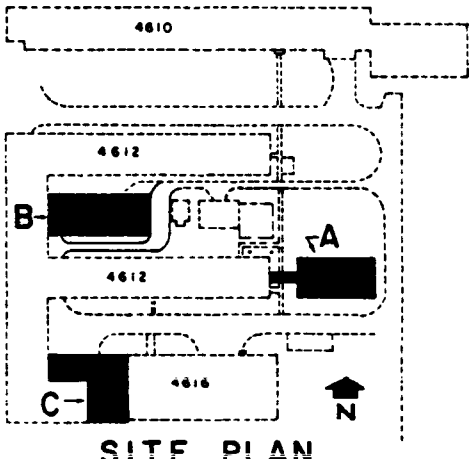
ADDITION C



ADDITION A 2nd FLOOR



ADDITION A 1st FLOOR



SITE PLAN

0 100 200 300 400 FEET

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

TEST ENGINEERING BUILDING EXTENSION

AUTHORIZATION LINE ITEM: Marshall Space Flight Center

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Huntsville, Madison County, Alabama

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Extension

FUNDING:

FY 1965 and Prior Years	$1,478,000
FY 1966 Estimate	616,000
Total Funding Through FY 1966	$2,094,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$531,800
Building	Sq. Ft.	19,500	$24.70	481,600
Site development	LS	---	14,200	14,200
Utilities and paving	LS	---	36,000	36,000
Equipment				$84,200
Office furniture and equipment	LS	---	84,200	84,200
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$616,000

PROJECT PURPOSE:

To provide adequate engineering space required to house Test Division personnel who work in direct support of research, development and acceptance testing of boosters, engines and components for the Saturn IB and Saturn V projects.

PROJECT DESCRIPTION:

This project will provide for the construction of a 19,500 square foot extension to the existing Test Engineering Building (#4666) to house engineering and administrative personnel. The building will be a two-story reinforced concrete structure approximately 40 feet wide by 225 feet in length, connected to the existing building by a two story corridor, approximately 28 feet wide by 24 feet long. It will be equipped with movable type partitions, fluorescent lighting, composition tile floors, and the necessary heating and cooling systems.

PROJECT JUSTIFICATION:

Test Division personnel require administrative and engineering space within the remotely sited Test Area. Two administrative type buildings are now available with a total net 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. An additional 230 people are housed in 36 trailers with a total of 20,000 square feet, or 87 square feet per person.

Trailers are basically an unsatisfactory method for housing engineering and administrative personnel on a long term basis. Within the Test Area, trailers are even more unsatisfactory since evacuation is necessary during the numerous static test firings of the F-1 engine and S-1 stages. In addition, activation of the S-IC Static Test Stand requires relocation of the trailers away from the Test Division center of operations which further downgrades operational effectiveness and efficiency.

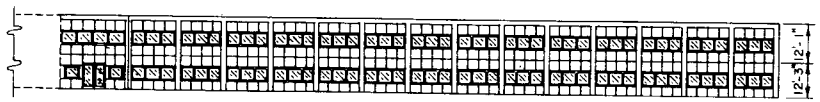
The planned addition to the Test Engineering Building will provide space for Test Division employees in quarters which will permit support of the Apollo Program with maximum effectiveness.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

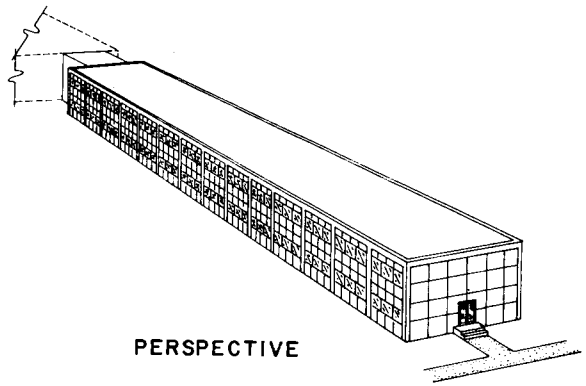
MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

TEST ENGINEERING BUILDING EXTENSION



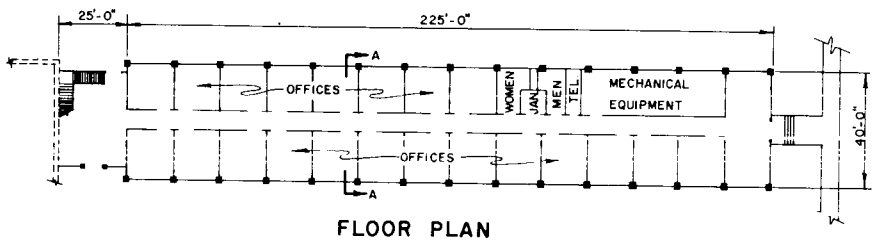
EAST ELEVATION



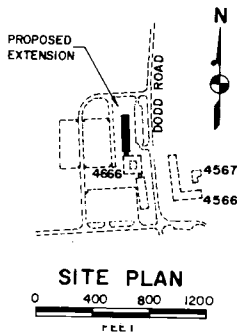
PERSPECTIVE

SECTION A-A

NORTH ELEVATION



FLOOR PLAN



SITE PLAN

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

EXTENSION TO HIGH PRESSURE GAS SYSTEMS

AUTHORIZATION LINE ITEM: Marshall Space Flight Center

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Huntsville, Madison County, Alabama

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Extension

FUNDING:

FY 1965 and Prior Years	$117,000
FY 1966 Estimate	1,415,000
Total Funding Through FY 1966	$1,532,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$207,900
Building	Sq. Ft.	5,540	$23.92	132,500
Site development and utilities	LS	---	75,400	75,400
Equipment				$1,207,100
Compressors, piping and valves	LS	---	664,700	664,700
Storage vessels	LS	---	542,400	542,400
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$1,415,000

PROJECT PURPOSE:

To provide the additional high pressure air and helium capability required to support the Saturn V test program.

PROJECT DESCRIPTION:

This project provides for expansion of the centralized High Pressure Gas Systems Facility. Expansion of the air compressor facilities includes: (a) addition of two 20-foot bays to the east end of the air compressor building; (b) acquisition and installation of two air compressors with a combined capacity of 1,100 standard cubic feet per minute at 3,500 pounds per square inch gravity (psig), and two 1,250 cubic foot compressed air storage bottles; (c) interconnections to the existing distribution system, and (d) installation of a central control system.

Additions to the high pressure helium system include: (a) the addition of three 20-foot bays to the west end of the air compressor building; (b) the installation of two 5,000 psig helium compressors which will be relocated from the remote Helium Compressor Station to the air compressor building; (c) a new low temperature type helium purification system with valves, piping, and a central control system; (d) two 500 psig, 6,000 cubic foot helium receivers for rail car shipments, and one 5,000 psig 1,250 cubic foot helium bottle for high pressure storage; and (e) support facilities such as railroad siding, unloading station, as well as all the necessary distribution piping.

PROJECT JUSTIFICATION:

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 the existing capability for supplying high pressure air and helium to the Test Area. The present air compressor capacity can support a requirement for 40,000,000 standard cubic feet per month; by 1967 the demand will rise to 50,000,000 standard cubic feet per month.

High pressure helium is used for purging and pressurizing liquid hydrogen and liquid oxygen systems and tanks. It is also used for pressure pumping liquid hydrogen from tanks into vehicle systems. With the increased use of liquid hydrogen in the Apollo Program considerably greater quantities of helium will be required. Current usage of gaseous helium averages 1,800,000 standard cubic feet per month; by 1967 the use rate is expected to reach 2,500,000.

The helium requirement is currently met by a compressor station located approximately two miles from the principal area of usage. Nearly 1,000 K bottles (capacity of approximately 230 standard cubic feet) are used per month as the supply medium. By converting from the small portable K bottles system to a centralized compressor system, with additional high pressure storage, and a fixed distribution piping system, the increased requirement can be met. Relocation of the two existing compressor units to a centrally located high pressure gas facility will permit more efficient and economical service,

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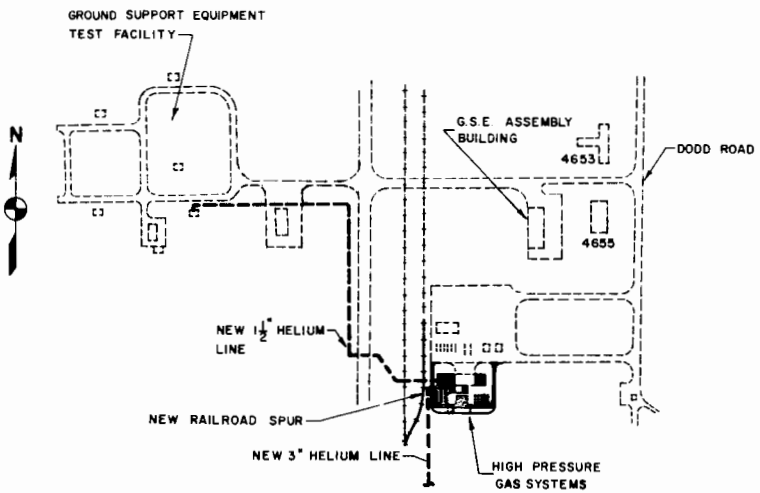
particularly when coupled with a rail delivery system.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

EXTENSION TO HIGH PRESSURE GAS SYSTEMS



SITE PLAN

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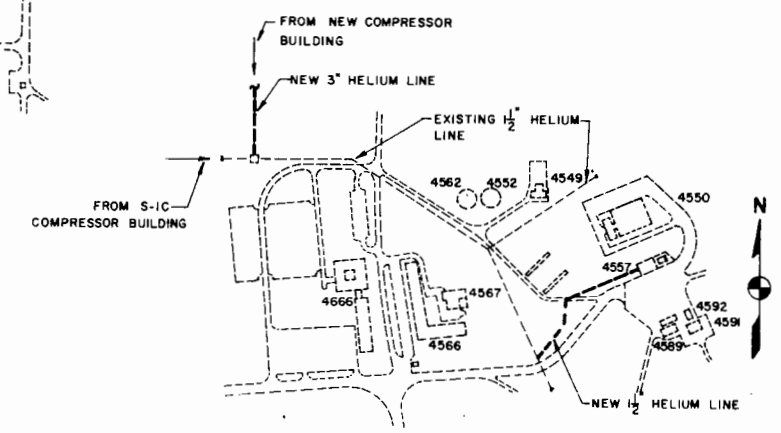
FEET



SITE PLAN

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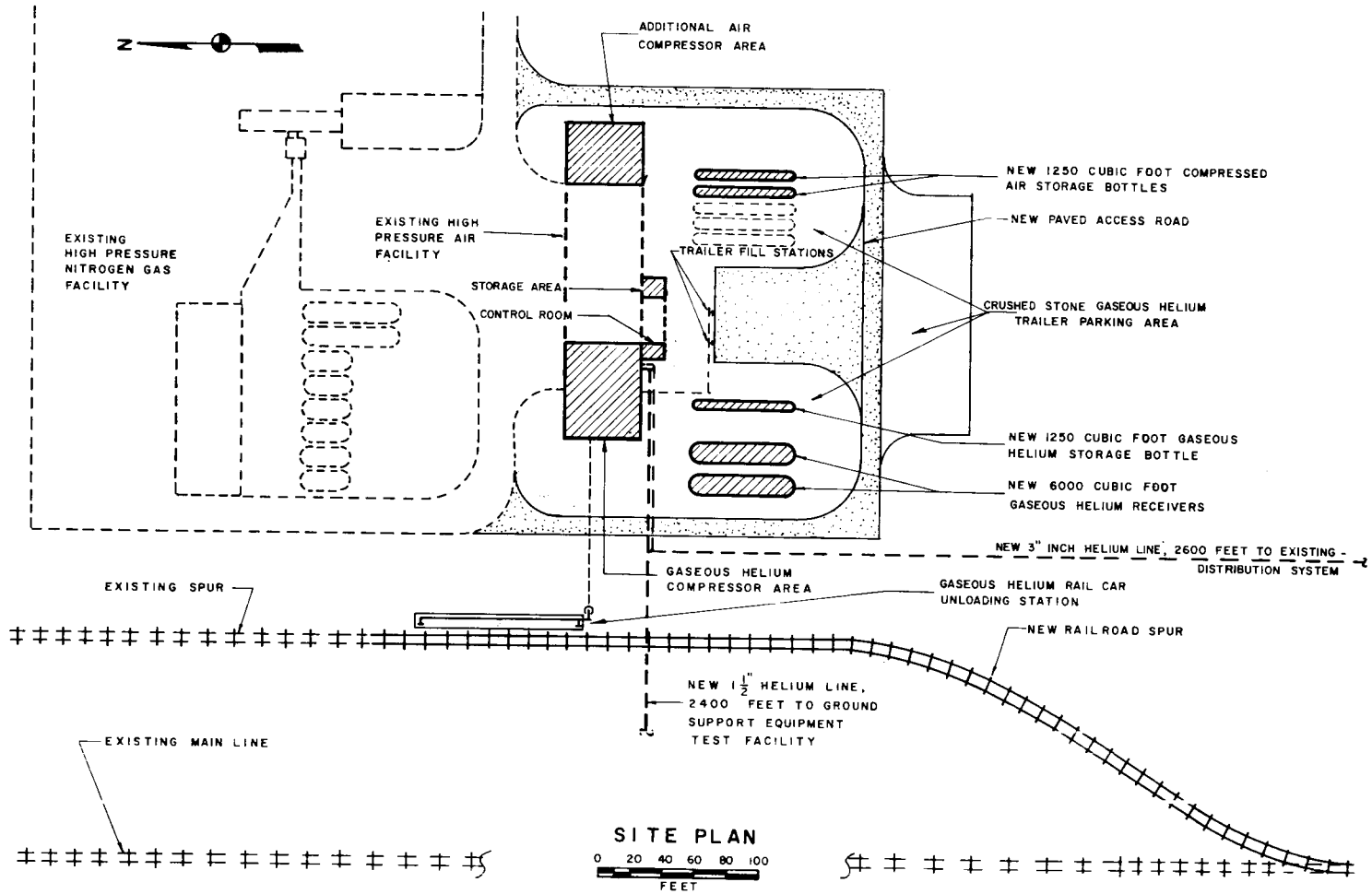
FEET

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

EXTENSION TO HIGH PRESSURE GAS SYSTEMS

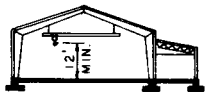


MARSHALL SPACE FLIGHT CENTER

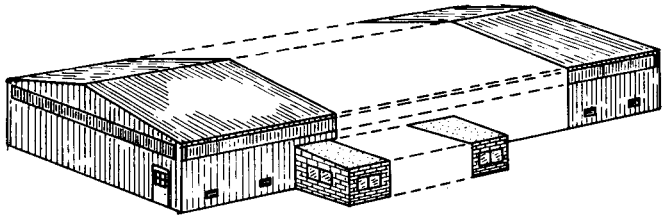
FISCAL YEAR 1966 ESTIMATES

EXTENSION TO HIGH PRESSURE GAS SYSTEMS

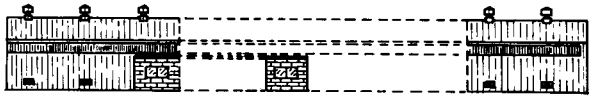
ELEVATION



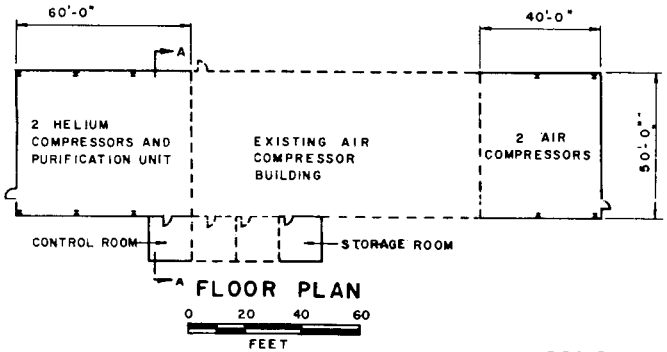
SECTION A-A



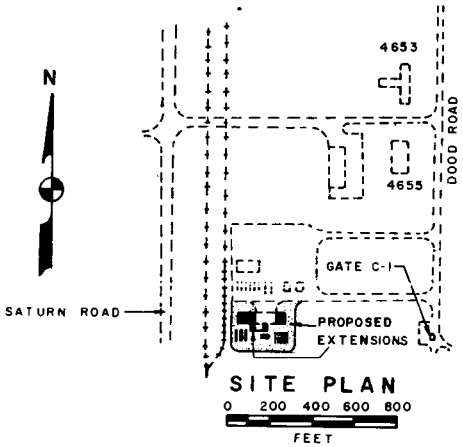
PERSPECTIVE



ELEVATION



FLOOR PLAN



SITE PLAN

COMPRESSOR BUILDING

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

LOX STORAGE FACILITIES FOR WEST TEST AREA

AUTHORIZATION LINE ITEM: Marshall Space Flight Center

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Huntsville, Madison County, Alabama

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1965 and Prior Years	$76,000
FY 1966 Estimate	$930,000
Total Funding Through FY 1966	$1,006,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$192,600
Tank pad and foundation	LS	---	$28,700	28,700
Site development and utilities	LS	---	163,900	163,900
Equipment				$737,400
Tank	Gals.	225,000	2.40	540,000
Piping	LS	---	197,400	197,400
Design	---	---	---	---
Fallout Shelters (Not feasible)	---	---	---	None
		TOTAL		$930,000

PROJECT PURPOSE:

To provide the LOX storage capacity required to meet full duration firing

schedules on the S-IC and F-1 stands for the Saturn V.

PROJECT DESCRIPTION:

This project will provide for the construction of a LOX Storage Facility near the F-1 Engine Static Test Stand. The facility will consist of a 225,000 gallon spherical, vacuum jacketed LOX storage tank with associated transfer piping (including a connection to the existing six inch line from the S-IC Stand), transfer control station, pumps, filters, valves, paving and siding for both truck and tank car unloading. Necessary utilities, services and site work are included.

PROJECT JUSTIFICATION:

The original construction program for the F-1 Engine and S-1C Static Test Stands provided for construction of two 225,000 gallon LOX storage tanks to satisfy the initial needs of both facilities. Normally the F-1 Engine requires 75,000 gallons of LOX and the S-1C Stand 425,000 gallons for full duration firings. The early phases of the program called for the testing of single engines with progressive combinations of one, three and five engines.

As the testing program progresses and full duration firings become more frequent, the existing capacity becomes inadequate. For example, simulation of a twelve-hour hold requires "topping-off" at a rate of 16,000 gallons per hour to make up for the boil-off rate. The full duration firings which complete this test are not possible with the existing LOX storage capacity. An additional significant limitation of existing capacity is disruption of operations for maintenance or repair. Although maintenance can be scheduled, repairs are frequently unforeseen, and as a consequence pose the greatest threat to testing schedules.

Marketing conditions also affect the LOX storage problem. LOX suppliers, who were previously solely dependent upon NASA and the Army as customers, have now expanded the market to include regional steel mills. Thus, only a portion of the suppliers' production capacity is now available to NASA. Since scheduling LOX deliveries is dependent upon factors such as weather, equipment failures, hardware delivery and miscellaneous delays, increased capacity to stabilize delivery schedules becomes essential.

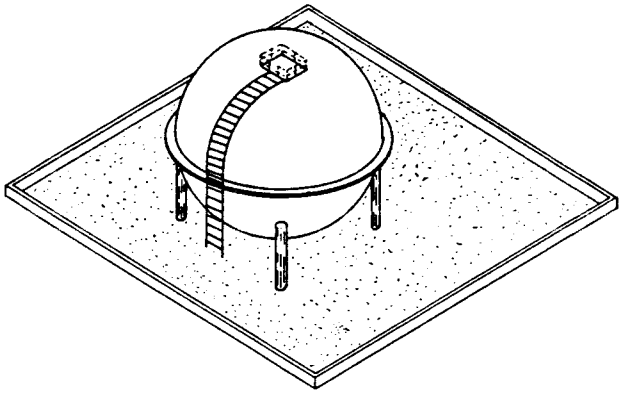
The problems set forth above can be solved with maximum efficiency and economy through the acquisition of a third 225,000 gallon capacity LOX storage tank. Although this tank will basically serve the F-1 Engine Test Stand, it will also provide reserve capacity for "topping-off" the S-1C tanks, and provide for greater flexibility of operation whenever tanks are out of service for maintenance or repair.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

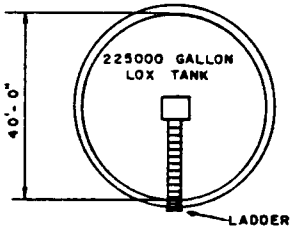
MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1966 ESTIMATES

LOX STORAGE FACILITIES FOR THE WEST TEST AREA

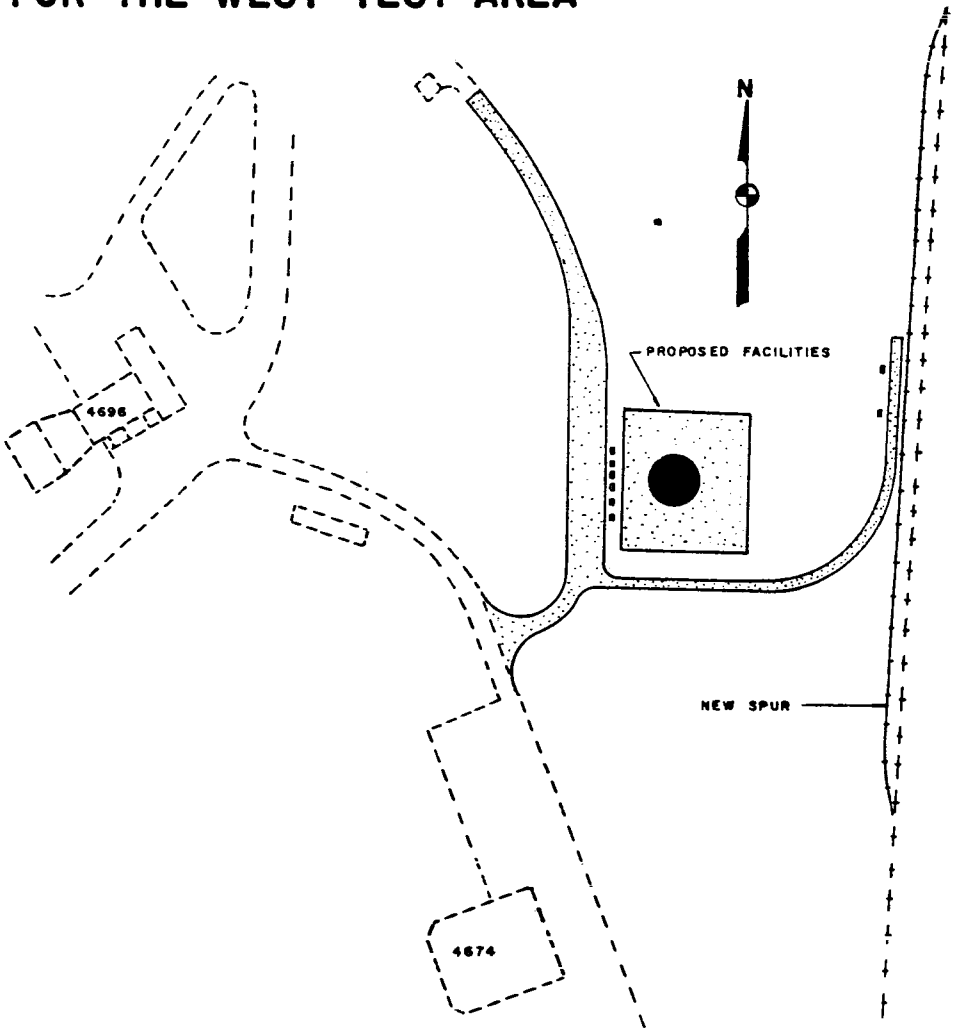


PERSPECTIVE



PLAN

0 10 20 30 40
FEET



SITE PLAN

0 100 200
FEET

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

MICHOUD PLANT

	Page No.
Location plan	CF 9-1
Summary	CF 9-2
Office of Manned Space Flight Project:	
Improvements to storm drainage system	CF 9-3

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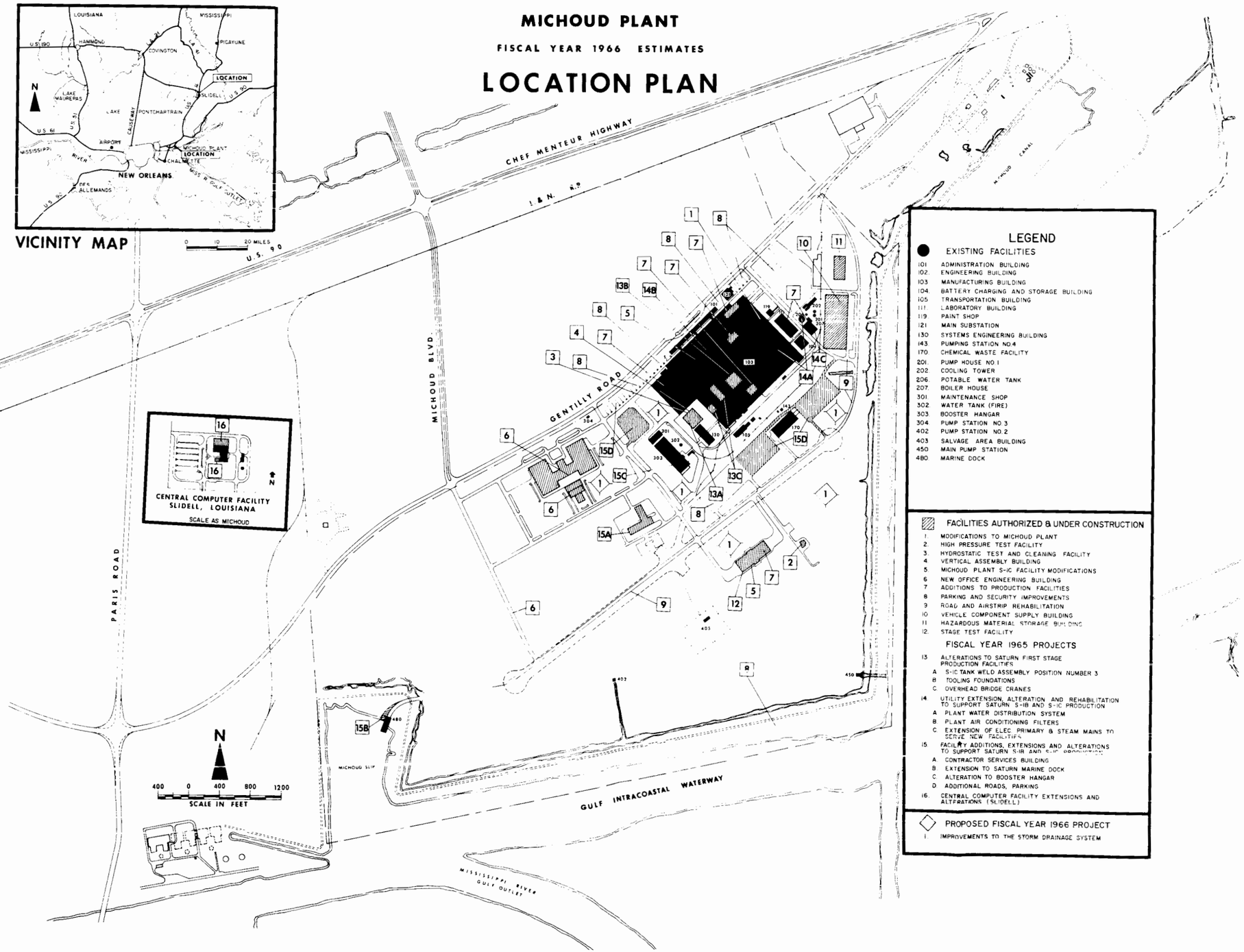
MICHOUD PLANT

FISCAL YEAR 1966 ESTIMATES

LOCATION PLAN



761-934 O - 65 (Fols. CF 9)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 66 BUDGET ESTIMATES

(Dollars in thousands)

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 19 64	FY 19 65	FY 19 66
NASA PERSONNEL *(End of Year)*	281	312	320
CONTRACTOR AND OTHER PERSONNEL	10,985	12,050	11,450
TOTAL ALL PERSONNEL	11,266	12,362	11,770

LAND	NO. ACRES
NASA-OWNED	839
OTHER GOVERNMENT AGENCY-OWNED	72
NON-FEDERAL *(Leases, easements)*	
TOTAL LAND	911
TOTAL CAPITAL INVESTMENT *(Including NASA-Owned Land) (as of June 30, 1964)*	$ 100,651.0

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1962 THRU CURRENT YEAR	FY 19 66 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Improvements to the Storm Drainage System	MSF	24.0	300.0	-0-	324.0
ALL OTHER PROJECTS		$55,494.0			
TOTALS		$55,518.0	300.0		

NASA FORM 1029 (REV. NOV 64) PREVIOUS EDITIONS ARE OBSOLETE.

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

IMPROVEMENTS TO STORM DRAINAGE SYSTEM

AUTHORIZATION LINE ITEM: Michoud Plant

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: New Orleans, Orleans Parish, Louisiana

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1965 and Prior Years	$24,000
FY 1966 Estimate	300,000
Total Funding Through FY 1966	$324,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction	LS	---	$300,000	$300,000
Equipment	---	---	---	---
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$300,000

PROJECT PURPOSE:

To provide storm drainage improvements at the Michoud Plant necessary to prevent flooding and damage of existing facilities and equipment.

PROJECT DESCRIPTION:

This project provides for storm drainage improvements at the Michoud Plant necessary to protect such facilities as the manufacturing building, the final stage checkout building, the high pressure test building, adjacent roads and parking areas.

Specific items of work consist of: rehabilitation of the east and south storage reservoirs adjacent to the levees; replacement of deficient drain lines; construction of new open ditches to carry storm drainage to the reservoirs; construction of new drain lines and catch basins to connect with the new ditches; filling and grading of areas adjacent to the new ditches and existing reservoirs in order to improve storm run-off; and seeding and sodding of all the graded areas for control of erosion.

PROJECT JUSTIFICATION:

The existing Michoud drainage system consists of a network of open ditches and drain pipes leading to catch basins and reservoirs. Storm water from the reservoirs is pumped over a levee into a canal. A residual is continuously maintained in the reservoirs to supplement the Michoud fire protection system.

The extensive network described above is required because of the heavy rainfall in the Michoud-New Orleans area. Weather Bureau records show that the average annual amount totals 64 inches (15 year frequency), with a maximum twenty-four hour rate of 13.7 inches and a maximum one hour rate of 3.4 inches. The area is also subject to tropical storms which occur about once every two years. Such a network for removal of storm drainage is essential to prevent excessive ponding and damaging floods.

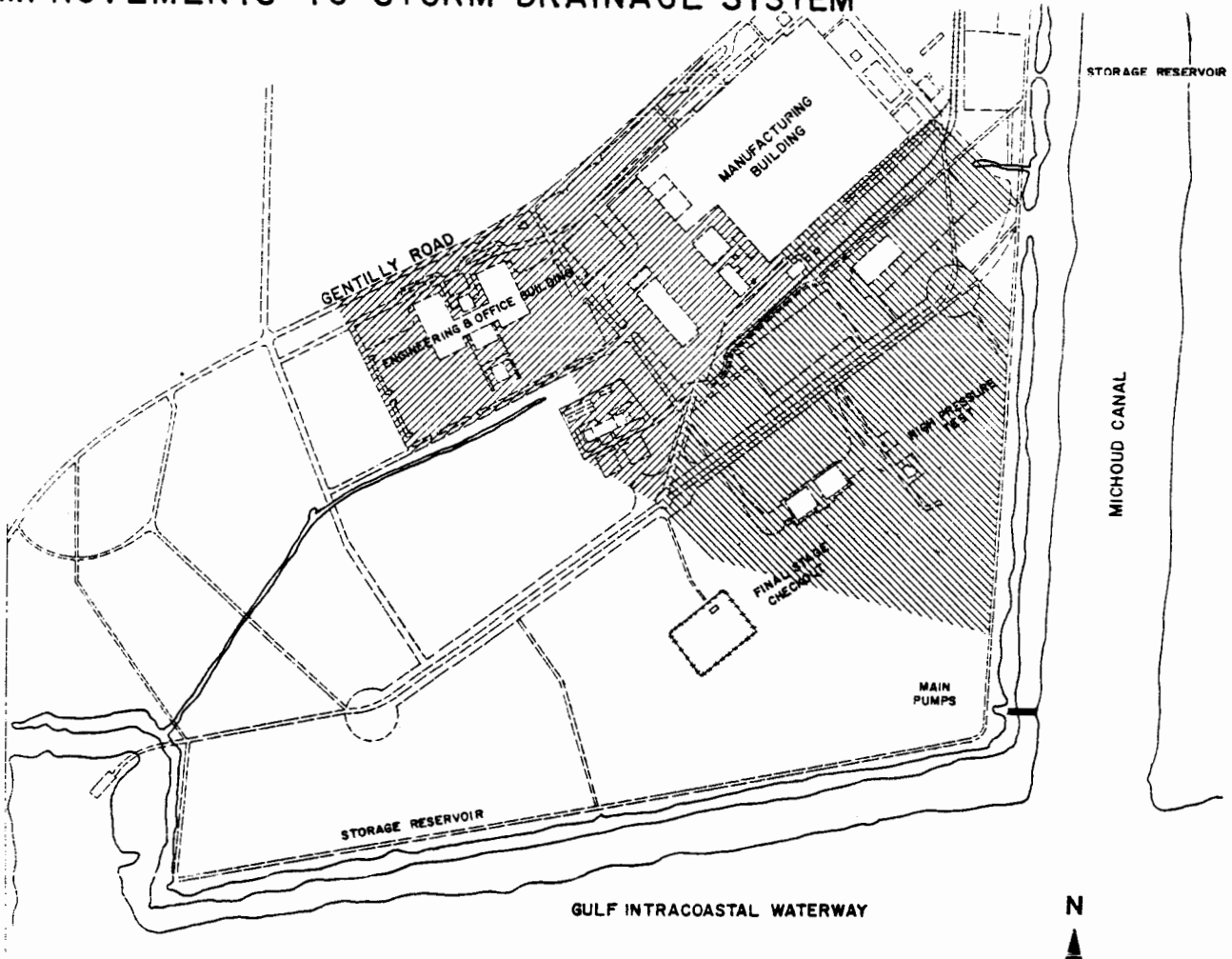
Through many years of plant inactivity and the resulting lack of maintenance, the Michoud drainage system lost much of its effectiveness. Silt and sludge accumulated throughout the system, and many lines suffered significant damage. In addition, new construction has added large paved areas which have increased both the rate and quantity of run-off. Although work in support of critical areas and new construction has been performed, a comprehensive project is required to integrate the entire system and provide the necessary flood protection to operating areas and equipment.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

MICHOUD PLANT

FISCAL YEAR 1966 ESTIMATES

IMPROVEMENTS TO STORM DRAINAGE SYSTEM



LEGEND:

- PUMP STATION NUMBER 3 DRAINAGE SYSTEM
- PUMP STATION NUMBER 4 DRAINAGE SYSTEM

SITE PLAN

0 200 600 1200
FEET

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

MISSISSIPPI TEST FACILITY

Page No.

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Summary..... CF 10-2

Office of Manned Space Flight Projects:

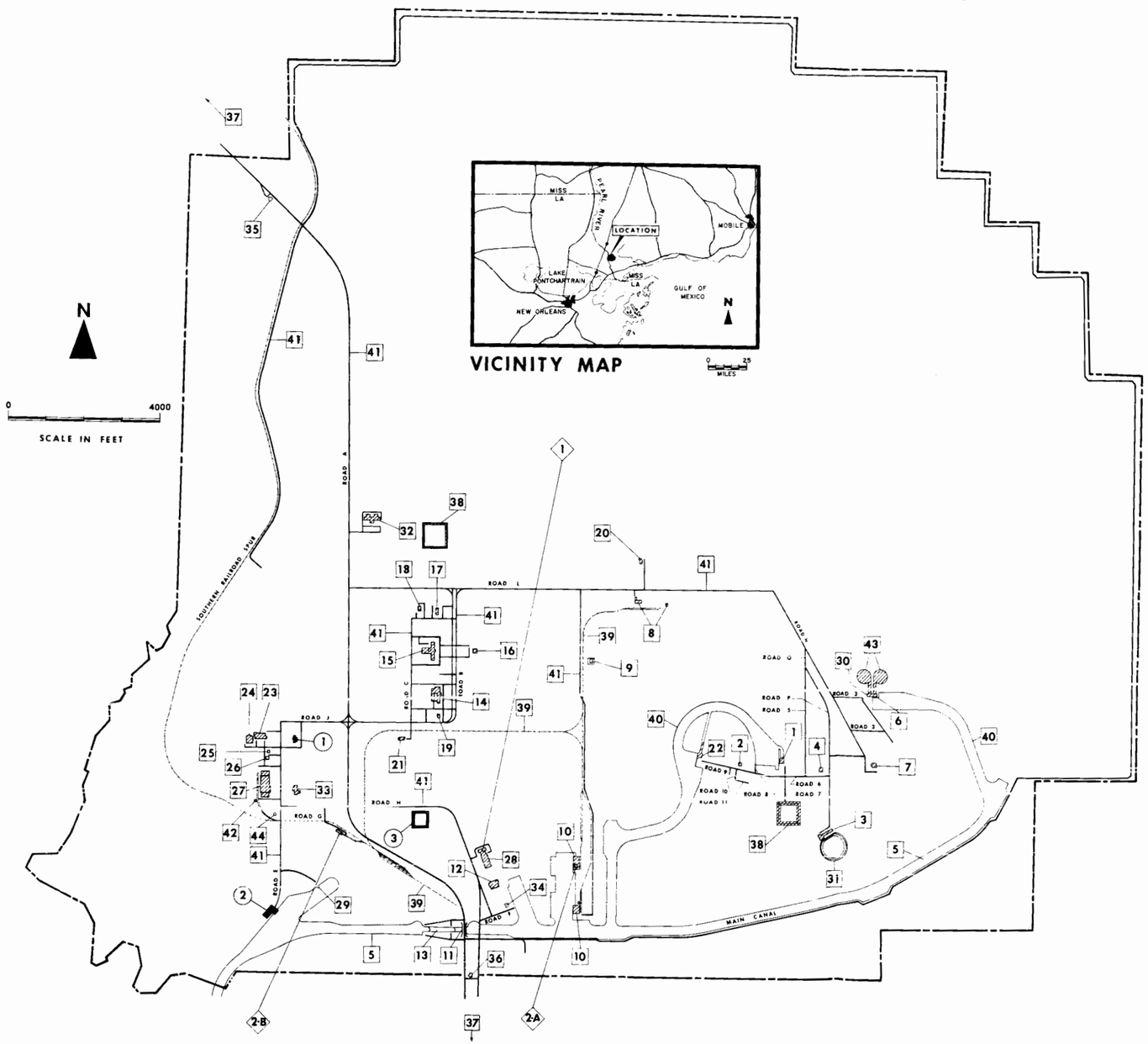
Additions to S-II stage checkout and storage building..... CF 10-3

General support facilities..... CF 10-6

MISSISSIPPI TEST FACILITY

FISCAL YEAR 1966 ESTIMATES

LOCATION PLAN



LEGEND

● EXISTING FACILITIES

1. EMERGENCY SERVICE BUILDING
2. CONSTRUCTION DOCK
3. SEWAGE LAGOON NO. 2

▨ FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

1. S-II TEST STAND (FIRST)
2. S-II TEST CONTROL CENTER
3. HIGH PRESSURE INDUSTRIAL WATER PUMPING STATION
4. DATA ACQUISITION CENTER
5. CANAL DREDGING
6. S-IC TEST STAND (FIRST POSITION 220-B)
7. S-IC TEST CONTROL CENTER
8. CENTRAL COMPRESSOR BUILDINGS
9. RP-1 CENTRAL STORAGE
10. CRYOGENICS STORAGE AND TRANSFER STATION
11. CANAL BRIDGE
12. S-IC STAGE STORAGE BUILDING
13. NAVIGATION LOCK
14. ELECTRONICS INSTRUMENTATION AND MATERIALS LABORATORY
15. OFFICE AND ADMINISTRATION BUILDING
16. DATA HANDLING CENTER
17. TEST AREA CONTROL CENTER
18. COMMUNICATIONS AND TELEPHONE BUILDING
19. ACOUSTICS LABORATORY
20. METEOROLOGICAL BUILDING
21. CENTRAL HEATING PLANT
22. S-II TEST STAND (SECOND)
23. SITE MAINTENANCE BUILDING
24. TEST MAINTENANCE BUILDING
25. COMPRESSED GAS CYLINDER STORAGE BUILDING
26. INFLAMMABLE MATERIALS STORAGE BUILDING
27. WAREHOUSE
28. S-II STAGE CHECKOUT AND STORAGE FACILITY
29. RP-1 TRANSFER DOCK
30. S-IC TEST STAND (SECOND POSITION 220-A)
31. INDUSTRIAL WATER RESERVOIR
32. COMPONENTS SERVICE FACILITIES
33. MOBILE EQUIPMENT OPERATIONS BUILDING
34. CRYOGENICS BARGE SERVICE BUILDING
35. SECURITY CONTROL CENTER (NORTH)
36. SECURITY CONTROL CENTER (SOUTH)
37. ACCESS ROADS (OUTSIDE FEE AREA)
38. SEWAGE LAGOONS
39. RAILROADS
40. TEST AREA WATERWAYS
41. AREA ROADS
42. SALVAGE MATERIALS STORAGE BUILDING
43. S-IC TEST STAND SOUND SUPPRESSORS
44. ELEVATED WATER TANK NO. 1

◇ PROPOSED FISCAL YEAR 1966 PROJECTS

1. ADDITION TO S-II STAGE CHECKOUT AND STORAGE FACILITY

2. GENERAL SUPPORT FACILITIES
   - A. LIQUID HYDROGEN RECEIVING STORAGE
   - B. LOCOMOTIVE SHOP

CF 10-1

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES
(Dollars in Thousands)

NASA 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.

INSTALLATION 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	143
CONTRACTOR AND OTHER PERSONNEL	248	1,113	2,349
TOTAL ALL PERSONNEL	291	1,239	2,492

LAND	NO. ACRES
NASA-OWNED	21,391
OTHER GOVERNMENT AGENCY-OWNED	-
NON-FEDERAL *(Leases, easements)*	117,704
TOTAL LAND	139,095
TOTAL CAPITAL INVESTMENT *(Including NASA-Owned Land) (as of June 30, 1964)*	$ 57,103.0

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1962 THRU CURRENT YEAR	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Addition to S-II Stage Checkout & Storage Facility	MSF	4,748.7	1,177.0	-0-	5,925.7
General Support Facilities	MSF	60.0	944.0	-0-	1,004.0
ALL OTHER PROJECTS		246,209.3			
TOTALS		251,018.0	2,121.0		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

ADDITIONS TO S-II STAGE CHECKOUT AND STORAGE BUILDING

AUTHORIZATION LINE ITEM: Mississippi Test Facility

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Hancock County, Mississippi

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: Addition

FUNDING:

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

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$939,900
Site development	LS	---	$13,400	13,400
Vertical checkout bay (125 ft. high - 6 floors @ 60 x 63 ft.)	Sq. Ft.	22,680	40.85	926,500
Equipment				$237,100
Stage checkout dolly	LS	---	91,100	91,100
Technical systems	LS	---	146,000	146,000
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$1,177,000

PROJECT PURPOSE:

To provide a second vertical checkout bay required for the post static testing of the S-II stage of the Saturn V.

PROJECT DESCRIPTION:

This addition will consist of a high-bay area having floors with manually adjustable heights. The building frame will be structural steel; the exterior walls will be metal siding. The structure, 63 feet long x 60 feet wide x 125 feet high, will withstand hurricane wind velocities and will be designed to resist fragmentation damage in case of vehicle tank rupture. 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 accomplish the post static checkout testing which is the final phase of acceptance testing of S-II stages. The checkout to be accomplished is 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.

The tests consist of mechanical systems checks, electrical systems checks, individual component checks, systems integration checkout, sequence tests, leak checks, S-IC/S-II interstage electrical integrity checkout, and telemetry checkout.

Time required for these tests is estimated to be three months per stage. To accomplish these tests, two vertical checkout bays are required. The first, which was funded in 1965, is adequate to achieve the required testing through Calendar Year 1966. With the increased stage delivery rate starting in Calendar Year 1967, a second vertical bay is required. This addition must be funded in Fiscal Year 1966 in order to be available by 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 bays will be testing stages concurrently to meet the planned delivery schedules.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

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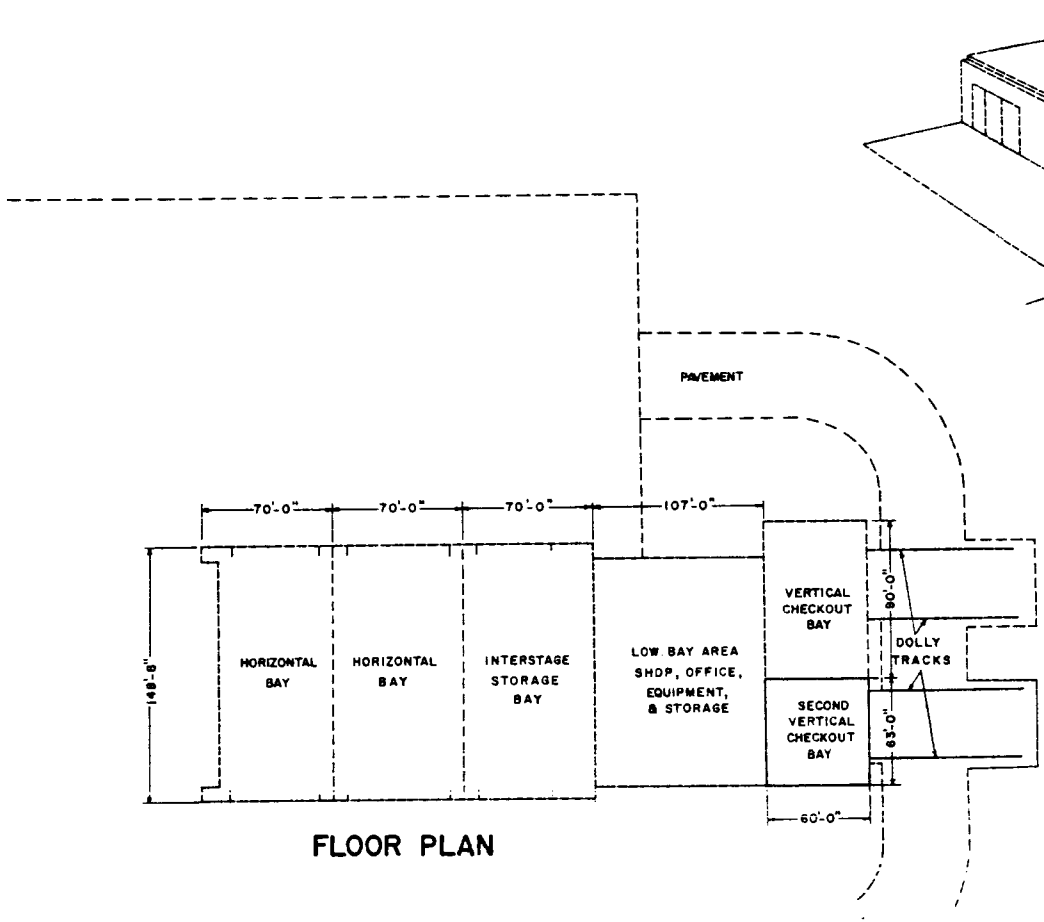
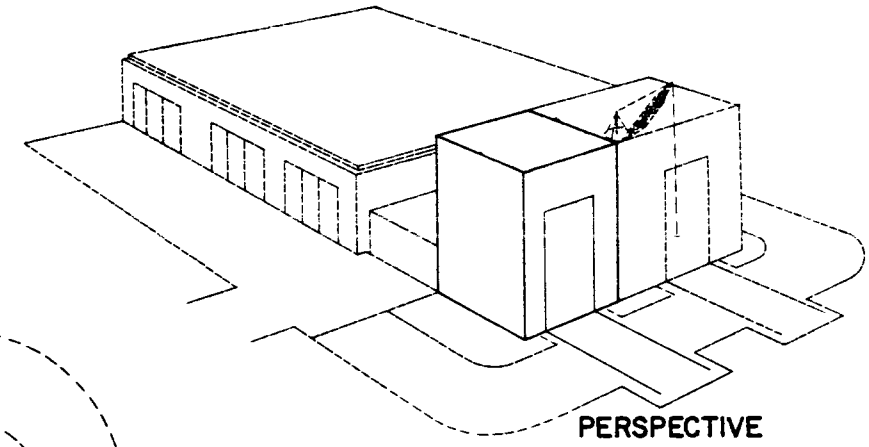
MISSISSIPPI TEST FACILITY

FISCAL YEAR 1966 ESTIMATES

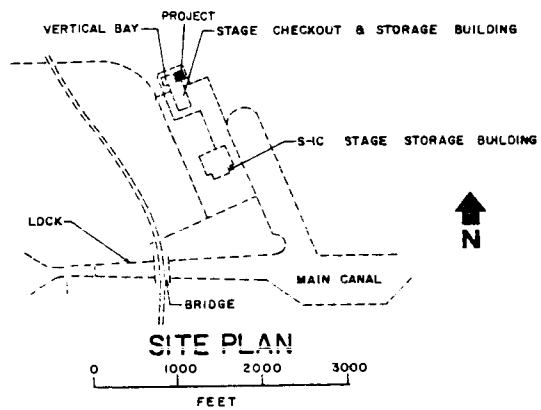
ADDITION TO S-II STAGE CHECKOUT & STORAGE BUILDING



FLOOR PLAN



PERSPECTIVE



SITE PLAN

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

GENERAL SUPPORT FACILITIES

AUTHORIZATION LINE ITEM: Mississippi Test Facility

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Hancock County, Mississippi

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1965 and Prior Years	$60,000
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	Gals.	500,000	$1.60	800,000
Locomotive shop	Sq. Ft.	1,800	22.78	41,000
Service pit and inside railroad	LS	---	4,800	4,800
Utilities	LS	---	22,000	22,000
Railroad spur	LF	1,000	22.80	22,800
Site preparation	LS	---	49,400	49,400
Equipment				$4,000
Locomotive shop equipment	LS	---	4,000	4,000
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$944,000

PROJECT PURPOSE:

To provide on site liquid hydrogen storage capacity, a locomotive shop, a railroad spur and supporting utilities at the Mississippi Test Facility.

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 hydrogen storage tank, two transfer platforms and associated equipment. The storage tank and its supporting structure will be designed for blast loading.

Locomotive Shop - This facility will be a prefabricated sheet metal structure on a concrete slab of about 1,800 square feet. Included will be a railroad track into the shop and equipment for basic maintenance and minor repairs. A concrete pit will be provided within the building for inspection and maintenance activities.

Railroad Spur - This item consists of 1,000 linear feet of railroad from the main track to the locomotive shop. 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 locomotive shop. Sewage treatment will be provided by a septic tank system. A fuel oil storage and dispensing system will also be provided.

PROJECT JUSTIFICATION:

Liquid hydrogen will be transported to the Mississippi Test Facility by barges, which function as both carriers and storage vessels. In support of these operations, the liquid hydrogen storage tank will:

1. Provide reserve capacity when the barges require servicing, or in case of damage to one of the barges.

2. Permit top-off of 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. Supply liquid hydrogen short-term test demands when weather precludes barge movement. Testing can thus proceed on schedule regardless of weather conditions.

A locomotive shop is required for periodic inspection, minor routine maintenance, and shelter of the government-owned locomotive which is used for switching within the Fee Area. Movement of the locomotive to and from

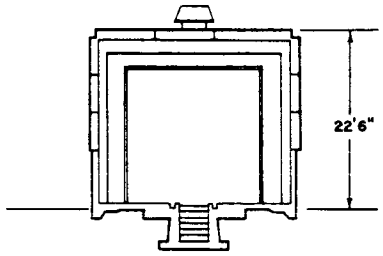
a New Orleans shop is an expensive and time consuming alternative to on-site performance of minor day-to-day maintenance.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

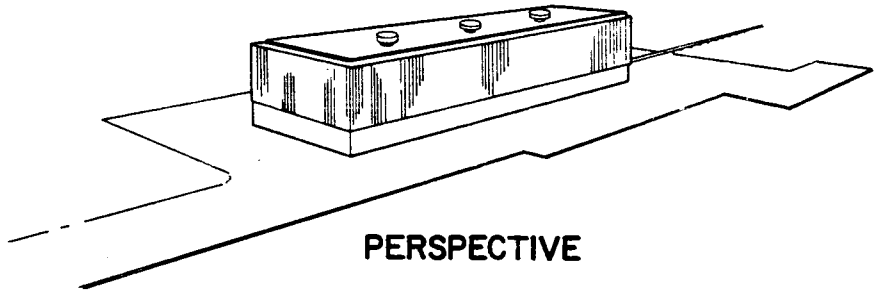
MISSISSIPPI TEST FACILITY

FISCAL YEAR 1966 ESTIMATES

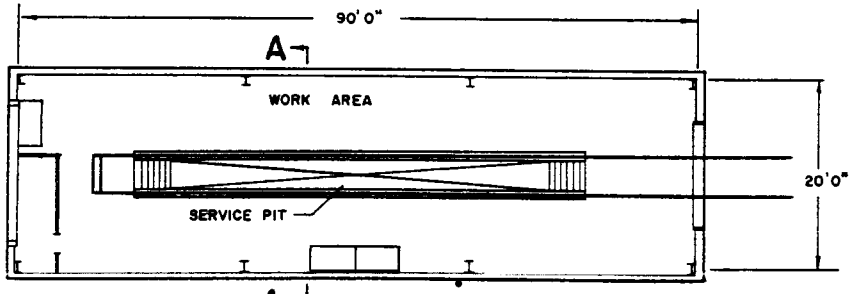
GENERAL SUPPORT FACILITIES



SECTION A-A



PERSPECTIVE



FLOOR PLAN

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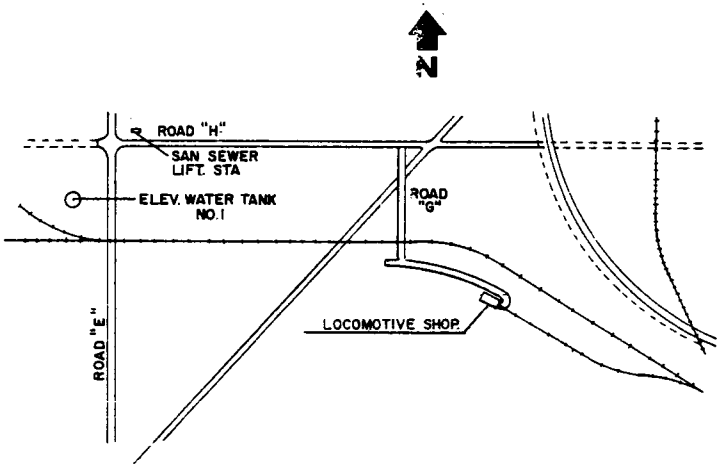
FEET

LOCOMOTIVE SHOP



SITE PLAN

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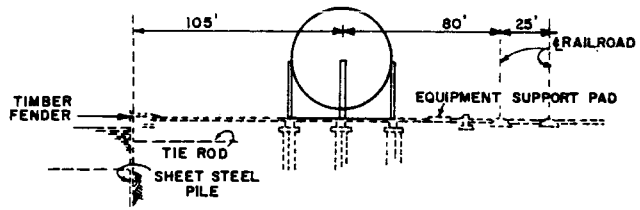
FEET

MISSISSIPPI TEST FACILITY

FISCAL YEAR 1966 ESTIMATES

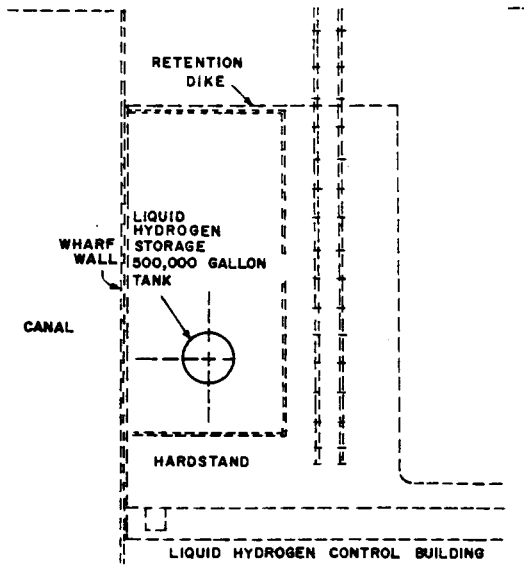
GENERAL SUPPORT FACILITIES



TYPICAL SECTION

AT STORAGE TANK

NO SCALE



PLAN

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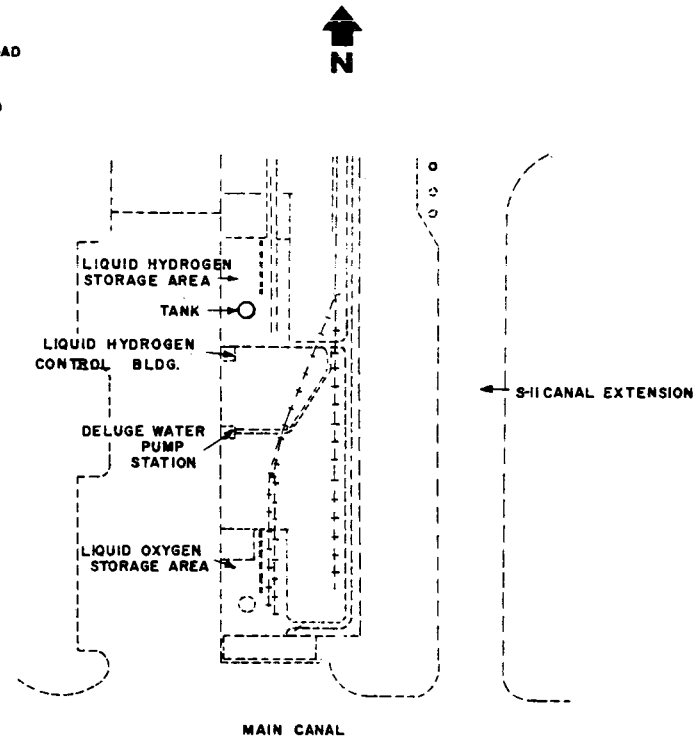
SCALE IN FEET



SITE PLAN

0 400 800

SCALE IN FEET

LIQUID HYDROGEN RECEIVING STORAGE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

VARIOUS LOCATIONS

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Deep space antenna facility, Canberra, Australia..... CF 11-22

STADAN facility, Fairbanks, Alaska..... CF 11-27

Apollo network ground station, Antigua, W. I.
(facility for unified "S" band system)..... CF 11-34

Apollo network ground station, Antigua, W. I.
(community support facilities)..... CF 11-37

Apollo network ground station, Grand Canary Islands..... CF 11-42

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 BUDGET ESTIMATES
(Dollars in Thousands)

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Various Locations	Manned Space Flight	Not applicable	Not applicable	Not applicable

INSTALLATION MISSION

PERSONNEL STRENGTH	FY 1964	FY 1965	FY 1966
NASA PERSONNEL *(End of Year)*			
CONTRACTOR AND OTHER PERSONNEL			
TOTAL ALL PERSONNEL			

LAND	NO. ACRES
NASA-OWNED	
OTHER GOVERNMENT AGENCY-OWNED	
NON-FEDERAL *(Leases, easements)*	
TOTAL LAND	
TOTAL CAPITAL INVESTMENT *(Including NASA-Owned Land) (as of June 30, 1964)*	$ ---

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1962 THRU CURRENT YEAR	FY 1966 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Facilities for F-1 Engine Program	MSF	62,196.0	2,007.0	-0-	64,203.0
Facilities for J-2 Engine Program	MSF	29,502.8	2,436.0	-0-	31,938.8
Facilities for S-II Stage Program	MSF	2,863.7	1,690.0	-0-	4,553.7
Deep Space Antenna Facility, Madrid, Spain	TDA	36.0	472.0	-0-	508.0
Deep Space Antenna Facility, Canberra, Australia	TDA	38.0	510.0	-0-	548.0
STADAN Facility, Fairbanks, Alaska	TDA	83.0	1,115.0	-0-	1,198.0
Apollo Network Ground Station - Antigua (Fac. for Unified "S" - Band System)	TDA	162.0	2,700.0	-0-	2,862.0
Apollo Network Ground Station - Antigua (Community Support Facilities)	TDA	210.0	3,090.0	-0-	3,300.0
Apollo Network Ground Station - Canary Islands	TDA	120.0	7,674.0	-0-	7,794.0
ALL OTHER PROJECTS		390,672.5			
TOTALS		485,884.0	21,694.0		

NASA FORM 1029 (REV. NOV 64) PREVIOUS EDITIONS ARE OBSOLETE.

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

FACILITIES FOR F-1 ENGINE PROGRAM

AUTHORIZATION LINE ITEM: Various Locations

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Canoga Park, Santa Susana, and Edwards, California

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1965 and Prior Years	$62,196,000
FY 1966 Estimate	2,007,000
Total Funding Through FY 1966	$64,203,000

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,375,000
Developmental test facilities	LS	---	$785,000	785,000
Component test facilities	LS	---	220,000	220,000
Static test facilities	LS	---	370,000	370,000
Equipment				$632,000
Laboratory and instrumentation equipment	LS	---	632,000	632,000
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$2,007,000

PROJECT PURPOSE:

To provide facilities at Canoga Park, Santa Susana and Edwards for the continued development, manufacture and testing of the F-1 Engine.

PROJECT DESCRIPTION:

At Canoga Park construction will include a 1,200 square foot engine checkout cell, a 3,000 square foot Class II clean room, a 2,800 square foot acoustical test facility, a 4,000 square foot hydro-shaker test facility, augmentation of development equipment as well as additions and modifications to instrumentation and the liquid nitrogen and gaseous nitrogen distribution systems.

At Santa Susana, a 1,600 square foot turbo-pump support building will be erected. Miscellaneous modifications, test system additions and general facility modifications to the gaseous nitrogen, liquid nitrogen, helium, and high pressure propellant storage facilities will also be required.

Construction at Edwards will include modifications and improvements to area test support facilities, as well as modifications and additions to test stand instrumentation, power supplies and cryogenic transfer system.

Procurement and installation of additional development, test and instrumentation equipment is included for each of the three locations.

PROJECT JUSTIFICATION:

The facilities in this project are required to support the planned production rate of the F-1 engine and to assure its continued development.

At Canoga Park an additional engine checkout cell is required having a capability of supporting full pressure tests. This cell is required to support the normal product improvement program which parallels the production phase of the engine. By this means weaknesses which develop during engine firings are overcome and other improvements are incorporated into the system. The alternate to accomplishing this work in a test cell is to conduct the final tests on the stands. This is time consuming and unsatisfactory in view of the number of engines to be tested. All planned facilities at Canoga Park of this type are required for the testing of the production engines, therefore, an additional cell is needed to support product improvement. Associated with this test cell is a 3,000 square foot clean room. This room is required so that engines which develop leaks or are otherwise faulty can be disassembled, repaired, and reassembled in a contaminant free environment.

Facilities for the acoustical and vibrational loading of engine components and assemblies are also required. These facilities are largely

developmental in nature and are needed to provide an added capability of subjecting the engine components and assemblies to the sonic and vibration loads they will encounter prior to full scale operation on the test stand. As the F-1 engine undergoes further development, these forces will change. It is necessary that the engine components and assemblies be tested for their capability to withstand operational loads under conditions where failure will not result in a loss of the entire engine.

A turbo pump support building is needed in the Bravo test area at Santa Susana to provide shop space and storage for pump components. Pump testing was moved to the Bravo area because of safety considerations. These considerations became very critical as a result of an accident which virtually destroyed the pump test cell in Component Test Laboratory 3. The supporting shop and parts storage is still located in the former test area, some 2½ miles away from the present site.

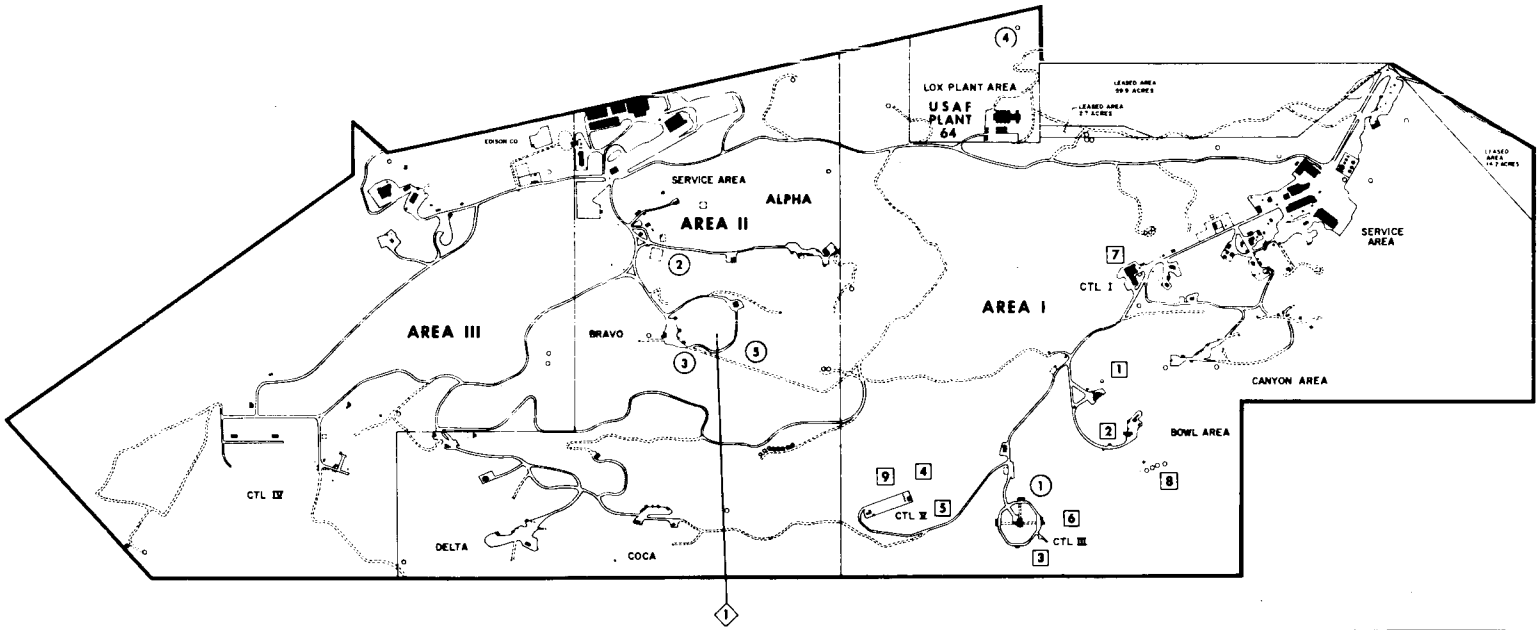
At Edwards there will be need to modify the development test stands and related technical and support systems to accommodate changes in the engine development program. Development changes on the engines will continue to take place for considerable time after full production has been achieved. These changes will be generated as a result of flight operations, ground testing of production articles or changes dictated by the need for increased reliability.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

VARIOUS LOCATIONS

FISCAL YEAR 1966 ESTIMATES

FACILITIES FOR F-1 ENGINE PROGRAM



LEGEND

● EXISTING FACILITIES

1 CTL-3
2 BRAVO 1
3 BRAVO 2
4 LN_2 LOX BUFFER STORAGE
5 MODIFICATION TO BRAVO AREA

N

500 0 500 1000 1500
SCALE IN FEET

▨ FACILITIES AUTHORIZED & UNDER CONSTRUCTION

FISCAL YEAR 1964 PROJECT
1 ADDITIONAL INSTRUMENTATION RECORDING CENTER
2 BOWL AREA
3 ADDITIONAL STORAGE TANKS CTL-3
4 ADDITIONAL STORAGE BOTTLES CTL-5
5 MISC ITEMS FOR CTL-3 & CTL-5
6 ADDITIONAL INSTRUMENTATION

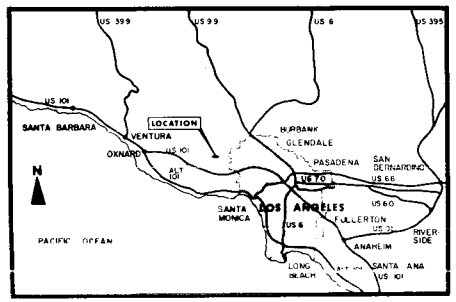
FISCAL YEAR 1965 PROJECT
7 LOX RUN TANK
8 FUEL RUN TANK
9 GN_2 BOTTLE

◇ PROPOSED FISCAL YEAR 1966 PROJECT

1 TURBOPUMP STORAGE & SERVICE
2 COMPONENTS TEST SYSTEMS
3 UTILITY SYSTEMS

NOTE: THESE SYSTEMS (ITEMS 2 & 3) ARE OF A GENERAL NATURE AND TOO WIDESPREAD TO LOCATE SPECIFICALLY

SANTA SUSANA, CALIFORNIA



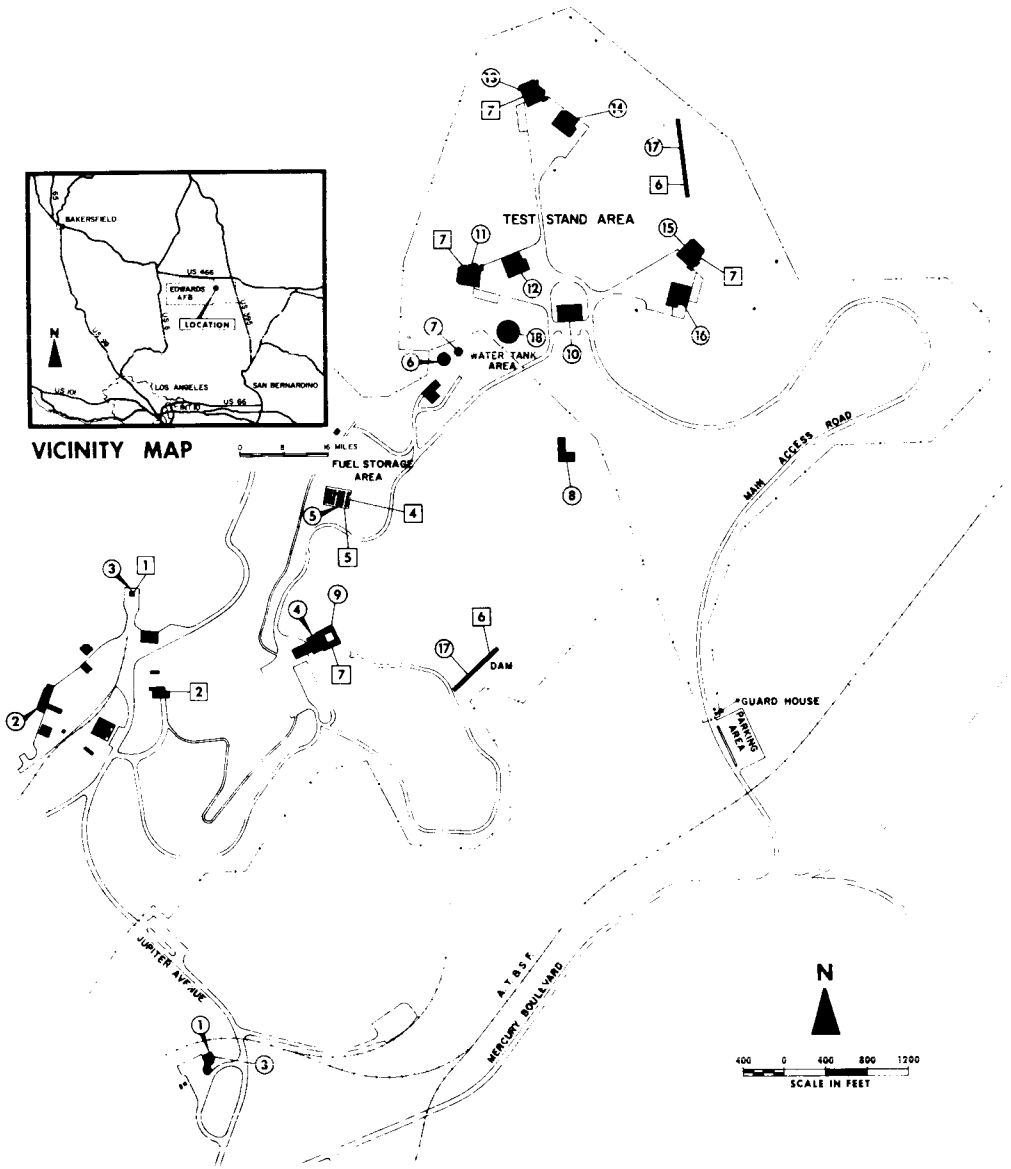
VICINITY MAP

20 10 0 20 40 60
SCALE IN MILES

VARIOUS LOCATIONS

FISCAL YEAR 1966 ESTIMATES

FACILITIES FOR F-1 ENGINE PROGRAM



EDWARDS AIR FORCE BASE, CALIFORNIA

LEGEND

● EXISTING FACILITIES

1 LIQUID OXYGEN STORAGE
2 TEST STAND 2-A
3 TEST STAND 1-A
4 TEST STAND 1-B
5 FUEL STORAGE
6 WATER STORAGE
7 400,000 GAL. FIREX TANK
8 PUMP HOUSE AREA
9 MODIFICATION OF TEST STAND 1-B
10 CONTROL CENTER
11 TEST STAND 1-C
12 PRE TEST BUILDING 1 C
13 TEST STAND 1-D
14 PRE TEST BUILDING 1-D
15 TEST STAND 1-E
16 PRE-TEST BUILDING 1-E
17 RECLAMATION DAM
18 3,000,000 GAL. DEFLECTOR WATER TANK

▨ FACILITIES AUTHORIZED & UNDER CONSTRUCTION

FISCAL YEAR 1964 PROJECT
1 MODIFICATION OF TEST STAND 1-A
2 NEW VALVE SERVICING AREA & MISC. ITEMS

FISCAL YEAR 1965 PROJECT
3 ADDITIONAL LOX STORAGE
4 ADDITIONAL FUEL STORAGE
5 FUEL SUPPLY SYSTEM
6 RECLAMATION DAMS MODIFICATION
7 FLAME CHANNEL MODIFICATIONS

◇ PROPOSED FISCAL YEAR 1966 PROJECT

1 IMPROVEMENTS TO DRAINAGE CHANNELS & BASINS, ROADS & PAVING
2 IMPROVEMENTS TO WATER SUPPLY SYSTEMS
3 IMPROVEMENTS TO UTILITY SYSTEMS
4 MODIFICATIONS & ADDITIONS TO TEST FACILITIES FOR PRODUCTION SUPPORT & R&D OPERATIONS
5 GENERAL IMPROVEMENTS TO TEST STANDS

NOTE: THESE PROPOSED FY-66 FACILITIES ARE OF A GENERAL NATURE AND TOO WIDESPREAD TO LOCATE SPECIFICALLY.

VARIOUS LOCATIONS

FISCAL YEAR 1966 ESTIMATES

FACILITIES FOR F-1 ENGINE PROGRAM

VICINITY MAP

CANOGA PARK, CALIFORNIA

LEGEND

EXISTING FACILITIES

1 MANUFACTURING BUILDING NO. 1 (BLDG. NO. 6600)
2 MANUFACTURING BUILDING NO. 2
3 MANUFACTURING BUILDING NO. 3
4 MATERIAL BUILDING (BLDG. NO. 6620)
5 MAIN BUILDING (BLDG. NO. 6633)
6 WAREHOUSE (BLDG. NO. 6701)
7 ANNEX (BLDG. NO. 6733)
8 VANOWEN (BLDG. NO. 21600)
9 CAFE
10 NORTH SHED
11 MAINTENANCE BUILDING
12 SOUTH SHED
13 PAINT & CHEMICAL STORAGE
14 SHED
15 INCINERATOR
16 MANUFACTURING BUILDING NO. 4

FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

FISCAL YEAR 1963 PROJECT

1 EXPANSION OF R&D PRODUCTION MANUFACTURING EQUIPMENT

FISCAL YEAR 1964 PROJECT

2 EXPANSION OF R&D PRODUCTION MANUFACTURING EQUIPMENT

FISCAL YEAR 1965 PROJECT

3 ENGINE CHECKOUT CELL

PROPOSED FISCAL YEAR 1966 PROJECT

1 CLEAN ROOM
2 ACCOUSTICAL ROOM
3 ENGINE CHECKOUT CELL
4 HYDROSHAKER ROOM
5 LIQUID NITROGEN & GASEOUS NITROGEN SYSTEMS

NOTE: THESE SYSTEMS (ITEM 5) ARE OF A GENERAL NATURE AND TOO WIDESPREAD TO LOCATE SPECIFICALLY.

N

150 0 150 300 450
SCALE IN FEET

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

FACILITIES FOR J-2 ENGINE PROGRAM

AUTHORIZATION LINE ITEM: Various Locations

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Canoga Park, Santa Susana, California

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1965 and Prior Years	$29,502,800
FY 1966 Estimate	2,436,000
Total Funding Through FY 1966	$31,938,800

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$2,130,000
Bowl test area facilities	LS	---	$626,000	626,000
Component test area facilities	LS	---	329,000	329,000
Delta test area facilities	LS	---	265,000	265,000
Delta 2 test stand modification	LS	---	480,000	480,000
Vertical test stand 2 modification	LS	---	215,000	215,000
Vertical test stand 3 modification	LS	---	215,000	215,000
Equipment				$306,000
Environmental equipment	LS	---	90,000	90,000
Instrumentation	LS	---	141,000	141,000
Test equipment	LS	---	75,000	75,000

	Unit of Measure	Quantity	Unit Cost	Total Cost
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$2,436,000

PROJECT PURPOSE:

To provide facility additions and modifications at Canoga Park and Santa Susana, California, necessary for the continued development and improvement of the J-2 engine.

PROJECT DESCRIPTION:

Construction in the Santa Susana Bowl area will include a 5,000 gallon increase in the liquid hydrogen and a 1,500 gallon increase in the liquid oxygen run tanks of Vertical Test Stand No. 2. At the dual position Vertical Test Stand No. 3 there will be an increase of 5,000 gallons to the liquid hydrogen and 1,500 gallons to each of the liquid oxygen run tanks. Additional equipment for the recording system will be installed. The liquid oxygen storage will be increased by 28,000 gallons, liquid hydrogen storage by 45,000 gallons. Eight additional storage bottles will be provided for gaseous hydrogen, nitrogen and helium.

Component test area modifications will include a 45,000 gallon increase in both the liquid oxygen and hydrogen tankage supporting Test Laboratory III and a 45,000 gallon increase in the hydrogen storage for Laboratory V. Additional transfer lines and water distribution service will also be provided.

In the Delta area, construction supporting the dual position Delta 2 test stand will include structural modifications plus a 9,000 gallon increase to the liquid hydrogen and 3,000 gallon increase to the liquid oxygen run tanks. Additional storage will be provided in the Delta area in the form of a 45,000 gallon liquid hydrogen tank, an 80,000 gallon liquid oxygen tank together with 13 storage bottles for helium, gaseous hydrogen and nitrogen.

Additional environmental, instrumentation, and test equipment will be procured and installed at both Canoga Park and Santa Susana.

PROJECT JUSTIFICATION:

Existing J-2 facilities are highly specialized devices which must be continually advanced to accommodate engine modifications and testing requirements. These facilities must support the J-2 engine development and production programs through FY 1968 as well as follow-on effort projected through FY 1970.

Modifications and additions to the Bowl test area facilities are required

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to support increased engine run times with a resulting increase in propellant consumption for each run. Much of the planned testing will be in the altitude facilities in this area where a 225 second run capability exists. This capability must be expanded by at least 10 per cent for continued engine development.

Modifications and additions to the Delta test stands are required in order to accommodate changes affecting engine reliability and improved performance. Substantiation of these changes in flight hardware will be accomplished on these stands. Longer run times are necessary to provide assurance that the engine is fully capable of operating for a reasonably longer time than is actually required in flight. This necessitates an increase in the sizes of the present propellant tanks and supply lines.

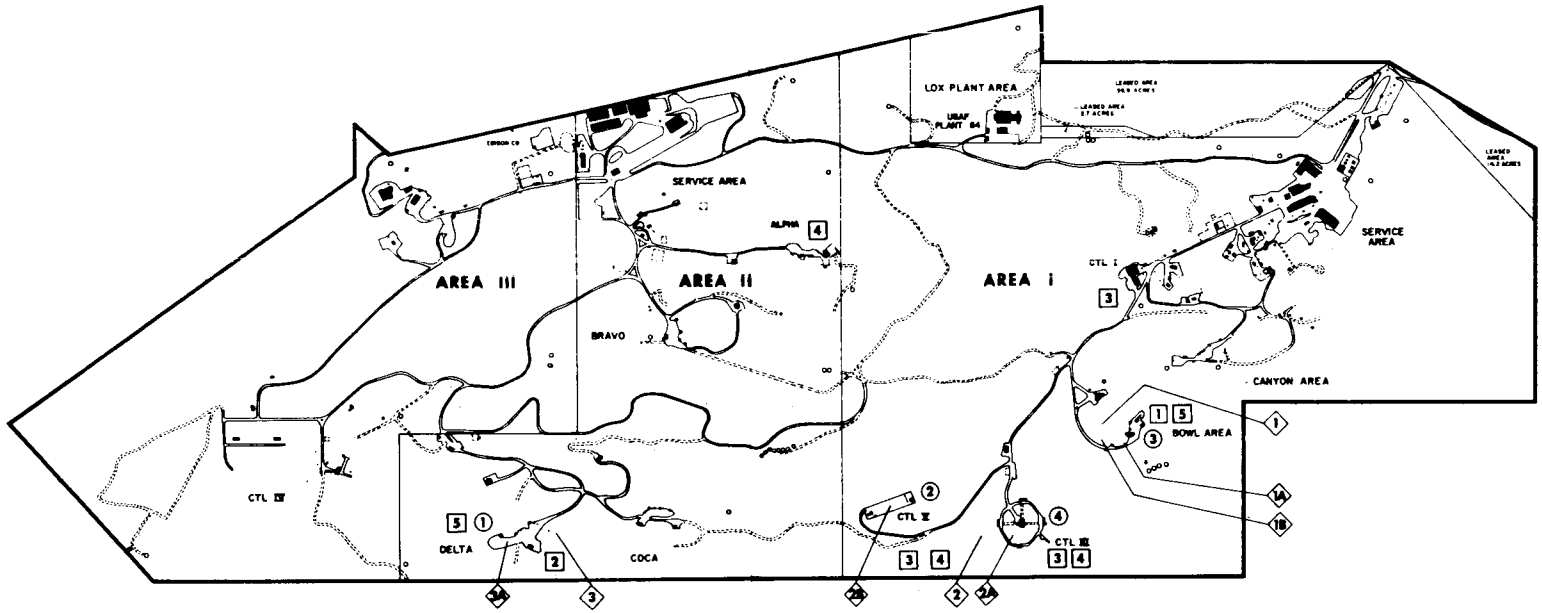
Additions and modification to the Component Test Laboratories III and V are required to support component and subsystem changes necessary to improve engine performance and reliability. For example, changes in the turbo pump necessitate certain changes in the Component Test Laboratory so that the pump can be given rigorous endurance runs before incorporation into the engine system. Larger fuel supply tanks must be installed to allow these extended duration runs.

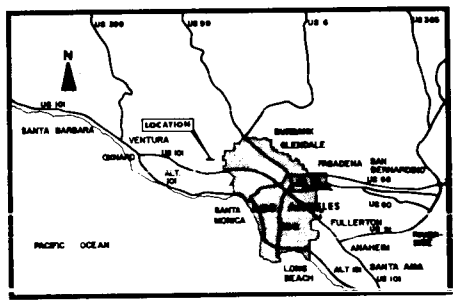
ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

VARIOUS LOCATIONS

FISCAL YEAR 1966 ESTIMATES

FACILITIES FOR J-2 ENGINE PROGRAM





VICINITY MAP

LEGEND

EXISTING FACILITIES

1 DELTA 2 TEST STAND - TWO TEST POSITIONS

2 CTL - 5

3 BOWL

4 CTL - 3

FACILITIES AUTHORIZED & UNDER CONSTRUCTION

FISCAL YEAR 1963 PROJECT

1 VTS - 3 MODIFICATION

FISCAL YEAR 1965 PROJECTS

2 DELTA - 1 MODIFICATION

3 CTL

4 PRODUCTION TEST FACILITIES

5 DEVELOPMENT SUPPORT EQUIPMENT

PROPOSED FISCAL YEAR 1966 PROJECTS

1 BOWL AREA FACILITIES

A. VERTICAL TEST STAND NO. 2

B. VERTICAL TEST STAND NO. 3

2 COMPONENT TEST AREA FACILITIES

A. CTL III

B. CTL V

3 DELTA AREA FACILITIES

A. TEST STAND NO. 2

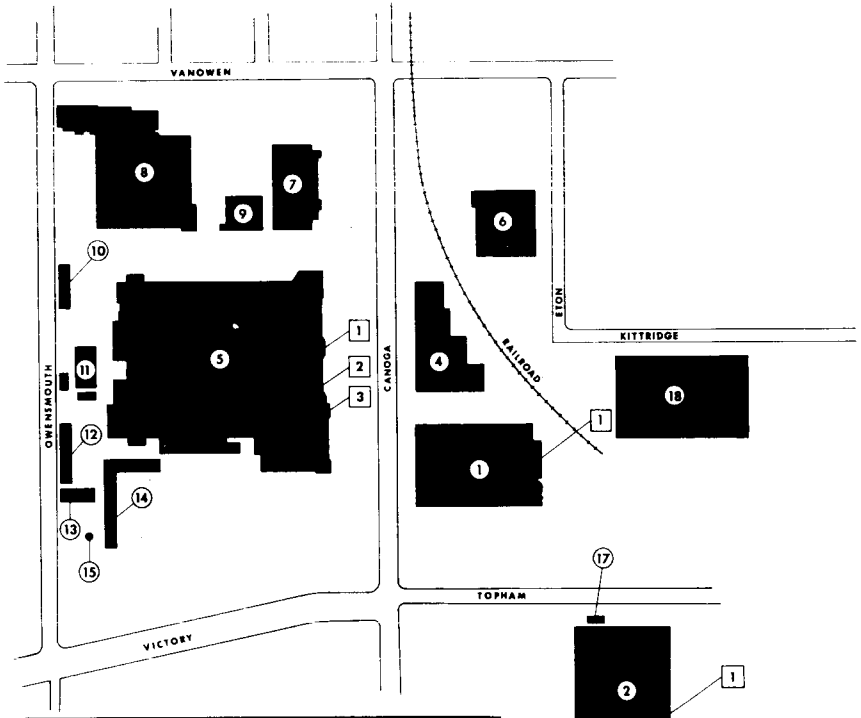
N

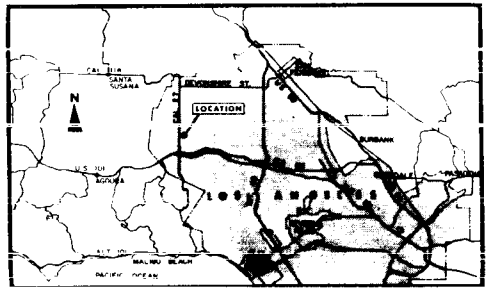
SANTA SUSANA, CALIFORNIA

VARIOUS LOCATIONS

FISCAL YEAR 1966 ESTIMATES

FACILITIES FOR J-2 ENGINE PROGRAM





VICINITY MAP

0 2 4 6 8 MILES

CANOGA PARK, CALIFORNIA

LEGEND

EXISTING FACILITIES

1 MANUFACTURING BUILDING NO. 1 (BLDG. NO. 6600)
2 MANUFACTURING BUILDING NO. 2
3 MANUFACTURING BUILDING NO. 3
4 MATERIAL BUILDING (BLDG. NO. 6620)
5 MAIN BUILDING (BLDG. NO. 6633)
6 WAREHOUSE (BLDG. NO. 6701)
7 ANNEX (BLDG. NO. 6733)
8 VANOWEN (BLDG. NO. 21600)
9 CAFE
10 NORTH SHED
11 MAINTENANCE BUILDING
12 SOUTH SHED
13 PAINT & CHEMICAL STORAGE
14 SHED
15 INCINERATOR
16 HELIUM K BOTTLE BANK
17 NITROGEN GAS CYLINDER & COMPRESSOR
18 MANUFACTURING BUILDING NO. 4

FACILITIES AUTHORIZED & UNDER CONSTRUCTION

FISCAL YEAR 1964 PROJECT

1 EXPANSION OF R & D PRODUCTION MANUFACTURING EQUIPMENT

FISCAL YEAR 1965 PROJECT

2 PRODUCTION TEST FACILITIES
3 DEVELOPMENT SUPPORT EQUIPMENT

PROPOSED FISCAL YEAR 1966 PROJECT

1 ADDITIONAL EQUIPMENT

NOTE: THIS EQUIPMENT WILL BE INSTALLED IN TOO WIDESPREAD AN AREA TO LOCATE SPECIFICALLY

N

150 0 150 300 450
SCALE IN FEET

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

FACILITIES FOR S-II STAGE PROGRAM

AUTHORIZATION LINE ITEM: Various Locations

PROGRAM OFFICE FOR THE PROJECT: Office of Manned Space Flight

LOCATION OF PROJECT: Santa Susana, Seal Beach, California

COGNIZANT NASA INSTALLATION: Marshall Space Flight Center

TYPE OF CONSTRUCTION PROJECT: New

FUNDING:

FY 1965 and Prior Years	$2,863,700
FY 1966 Estimate	1,690,000
Total Funding Through FY 1966	$4,553,700

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$875,000
Bond lay-up area	LS	---	$160,000	160,000
Vertical assembly modifications	LS	---	175,000	175,000
Bulkhead fabrication addition	LS	---	250,000	250,000
Ground service bldg. addition	LS	---	50,000	50,000
Electrical substation and transmission lines	LS	---	200,000	200,000
Helium transfer lines	LS	---	40,000	40,000
Equipment				$815,000
Helium drying system	LS	---	200,000	200,000
Helium store bottles	LS	---	400,000	400,000
Instrumentation system	LS	---	215,000	215,000

	Unit of Measure	Quantity	Unit Cost	Total Cost
Design	---	---	---	---
Fallout Shelter (Not feasible)	---	---	---	None
		TOTAL		$1,690,000

PROJECT PURPOSE:

To provide for the acquisition and construction of additional facilities at Seal Beach and Santa Susana, California for the development, testing and manufacture of the S-II stage.

PROJECT DESCRIPTION:

At Seal Beach, a 40' x 40' x 20' high, room will be added to the Bulkhead Fabrication Facility for the bond lay-up activities. A 40' by 130' addition to the west end of the Bulkhead Fabrication facility and additional oven capacity will be provided for insulation lay-up. Modifications will be made to three stations in the Vertical Assembly Hydrostatic Facility to provide for tank entry.

At Santa Susana 5 additional 470 cubic feet high pressure helium storage bottles will be installed in the Coca area. The helium supply will be expanded at the AlfaBravo Cascade station and the transfer line from AlfaBravo to the Coca area will be increased. The existing Data Recording system will be expanded and the instrumentation tunnel will be enlarged near the Ground Service building. A new substation for the Coca area will be installed as well as a helium drying facility. A 15' by 33' two story addition will be provided at the Coca 4 Ground Service building to provide space for additional ground support equipment.

PROJECT JUSTIFICATION:

The 40' x 40' addition to the Bulkhead Fabrication facility is required for the bond lay-up activities in the manufacture of the common bulkhead. An engineering decision has been reached that the vacuum bell system of assembly must be used in place of the strip seal and hot sizing thus necessitating this addition. The 40' x 130' addition with additional oven capacity provides the needed space in the double seal insulation lay-up.

The modifications to the three stations in the Vertical Assembly Hydrostatic facility are required so that entry can be made into the LH_2 tank to effect design changes to the internal tank system as necessitated by the development program.

The five additional helium bottles in the Coca area at Santa Susana are required to satisfy the increased usage which generates as a result of the engineering design decision to use helium in place of hydrogen for purge and chill down operations. This decision also generates a requirement for the addition of a new helium complex at the AlfaBravo Cascade Station and an increase in the size of the transfer lines between the two areas.

The expansion of the existing Recording Data system facility is required so that as development progresses and data requirements increase it will be possible to handle this added load. The present system has an expandable capability which will be activated.

The enlargement of the tunnel area near the Ground Service building at Coca is required so that additional instrumentation cables can be installed from the Control Center to Coca 4. This will also provide a means of installing future cables at a reduced cost.

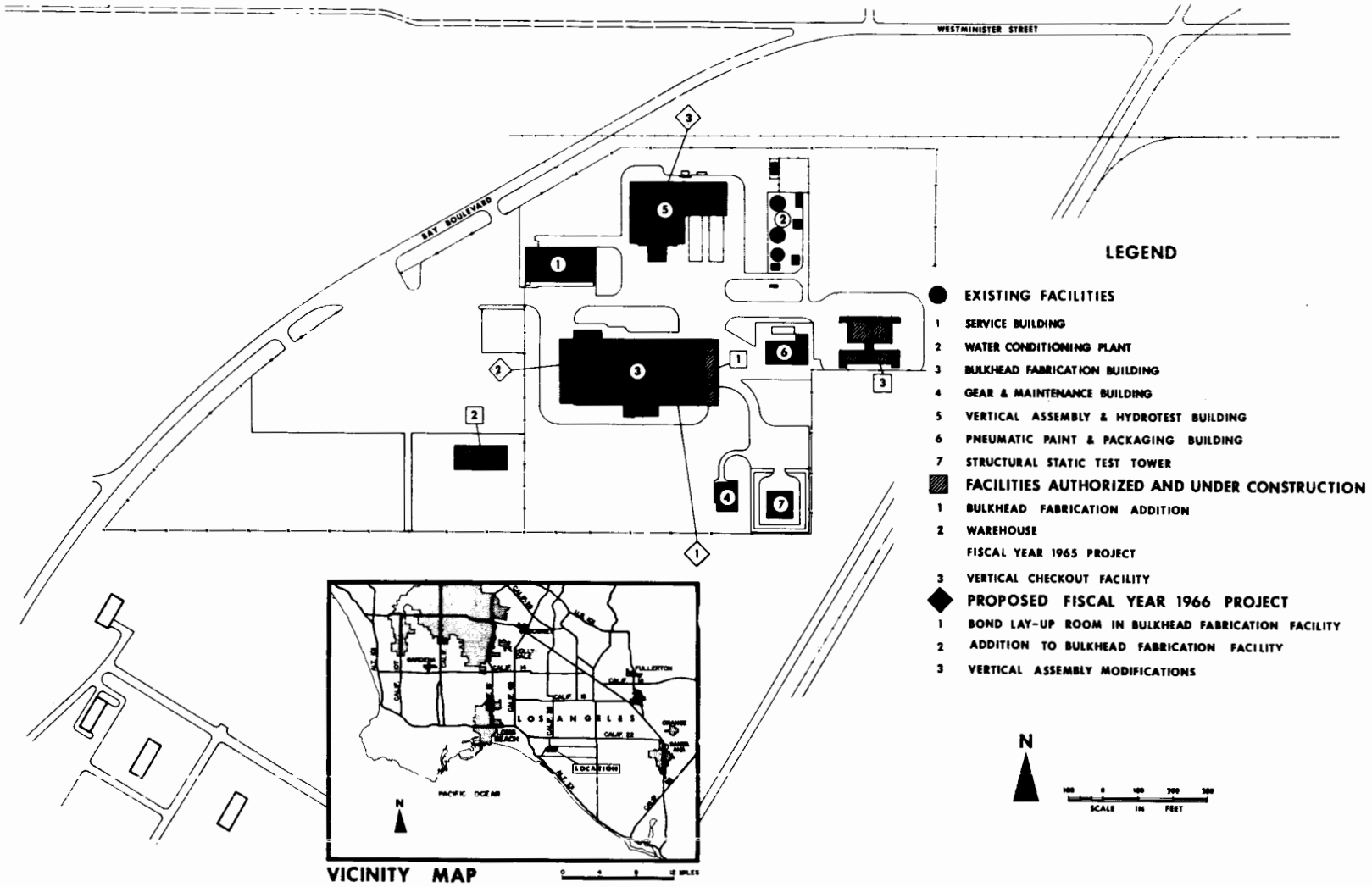
The new electric substation in the Coca area is required to provide for increasing area loads, part of which are generated by additional environmental tests requiring hot gas. A helium drying facility is required to provide a capability of conditioning available helium to required test conditions.

ESTIMATED FUTURE YEAR FUNDING FOR THIS PROJECT: None

VARIOUS LOCATIONS

FISCAL YEAR 1966 ESTIMATES

SATURN V SECOND STAGE (S-II) DEVELOPMENT FACILITIES



SEAL BEACH, CALIFORNIA

VARIOUS LOCATIONS

FISCAL YEAR 1966 ESTIMATES

SATURN V SECOND STAGE (S-II) DEVELOPMENT FACILITIES

LEGEND

● EXISTING FACILITIES

1 CONTROL CENTER
2 COCA 2 TEST STAND
3 COCA 3 TEST STAND
4 UPPER PRETEST BLDG
5 LOWER PRETEST BLDG
6 COCA 1 TEST STAND
7 COCA 4 TEST STAND
8 LH_2 VESSEL
9 LH_2 TRAILER HARDSTAND
10 GROUND SERVICE BLDG
11 VEHICLE PAD
12 LOX VESSEL
13 LOX TRAILER HARDSTAND
14 GROUND SERVICE BLDG
15 HIGH PRESSURE GAS BANK

▨ FACILITIES AUTHORIZED & UNDER CONSTRUCTION

FISCAL YEAR 1964 PROJECT

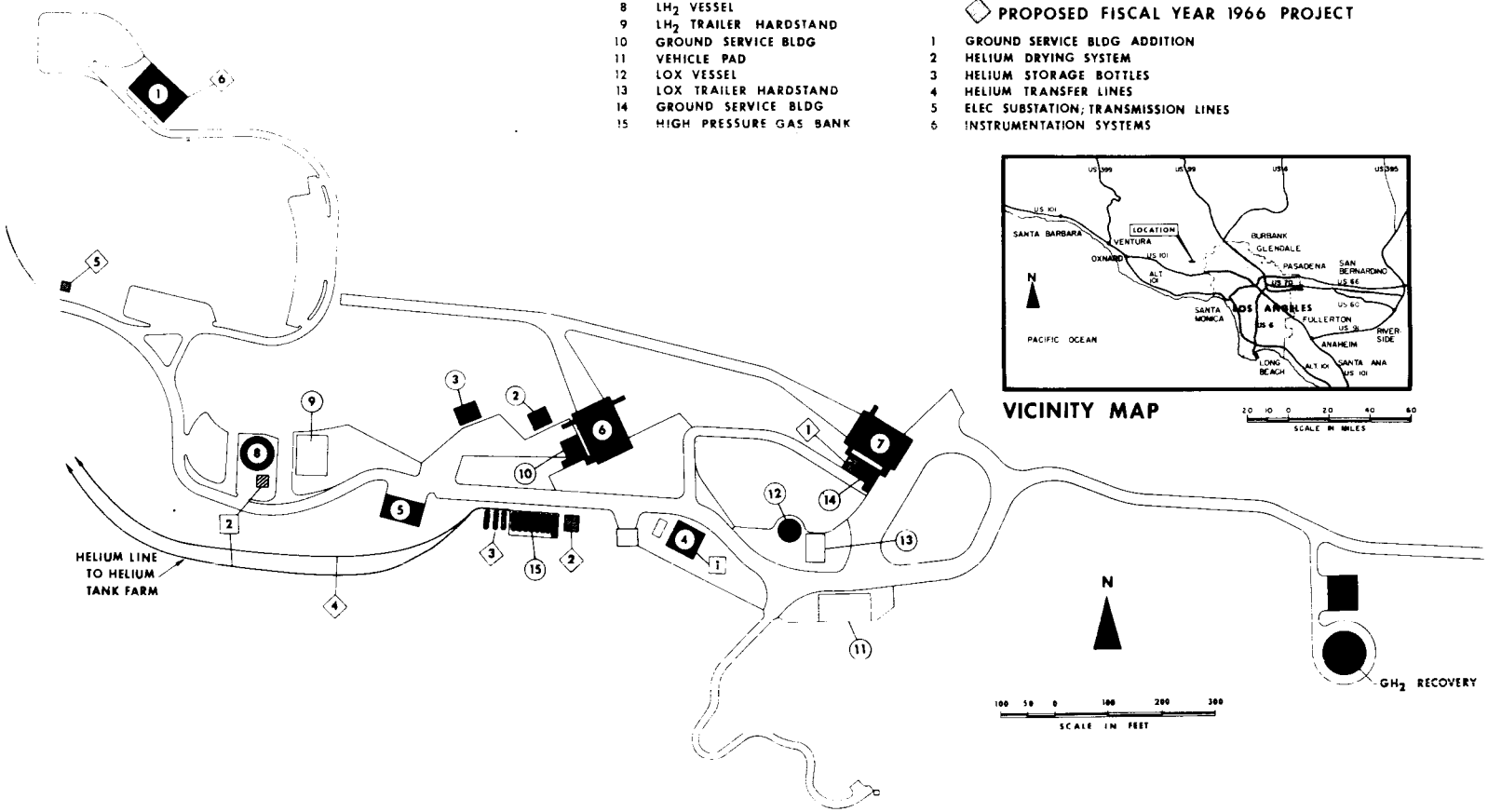
1 UPPER PRETEST BLDG

FISCAL YEAR 1965 PROJECT

2 HIGH PRESSURE GAS & THERMAL CONTROL SYSTEM

◇ PROPOSED FISCAL YEAR 1966 PROJECT

1 GROUND SERVICE BLDG ADDITION
2 HELIUM DRYING SYSTEM
3 HELIUM STORAGE BOTTLES
4 HELIUM TRANSFER LINES
5 ELEC SUBSTATION; TRANSMISSION LINES
6 INSTRUMENTATION SYSTEMS



VICINITY MAP

COCA AREA
SANTA SUSANA, CALIFORNIA

161-134 O - 65 - 19

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

FACILITY PLANNING AND DESIGN

	Page No.
Summary	CF 13-1
Office of the Associate Administrator (NASA General)	
Facility planning and design	CF 13-2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 66 BUDGET ESTIMATES

(Dollars in thousands)

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
All	Office of Associate Administrator	---	---	---

INSTALLATION MISSION

See Justification.

PERSONNEL STRENGTH	FY 19	FY 19	FY 19
NASA PERSONNEL *(End of Year)*			
CONTRACTOR AND OTHER PERSONNEL			
TOTAL ALL PERSONNEL	Not Applicable		

LAND	NO. ACRES
NASA-OWNED	
OTHER GOVERNMENT AGENCY-OWNED	
NON-FEDERAL *(Leases, easements)*	
TOTAL LAND	
TOTAL CAPITAL INVESTMENT *(Including NASA-Owned Land) (as of June 30, 19)*	$

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 19 62 THRU CURRENT YEAR	FY 19 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Facility Planning and Design	AA	$43,937.0	$7,500.0	Not Applicable	Not Applicable
ALL OTHER PROJECTS					
TOTALS		1/ ($43,937.0)	$7,500.0		

NASA FORM 1029 (REV. NOV 64) PREVIOUS EDITIONS ARE OBSOLETE.

1/ This amount is "non-add"; has been distributed in the appropriate installation summary sheets.

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1966 ESTIMATES

FACILITY PLANNING AND DESIGN

AUTHORIZATION LINE ITEM: **Facility Planning and Design**

PROGRAM OFFICE: Office of the Associate Administrator (NASA General)

FUNDING:

FY 1965 and Prior Years	$43,937,000
FY 1966 Estimate	7,500,000
Total Funding Through FY 1966	$51,437,000

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:

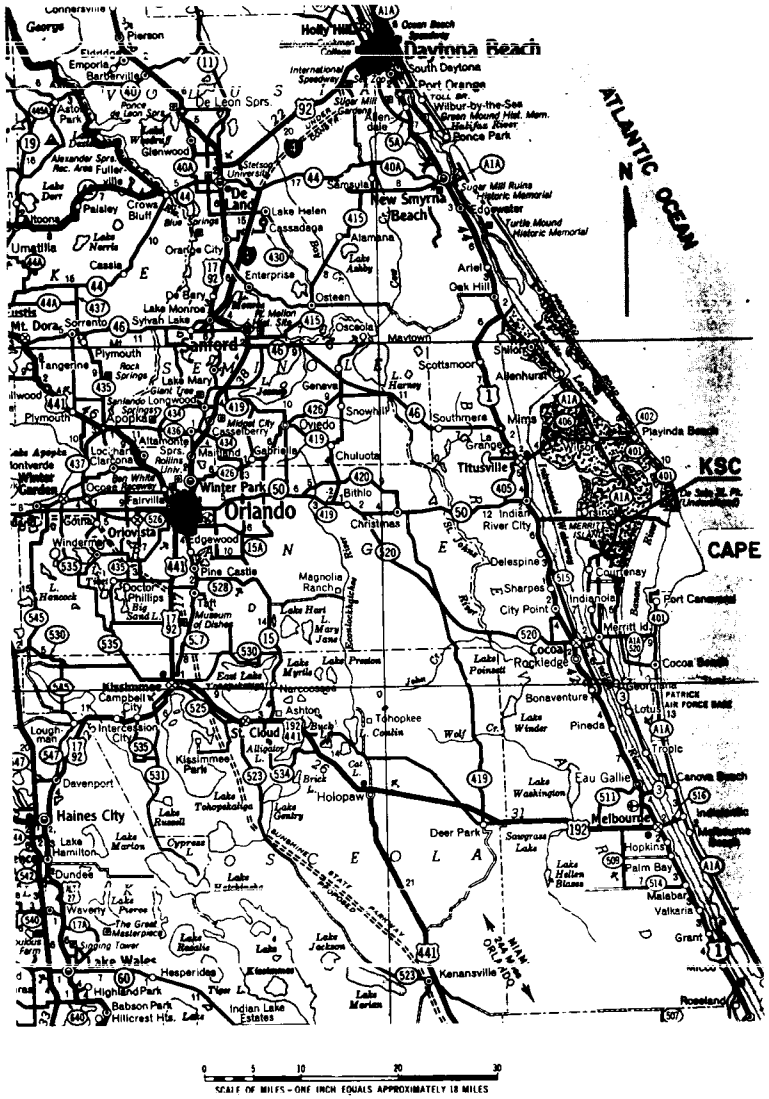
Long-range plans in several program areas must anticipate the need for the construction of facilities beyond the budget year for which estimates are being submitted. A considerable saving in time and an increase in the accuracy of construction cost estimates is possible with the availability of a facility 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.

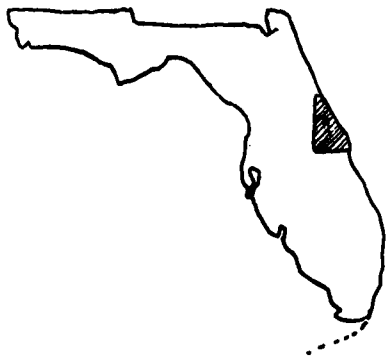
With these funds, NASA will continue as an on-going and continuing activity the general activity of facility planning and design of future construction projects which have not as yet been authorized or for which appropriations have not been made. NASA will also continue to make special project studies, feasibility studies, and other studies necessary to develop and improve overall criteria and standards for the design and construction of facilities.

JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1966 ESTIMATES

VICINITY MAP



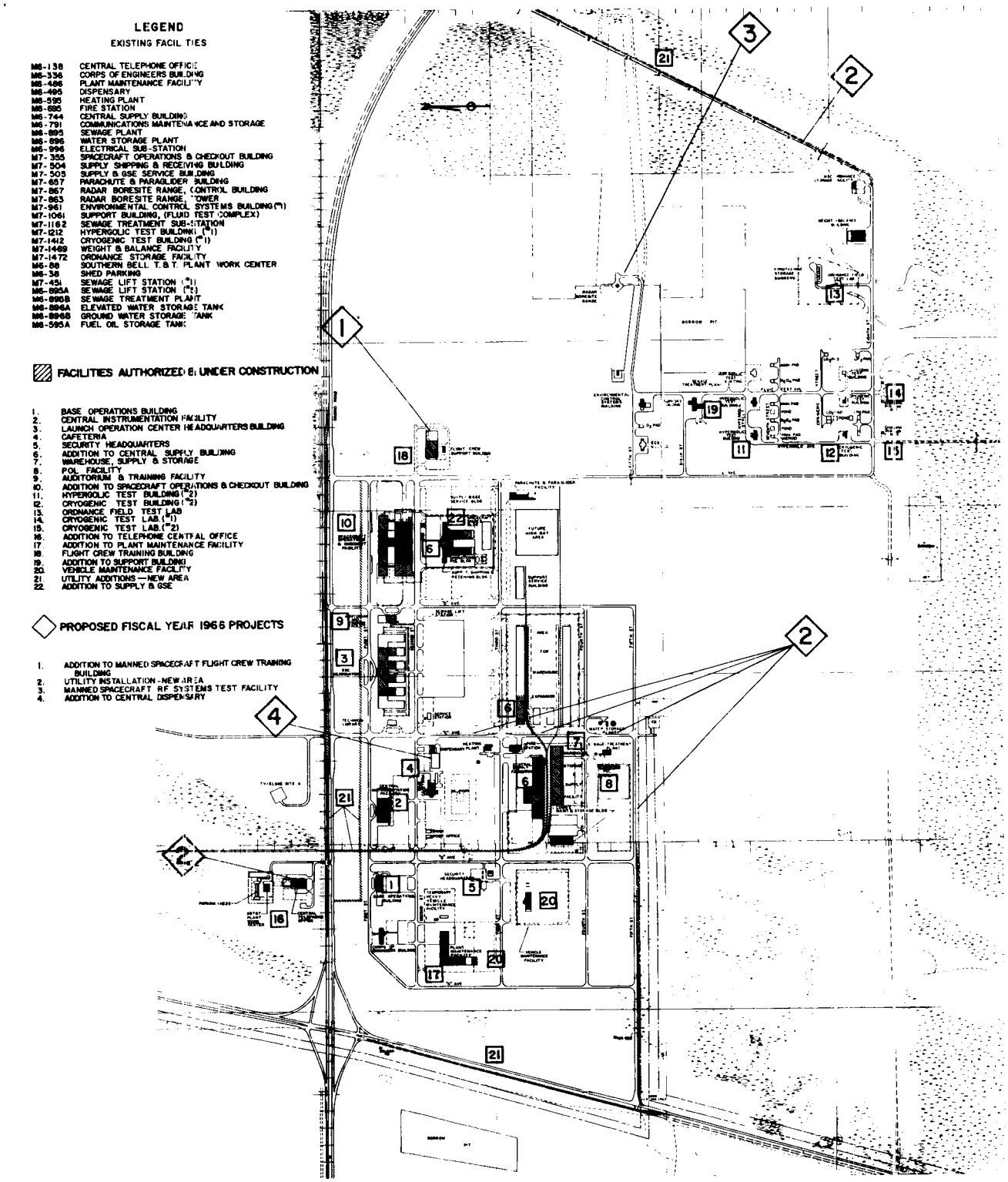


KEY PLAN

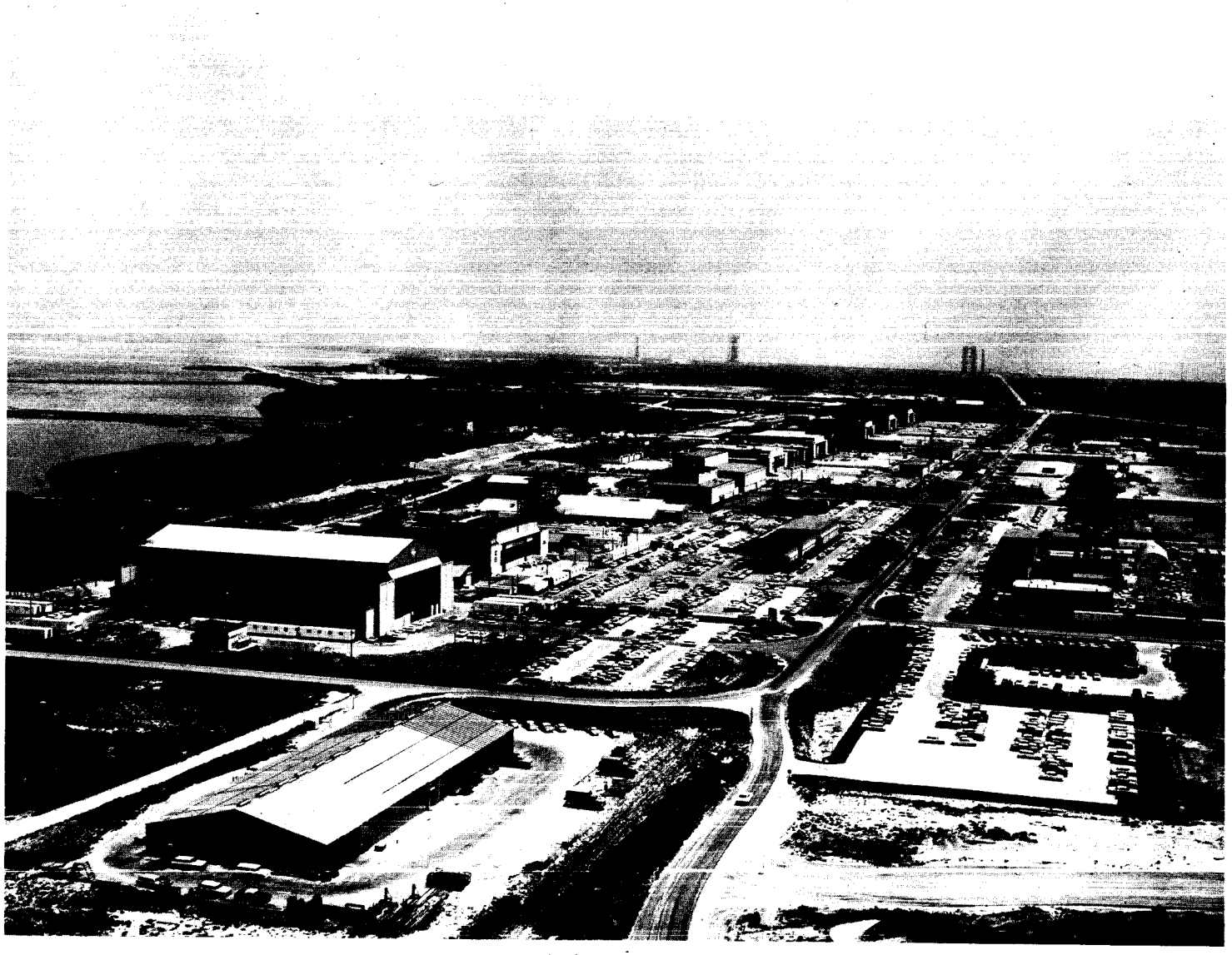
JOHN F. KENNEDY SPACE CENTER

FISCAL YEAR 1966 ESTIMATES

LOCATION PLAN



AO 1-2

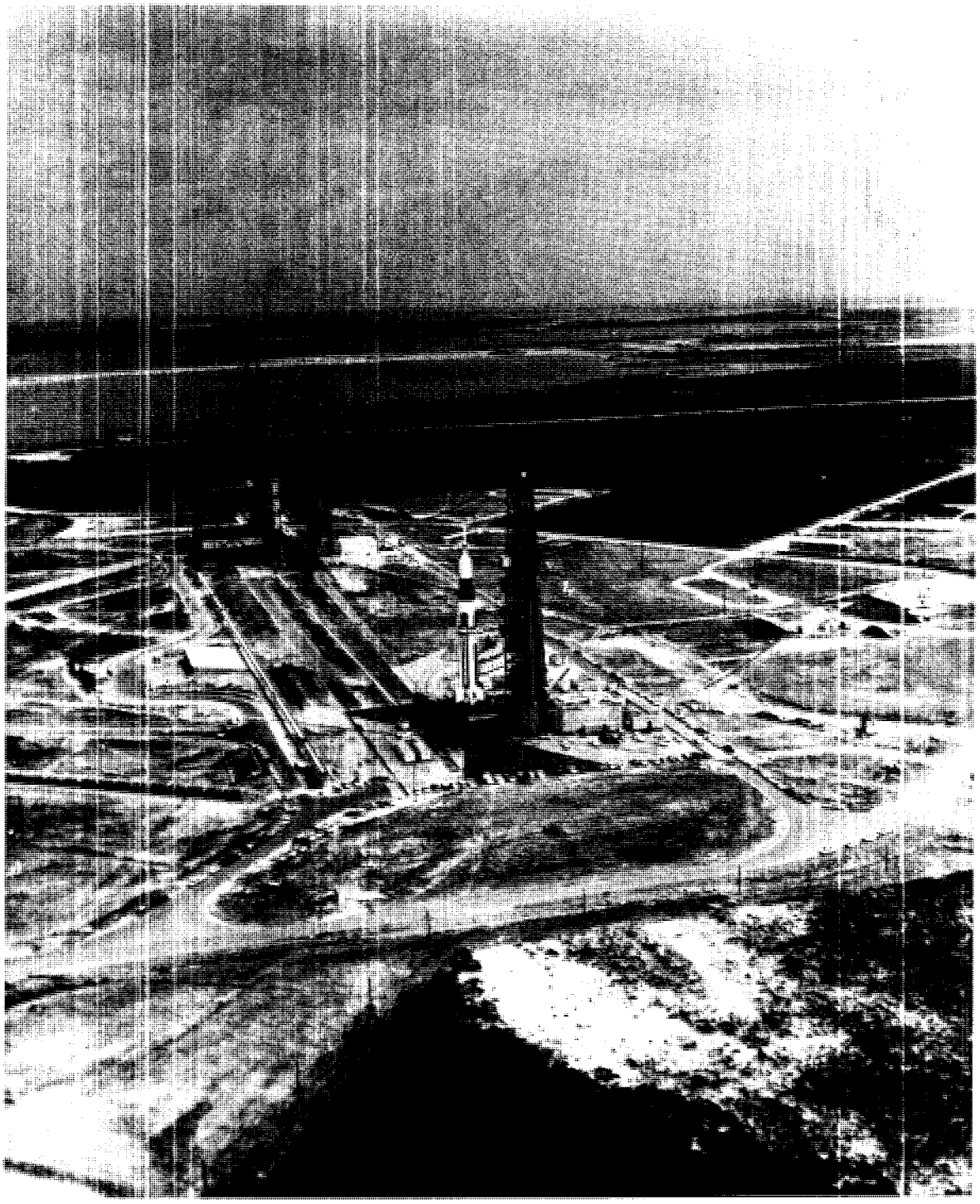


Industrial Area

JOHN F. KENNEDY SPACE CENTER, NASA

Launch Complex 34

JOHN F. KENNEDY SPACE CENTER, NASA



Launch Complex 37 AO 1-5

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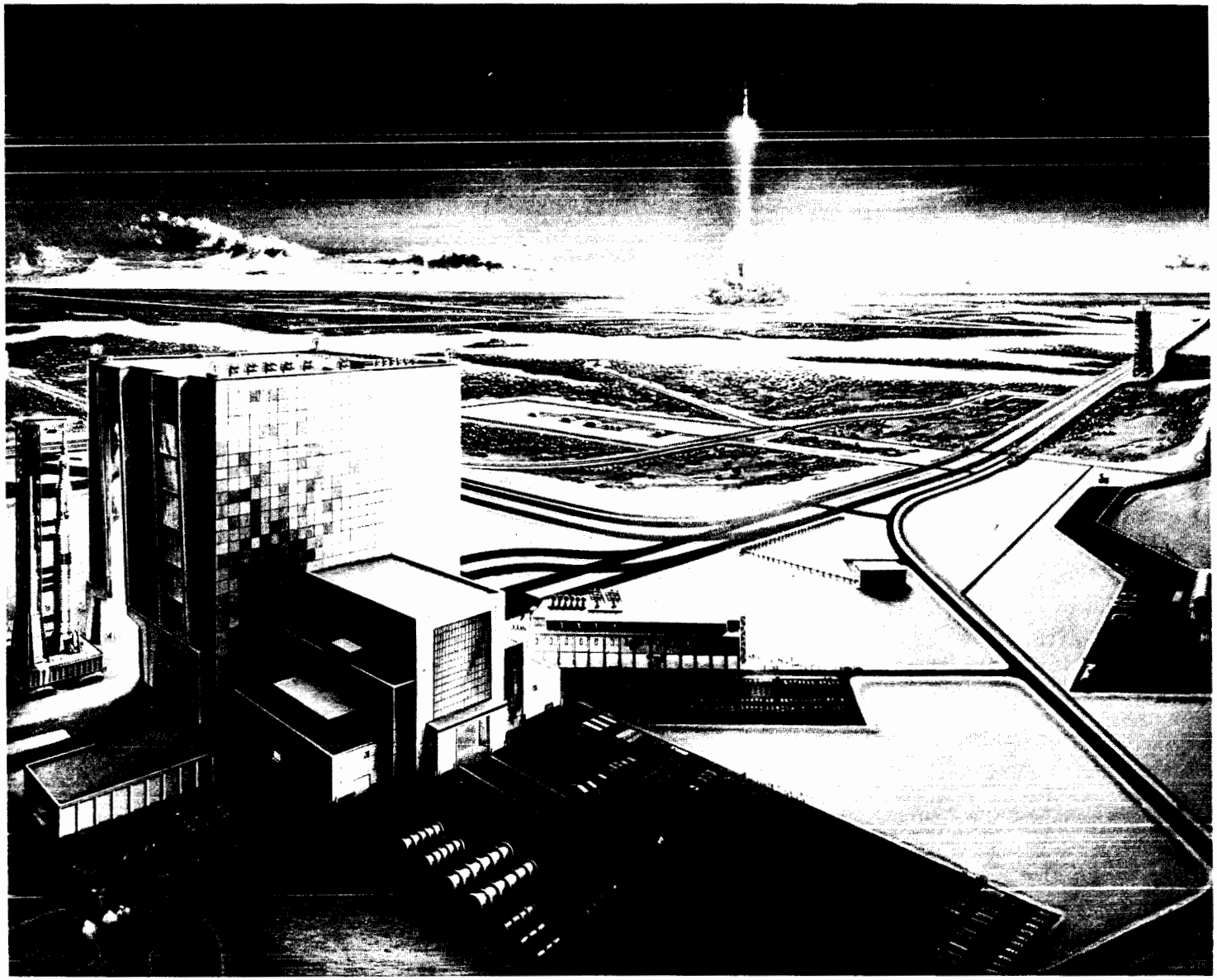
JOHN F. KENNEDY SPACE CENTER, NASA



Launch Complex 39

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ORGANIZATION AND STAFFING CHART

JOHN F. KENNEDY SPACE CENTER, NASA

STAFFING SUMMARY

	65	66
Excepted	15	15
GS-16	9	9
GS-15	62	62
GS-14	108	108
All other GS	1,750	1,750
Wage Board	101	101
Total Permanent	2,045	2,045
Temporary	37	37
Total Positions	2,082	2,082

OFFICE OF DIRECTOR

	65	66
Excepted	2	2
GS-16	-	-
GS-15	1	1
GS-14	-	-
All other GS	5	5
Wage Board	-	-
Total	8	8

TECHNICAL STAFF

	65	66
Excepted	-	-
GS-16	1	1
GS-15	1	1
GS-14	-	-
All other GS	2	2
Wage Board	-	-
Total	4	4

NASA TEST SUPPORT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	3	3
All other GS	6	6
Wage Board	-	-
Total	10	10

SAFETY OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	3	3
All other GS	17	17
Wage Board	-	-
Total	21	21

PUBLIC AFFAIRS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	3	3
All other GS	21	21
Wage Board	-	-
Total	25	25

ASSISTANT DIRECTOR FOR PROGRAM MANAGEMENT

	65	66
Excepted	-	-
GS-16	-	-
GS-15	6	6
GS-14	10	10
All other GS	97	97
Wage Board	-	-
Total	113	113

ASSISTANT DIRECTOR FOR ADMINISTRATIVE MANAGEMENT

	65	66
Excepted	2	2
GS-16	-	-
GS-15	8	8
GS-14	19	19
All other GS	540	540
Wage Board	2	2
Total	571	571

LAUNCH SUPPORT EQUIPMENT ENGINEERING DIVISION

	65	66
Excepted	2	2
GS-16	2	2
GS-15	10	10
GS-14	20	20
All other GS	128	128
Wage Board	-	-
Total	162	162

FACILITIES ENGINEERING AND CONSTRUCTION DIVISION

	65	66
Excepted	1	1
GS-16	1	1
GS-15	5	5
GS-14	12	12
All other GS	135	135
Wage Board	-	-
Total	154	154

ASSISTANT DIRECTOR FOR LAUNCH VEHICLE OPERATIONS

	65	66
Excepted	5	5
GS-16	3	3
GS-15	15	15
GS-14	16	16
All other GS	292	292
Wage Board	44	44
Total	375	375

ASSISTANT DIRECTOR FOR TECHNICAL SUPPORT OPERATIONS

	65	66
Excepted	1	1
GS-16	1	1
GS-15	6	6
GS-14	8	8
All other GS	283	283
Wage Board	55	55
Total	354	354

ASSISTANT DIRECTOR FOR INSTRUMENTATION

	65	66
Excepted	2	2
GS-16	1	1
GS-15	7	7
GS-14	14	14
All other GS	224	224
Wage Board	-	-
Total	248	248

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1966 ESTIMATES

JOHN F. KENNEDY SPACE CENTER, NASA

MISSION AND CAPABILITIES:

The John F. Kennedy Space Center, formerly the Launch Operations Directorate of the Marshall Space Flight Center, was organized as a separate center on July 1, 1962. The Center's primary responsibilities are:

1. Planning and supervision of the launch preparation and launch of assigned NASA space vehicle systems at the Merritt Island Launch Area and the Air Force Eastern Test Range.

2. Design and construction of NASA facilities at the Kennedy Space Center to meet users' functional requirements.

3. Physical integration of NASA ground support equipment at the launch sites for various space vehicle systems.

4. Programming, integrating, and fulfilling user requirements for general purpose facilities such as offices, warehouses, maintenance buildings, utilities, and roads.

5. Administrative and technical support services (public relations, visitor control services, community and industrial relations, legal, security, purchasing and contracting, transportation, and financial management) for all NASA elements located in the area.

6. Representing NASA in coordinating with the United States Air Force matters pertaining to tracking and data acquisition, and in making arrangements for tracking and data services and support required for operation of all NASA activities at the Air Force Eastern Test Range.

In January 1963, under NASA-DOD agreement, the Kennedy Space Center, NASA was designated as the executive agent and manager of the Merritt Island Launch Area.

The Center provides manpower with skills for testing, checkout, and launching vehicles, research and development of launch instrumentation, and design of launch and related ground support facilities and equipment.

Included in the Center's assigned responsibilities are the launching of Saturn vehicles, managing the Merritt Island Launch Area, and acting as

the focal point for all NASA activities at the Air Force Eastern Test Range. Missions include design, construction, activation, operation, and maintenance of Launch Complexes 34, 37, and 39 and related supporting industrial areas. The major activity during FY 1966 will be the preparation for launch, and support of the Apollo Saturn IB and Apollo Saturn V programs.

The Center also provides logistic support for all supporting contractors in the Cape Kennedy/Merritt Island Launch Area areas.

SUMMARY OF RESOURCES REQUIREMENTS:

	1964	1965	1966
Number of Positions, end of year.	1,625	2,082	2,082
Average Number of All Employees .	1,322	1,914	2,056
Administrative Operations.....	$34,959,000	$61,616,000	$62,697,000

INSTALLATION DESCRIPTION:

The Kennedy Space Center is adjacent to the Air Force Eastern Test Range Launch Area. It is situated approximately 50 miles East of Orlando, Florida in northwest Brevard County.

The land purchases for the Center, which began about three years ago, were approximately 92 per cent complete as of July 1964. The total land to be procured is approximately 88,743 acres and has been designated the Merritt Island Launch Area (MILA). In addition to the operation and maintenance of all facilities in the Merritt Island Launch Area, the Center is responsible for certain facilities within the Air Force Eastern Test Range Launch Area. Thirty four of these facilities were transferred from the Air Force to NASA on July 1, 1963. The capital investment as of June 30, 1964 was $298,069,000.

ANALYSIS OF RESOURCES REQUIREMENTS BY OBJECT CLASSIFICATION:

		1964	1965	1966
11.	Personnel Compensation.....	$13,365,000	$20,417,000	$21,879,000
12.	Personnel Benefits.....	868,000	1,364,000	1,465,000
	Total, personnel costs...	$14,233,000	$21,781,000	$23,344,000
21.	Travel and Transportation of Persons.....	2,181,000	2,113,000	1,538,000
22.	Transportation of Things...	350,000	872,000	722,000
23.	Rents, Communications, and Utilities.....	2,575,000	3,973,000	4,385,000
24.	Printing and Reproduction..	818,000	851,000	371,000

	1964	1965	1966
25. Other Services.....	4,672,000	19,912,000	23,937,000
Services of other agencies	4,303,000	5,148,000	4,620,000
26. Supplies and Materials.....	3,284,000	1,700,000	1,579,000
31. Equipment.....	1,753,000	4,333,000	1,000,000
32. Lands and Structures.....	790,000	932,000	700,000
42. Insurance Claims and Indemnities.....	-	1,000	1,000
Total.....	$34,959,000	$61,616,000	$62,697,000

JUSTIFICATION BY OBJECT CLASSIFICATION:

Personnel Distribution

	1964	1965	1966
Direct Personnel by Program			
Manned Space Flight			
Gemini.....	17	49	38
Apollo.....	753	1,022	1,032
Space Science and Applications			
Launch vehicle development.....	6	7	6
Advanced Research and Technology			
Space vehicle systems.....	3	4	6
Sub-total, direct positions..	779	1,082	1,082
Support personnel			
Director and Staff.....	56	71	71
Administration.....	420	444	444
Research and development support.	337	448	448
Sub-total, support positions...	813	963	963
Total, permanent positions.....	1,592	2,045	2,045

	1964	1965	1966
Other positions:			
Positions under cooperative training agreements.....	32	32	32
Other temporary positions.....	1	5	5
Total, all positions.....	1,625	2,082	2,082

Personnel requirements

The personnel requirements of the Kennedy Space Center are directly related to its assigned mission of launching vehicles, managing the Merritt Island Launch Area and support of all NASA elements in the Cape Kennedy - MILA area.

During FY 1966 support will be required for Saturn/Apollo I and IB launches and for the initial activation and operation of major facilities in the MILA area in support of the Apollo/Saturn V program. Requirements for administrative and logistic support of all NASA elements and associated contractors at Kennedy Space Center will increase with the buildup of pre-launch and launch activity during FY 1966.

Personnel Costs

	1964	1965	1966
Total Positions.....	1,625	2,082	2,082
Permanent.....	1,592	2,045	2,045
Other.....	33	37	37
Personnel Compensation:			
Annual cost of permanent positions.....	$14,468,000	$19,652,000	$19,767,000
Pay above the stated annual rate	113,000	70,000	75,000
Lapses (deduct).....	-2,904,000	-1,556,000	-300,000
Net cost of permanent positions.	11,677,000	18,166,000	19,542,000
Other personnel compensation....	1,688,000	2,251,000	2,337,000
Total compensation.....	13,365,000	20,417,000	21,879,000
NASA funded.....	13,365,000	20,417,000	21,879,000
Reimbursable.....	---	---	---
Personnel benefits.....	868,000	1,364,000	1,465,000
NASA funded.....	868,000	1,364,000	1,465,000
Reimbursable.....	---	---	---

	1964	1965	1966
Total personnel costs.....	$14,233,000	$21,781,000	$23,344,000
NASA funded.....	14,233,000	21,781,000	23,344,000
Reimbursable.....	---	---	---
Average Number of All Employees (Man Years).....	1,322	1,914	2,056

Personnel Costs - $23,344,000

The increase in personnel costs for FY 1966 is primarily attributable to an increase in man-years resulting from augmentation in personnel during FY 1965.

Travel and Transportation of Persons - $1,538,000

The estimate for travel and transportation of persons for FY 1966 is $575,000 less than the FY 1965 level. This reduction results primarily from the acquisition of an administrative aircraft to replace an aircraft currently under lease, and a reduction in local transportation costs due to consolidation of operations on Merritt Island.

Transportation of Things - $722,000

The decrease of $150,000 results from relocation costs for personnel hired as replacements as vacancies occur, and from lower utilization of GSA truck services due to the consolidation of the Center's activities on Merritt Island by the end of FY 1965.

Rents, Communications, and Utilities - $4,385,000

There is an increase of $412,000 in overall FY 1966 fund requirements for rents, communications, and utilities. Increases in communications and utilities required to keep pace with buildup in the Merritt Island Launch Area are partially offset by reductions in leased space and equipment.

Printing and Reproduction - $871,000

An increase of $20,000 for printing and reproduction services is projected to support the increased activity in the Merritt Island Launch Area.

Other Services - $28,557,000

The overall increase of $3,497,000 for FY 1966 is generated by an increase in workload requirements under both housekeeping services and mission support service contracts, by the addition of photographic services, and by the additional aircraft servicing requirements for the administrative aircraft purchased during FY 1965.

Increased contract man-years are required under both housekeeping services and in computer operations and programming to support first year operations at Merritt Island Launch Area. In addition there are increased requirements for technical documentation support for launch vehicle stage contractors at the Kennedy Space Center. These increases are partially offset by reduction in services provided by the Air Force through the range contractor.

Supplies and Materials - $1,579,000

The initial outfitting of the new facilities at the Merritt Island Launch Area, scheduled for completion during FY 1965, will allow a net reduction of $121,000 in the requirement for supplies and materials estimated for FY 1966.

Equipment - $1,000,000

Equipment requirements in FY 1966 will decrease by $3,333,000. This reduction is the result of procurement of non-recurring items of equipment during FY 1965. FY 1966 equipment requirements include: replacement of worn-out office machines and shop equipment, procurement of printing and reproduction and micro/documentation equipment to complete the outfit of the Merritt Island Launch Area facilities, photographic systems equipment and miscellaneous replacement equipments items.

Land and Structures - $700,000

The estimated requirements for FY 1966 for minor construction projects and modifications will decrease by $232,000 from the FY 1965 level, based on the initial occupancy of newly constructed facilities on Merritt Island. As improved techniques of checkout and launch evolve, a continuing requirement exists for modification and minor construction of technical and support facilities to permit their effective utilization. Funds requested for this purpose will permit the Center to react promptly to these requirements.

Insurance Claims and Indemnities - $1,000

Funds requested are for settlement of insurance claims and indemnities. This requirement is expected to remain at the FY 1965 level.

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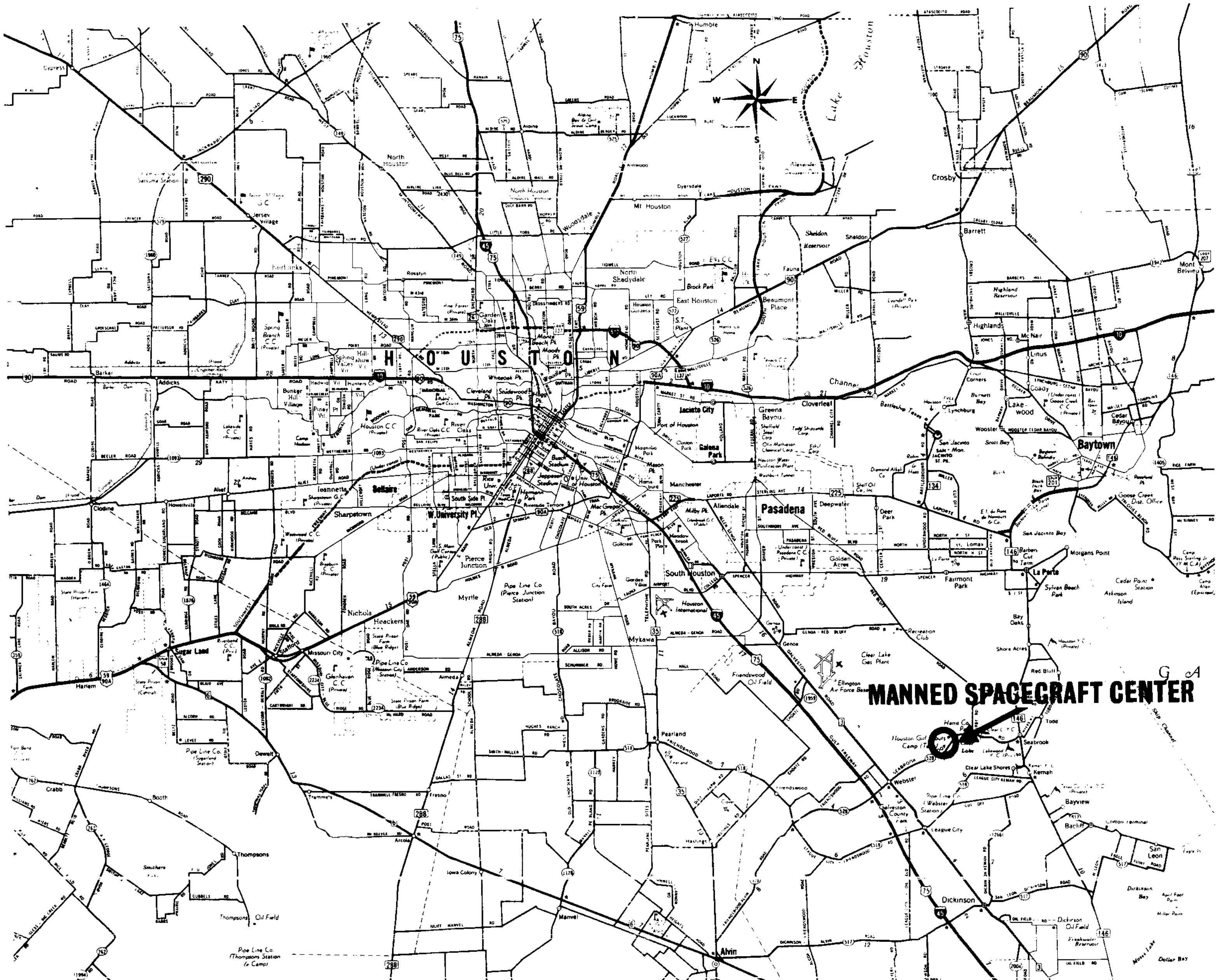

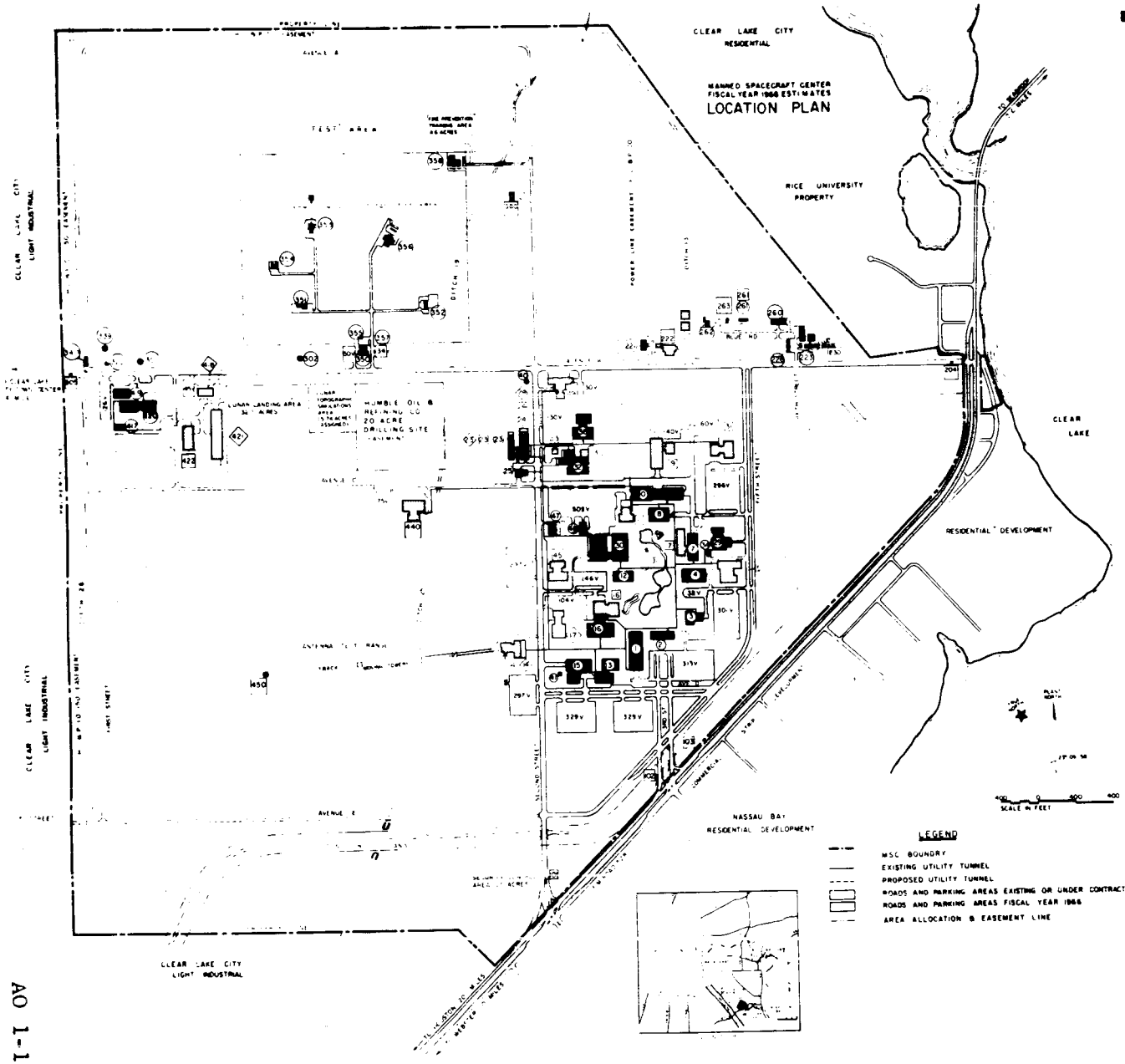

① EXISTING FACILITIES (FY-62, 63)

1 AUDITORIUM FY 62
2 PROJECT MANAGEMENT FY 62
3 CENTRAL CAFETERIA FY 62
4 FLIGHT OPERATIONS OFFICE FY 62
7 LIFE SYSTEMS LABORATORY FY 62
8 TECHNICAL & ENGINEERING SERVICES OFFICE FY 62
10 TECHNICAL SERVICES SHOP FY 62
12 CENTRAL DATA OFFICE FY 62
13 SYSTEMS EVALUATION LABORATORY FY 62
15 INSTRUMENTATION & ELECTRONIC SYSTEMS LAB FY 62
16 SPACECRAFT RESEARCH OFFICE & LABORATORY FY62
23 CENTRAL H & C COOLING TOWER FY 62, 63
24 CENTRAL HEATING & COOLING PLANT FY 62, 63
25 FIRE STATION FY 62
29 FLIGHT ACCELERATION FACILITY FY 63
30 INTEGRATED MISSION CONTROL FY 63
32 SPACE ENVIRONMENT SIMULATION LABORATORY FY 62
34 FLIGHT ACCELERATION MOTOR-GENERATION BUILDING FY
36 ESC CONTRACTOR SUPPORT FACILITY FY 62
40 ELEVATED WATER TANK FY 62
41 GAS STORAGE FY 62
47 SOUTHWESTERN BELL TELEPHONE BUILDING
48 EMERGENCY POWER BUILDING (IMCC) FY 63
221 ELECTRICAL SUBSTATION FY 62
223 SEWAGE TREATMENT PLANT FY 62
228 FIELD CONSTRUCTION OFFICE
260 TRANSLATION & DOCKING SIMULATION FACILITY FY 62
261 RADIOLOGICAL FACILITY FY 63
262 ARC JET, RADIANT HEATING & ACOUSTIC TEST FACILITY FY6
301 WATER WELL FY 62
302 WATER WELL FY 62
322 WATER TREATMENT FY62
339 GROUND WATER STORAGE TANK FY62
340 GAS METERING STATION FY 62
350 THERMOCHEMICAL TEST FACILITY FY 63
351 THERMOCHEMICAL SPACE CHAMBER FY 63
352 ELECTRO-EXPLOSIVE DEVICES FY 63
353 REACTION CONTROL TEST FACILITY FY 63
354 SPACE POWER SYSTEMS TEST FACILITY FY 63
355 CHEMICAL STORAGE BUILDING FY 63
356 COMPONENTS TEST FACILITY FY 63
357 THERMOCHEMICAL TEST AREA GATE HOUSE FY 63
358 THERMOCHEMICAL PROPELLANT WASTE TREATMENT FY 63
417 GARAGE FY 62
419 SUPPORT OFFICE FY 62
420 SUPPORT SHOP & WAREHOUSE FY 62

[5] FACILITIES AUTHORIZED OR UNDER CONTRACT

5 MISSION SIMULATION & TRAINING FACILITY FY 64
7 LIFE SYSTEMS LABORATORY FY 65
9 TECHNICAL SERVICES FACILITY FY 65
11 BRANCH CAFETERIA FY 65
14 ANECHOIC CHAMBER TEST FACILITY FY 64
16 SPACECRAFT RESEARCH OFFICE & LABORATORY FY 64
23 CENTRAL H & C COOLING TOWER FY 64, 65
24 CENTRAL HEATING & COOLING PLANT FY 64, 65
31 LUNAR MISSION & SPACE EXPLORATION FACILITY FY 66
32 SPACE ENVIRONMENT SIMULATION LABORATORY FY 66
33 ULTRA HIGH VACUUM CHAMBER FACILITY FY 64
45 PROJECT ENGINEERING FACILITY FY 64
49 VIBRATION & ACOUSTIC TEST FACILITY FY 64
101 GUARDHOUSE FY 64
102 GUARDHOUSE FY 64
103 GUARDHOUSE FY 64
104 GUARDHOUSE FY 64
204 GUARDHOUSE FY 64
222 ATMOS ENTRY SIMULATION FACILITY FY 64
223 SEWAGE TREATMENT PLANT FY 64
230 CREW SYSTEMS BIOLOGICAL FACILITY FY 64
261 RADIOLOGICAL FACILITY FY 64
263 HEALTH PHYSICS LABORATORY FY 64
305 GUARDHOUSE FY 64
380 HAZARDOUS MATERIAL STORAGE FACILITY FY 64
422 LOGISTIC SUPPORT WAREHOUSE FY 65
440 ELECTRONIC SYSTEMS COMPATABILITY FACILITY FY 65
450 ANTENNA SERVICE BUILDING & TOWER FY 64

[ ] ⊕ PROPOSED FISCAL YEAR 1966 PROJECTS

14 ADDITION TO ANECHOIC CHAMBER TEST FACILITY
17 SPACECRAFT INSTRUMENTATION EVALUATION FACILITY
24 ADDITION TO CENTRAL HEATING & COOLING PLANT
32 UPGRADING SPACE ENVIRONMENT SIMULATION LABORATORY
221 ADDITION TO ELECTRICAL SUBSTATION
418 MAINTENANCE OFFICE
421 MISSION SUPPORT WAREHOUSE

NASA
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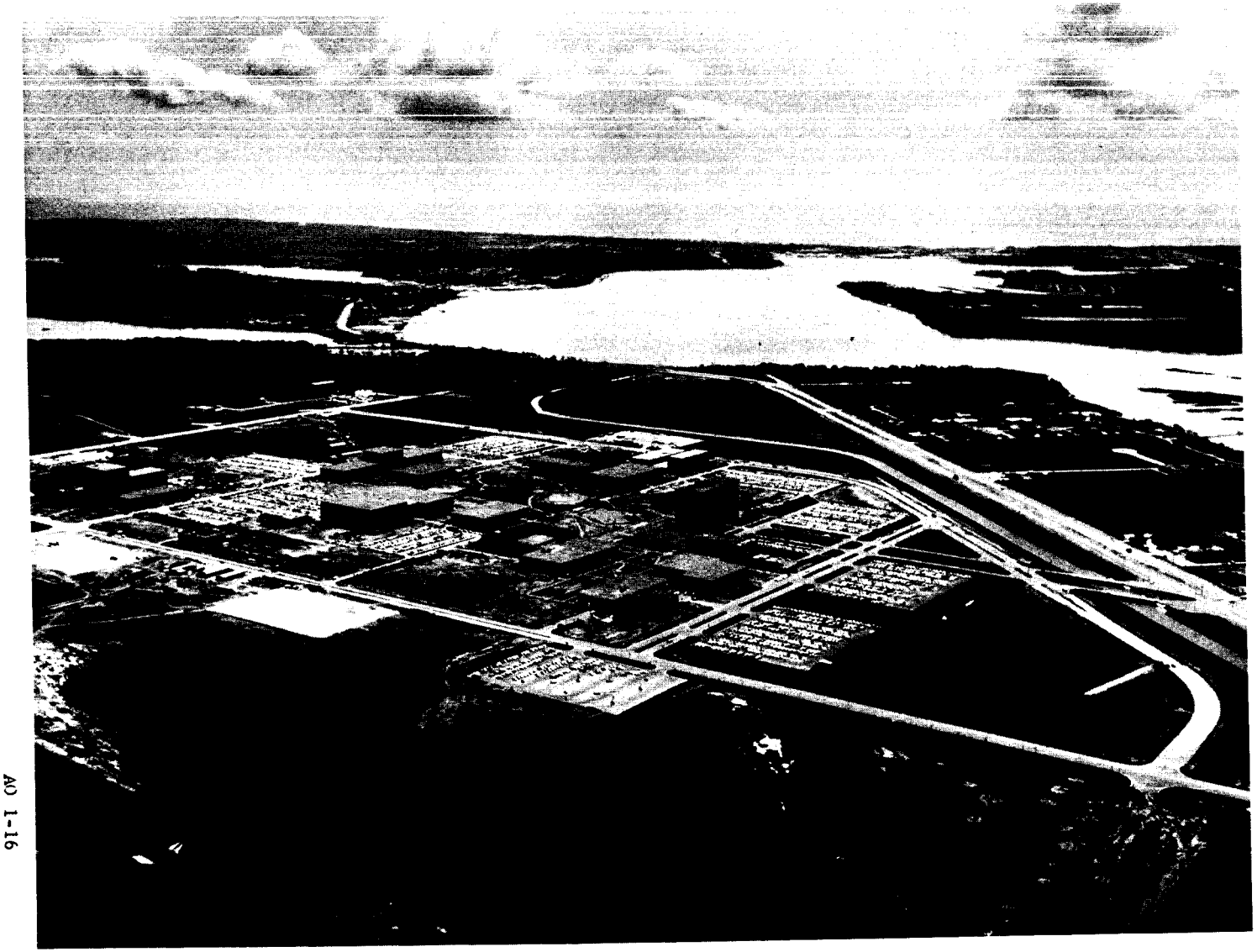
MANNED SPACECRAFT CENTER



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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART
MANNED SPACECRAFT CENTER

STAFFING SUMMARY

	65	66
Excepted	35	35
GS-16	15	15
GS-15	222	222
GS-14	398	398
All other GS	3,694	3,694
Wage Board	322	322
Total Permanent	4,686	4,686
Temporary	125	125
Total Positions	4,811	4,811

OFFICE OF THE DIRECTOR

	65	66
Excepted	4	4
GS-16	-	-
GS-15	-	-
GS-14	-	-
All other GS	11	11
Wage Board	-	-
Total	15	15

CHIEF OF CENTER MEDICAL PROGRAMS

	65	66
Excepted	1	1
GS-16	-	-
GS-15	1	1
GS-14	-	-
All other GS	4	4
Wage Board	-	-
Total	6	6

AUDIT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All other GS	13	13
Wage Board	-	-
Total	16	16

PUBLIC AFFAIRS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All other GS	52	52
Wage Board	1	1
Total	56	56

RELIABILITY AND QUALITY ASSURANCE OFFICE

	65	66
Excepted	1	1
GS-16	-	-
GS-15	9	9
GS-14	3	3
All other GS	23	23
Wage Board	-	-
Total	36	36

CENTER MEDICAL OFFICE

	65	66
Excepted	-	-
GS-16	1	1
GS-15	3	3
GS-14	2	2
All other GS	29	29
Wage Board	-	-
Total	35	35

LEGAL OF[illegible]

Excepted	
GS-16	
GS-15	
GS-14	
All other GS	
Wage Board	
Total	

GEMINI PROGRAM OFFICE

	65	66
Excepted	4	4
GS-16	3	3
GS-15	23	23
GS-14	34	34
All other GS	150	150
Wage Board	-	-
Total	214	214

APOLLO SPACECR[illegible] OFFIC[illegible]

Excepted	
GS-16	
GS-15	
GS-14	
All other GS	
Wage Board	
Total	

ASSISTANT DIRECTOR FOR FLIGHT OPERATIONS

	65	66
Excepted	1	1
GS-16	1	1
GS-15	3	3
GS-14	3	3
All other GS	23	23
Wage Board	-	-
Total	31	31

ASSISTANT DIRECTOR FOR ADMINISTRATION

	65	66
Excepted	3	3
GS-16	-	-
GS-15	-	-
GS-14	5	5
All other GS	22	22
Wage Board	-	-
Total	30	30

ASSISTANT DIRECTOR FOR ENGINEERING AND DEVELOPMENT

	65	66
Excepted	3	3
GS-16	-	-
GS-15	5	5
GS-14	2	2
All other GS	14	14
Wage Board	-	-
Total	24	24

FLIGHT SUPPORT DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	4	4
All other GS	58	58
Wage Board	-	-
Total	63	63

MISSION PLANNING AND ANALYSIS DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	5	5
GS-14	15	15
All other GS	196	196
Wage Board	-	-
Total	216	216

MANAGEMENT ANALYSIS DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All other GS	13	13
Wage Board	-	-
Total	16	16

OFFICE OF LON[illegible] PLANNI[illegible]

Excepted	
GS-16	
GS-15	
GS-14	
All other GS	
Wage Board	
Total	

FLIGHT CONTROL DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	6	6
GS-14	10	10
All other GS	167	167
Wage Board	-	-
Total	183	183

LANDING AND RECOVERY DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	3	3
GS-14	2	2
All other GS	69	69
Wage Board	1	1
Total	75	75

RESOURCES MANAGEMENT DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	3	3
GS-14	11	11
All other GS	134	134
Wage Board	-	-
Total	149	149

PROCUREMENT AND CONTRACTS DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	14	14
All other GS	190	190
Wage Board	1	1
Total	210	210

ADVANCED SPACECRAFT TECHNOLOGY DIVISION

	65	66
Excepted	1	1
GS-16	2	2
GS-15	6	6
GS-14	26	26
All other GS	174	174
Wage Board	-	-
Total	209	209

INFORMATION S[illegible] DIVISIO[illegible]

Excepted	
GS-16	
GS-15	
GS-14	
All other GS	
Wage Board	
Total	

PERSONNEL DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	3	3
All other GS	86	86
Wage Board	-	-
Total	90	90

SECURITY DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	-	-
GS-14	1	1
All other GS	20	20
Wage Board	-	-
Total	21	21

CREW SYSTEMS DIVISION

	65	66
Excepted	-	-
GS-16	1	1
GS-15	16	16
GS-14	13	13
All other GS	185	185
Wage Board	2	2
Total	217	217

COMPUTATION AN[illegible] DIVISI[illegible]

Excepted	
GS-16	
GS-15	
GS-14	
All other GS	
Wage Board	
Total	

OFFICE OF TECHNICAL AND ENGINEERING SERVICES

	65	66
Excepted	-	-
GS-16	1	1
GS-15	9	9
GS-14	11	11
All other GS	165	165
Wage Board	154	154
Total	340	340

OFFICE OF ADMINISTRATIVE SERVICES

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	3	3
All other GS	213	213
Wage Board	72	72
Total	289	289

INSTRUMENTATION AND ELECTRONIC SYSTEMS DIVISION

	65	66
Excepted	-	-
GS-16	1	1
GS-15	6	6
GS-14	22	22
All other GS	152	152
Wage Board	2	2
Total	183	183

GUIDANCE AN[illegible] DIVIS[illegible]

Excepted	
GS-16	
GS-15	
GS-14	
All other GS	
Wage Board	
Total	

PROPULSION AND POWER DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	6	6
GS-14	6	6
All other GS	121	121
Wage Board	-	-
Total	134	134

STRUCTURES AN[illegible] DIVIS[illegible]

Excepted	
GS-16	
GS-15	
GS-14	
All other GS	
Wage Board	
Total	

MSC - WSMR OPERATIONS

	65	66
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	11	11
All other GS	134	134
Wage Board	-	-
Total	150	150

MSC - FLORIDA OPERATIONS

	65	66
Excepted	1	1
GS-16	1	1
GS-15	19	19
GS-14	42	42
All other GS	406	406
Wage Board	81	81
Total	550	550

Total	16	16

Total	56	56

Total	36	36

Total	35	35

Total	18	18

GEMINI PROGRAM OFFICE

	65	66
Excepted	4	4
GS-16	3	3
GS-15	23	23
GS-14	34	34
All other GS	150	150
Wage Board	-	-
Total	214	214

APOLLO SPACECRAFT PROGRAM OFFICE

	65	66
Excepted	4	4
GS-16	-	-
GS-15	41	41
GS-14	69	69
All other GS	188	188
Wage Board	-	-
Total	302	302

ASSISTANT DIRECTOR FOR FLIGHT OPERATIONS

	65	66
Excepted	1	1
GS-16	1	1
GS-15	3	3
GS-14	3	3
All other GS	23	23
Wage Board	-	-
Total	31	31

ASSISTANT DIRECTOR FOR ADMINISTRATION

	65	66
Excepted	3	3
GS-16	-	-
GS-15	-	-
GS-14	5	5
All other GS	22	22
Wage Board	-	-
Total	30	30

ASSISTANT DIRECTOR FOR ENGINEERING AND DEVELOPMENT

	65	66
Excepted	3	3
GS-16	-	-
GS-15	5	5
GS-14	2	2
All other GS	14	14
Wage Board	-	-
Total	24	24

ASSISTANT DIRECTOR FOR FLIGHT CREW OPERATIONS

	65	66
Excepted	1	1
GS-16	1	1
GS-15	0	0
GS-14	1	1
All other GS	1	1
Wage Board	-	-
Total	4	4

FLIGHT SUPPORT DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	4	4
All other GS	58	58
Wage Board	-	-
Total	63	63

MISSION PLANNING AND ANALYSIS DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	5	5
GS-14	15	15
All other GS	196	196
Wage Board	-	-
Total	216	216

MANAGEMENT ANALYSIS DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All other GS	13	13
Wage Board	-	-
Total	16	16

OFFICE OF LONG RANGE PLANNING

	65	66
Excepted	1	1
GS-16	-	-
GS-15	1	1
GS-14	1	1
All other GS	3	3
Wage Board	-	-
Total	6	6

ASTRONAUT OFFICE

	65	66
Excepted	-	-
GS-16	2	2
GS-15	-	-
GS-14	3	3
All other GS	20	20
Wage Board	-	-
Total	25	25

AIRCRAFT OPERATIONS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	1	1
All other GS	17	17
Wage Board	6	6
Total	25	25

FLIGHT CONTROL DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	6	6
GS-14	10	10
All other GS	167	167
Wage Board	-	-
Total	183	183

LANDING AND RECOVERY DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	3	3
GS-14	2	2
All other GS	69	69
Wage Board	1	1
Total	75	75

RESOURCES MANAGEMENT DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	3	3
GS-14	11	11
All other GS	134	134
Wage Board	-	-
Total	149	149

PROCUREMENT AND CONTRACTS DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	14	14
All other GS	190	190
Wage Board	1	1
Total	210	210

ADVANCED SPACECRAFT TECHNOLOGY DIVISION

	65	66
Excepted	1	1
GS-16	2	2
GS-15	6	6
GS-14	26	26
All other GS	174	174
Wage Board	-	-
Total	209	209

INFORMATION SYSTEMS DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	5	5
GS-14	8	8
All other GS	57	57
Wage Board	-	-
Total	71	71

FLIGHT CREW SUPPORT DIVISION

	65	66
Excepted	2	2
GS-16	-	-
GS-15	8	8
GS-14	10	10
All other GS	150	150
Wage Board	1	1
Total	171	171

PERSONNEL DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	3	3
All other GS	86	86
Wage Board	-	-
Total	90	90

SECURITY DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	-	-
GS-14	1	1
All other GS	20	20
Wage Board	-	-
Total	21	21

CREW SYSTEMS DIVISION

	65	66
Excepted	-	-
GS-16	1	1
GS-15	16	16
GS-14	13	13
All other GS	185	185
Wage Board	2	2
Total	217	217

COMPUTATION AND ANALYSIS DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	5	5
GS-14	8	8
All other GS	141	141
Wage Board	-	-
Total	155	155

OFFICE OF TECHNICAL AND ENGINEERING SERVICES

	65	66
Excepted	-	-
GS-16	1	1
GS-15	5	5
GS-14	11	11
All other GS	165	165
Wage Board	154	154
Total	340	340

OFFICE OF ADMINISTRATIVE SERVICES

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	3	3
All other GS	213	213
Wage Board	72	72
Total	289	289

INSTRUMENTATION AND ELECTRONIC SYSTEMS DIVISION

	65	66
Excepted	-	-
GS-16	1	1
GS-15	6	6
GS-14	22	22
All other GS	152	152
Wage Board	2	2
Total	183	183

GUIDANCE AND CONTROL DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	13	13
GS-14	24	24
All other GS	106	106
Wage Board	-	-
Total	144	144

PROPULSION AND POWER DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	6	6
GS-14	6	6
All other GS	121	121
Wage Board	-	-
Total	134	134

STRUCTURES AND MECHANICS DIVISION

	65	66
Excepted	1	1
GS-16	1	1
GS-15	9	9
GS-14	21	21
All other GS	174	174
Wage Board	1	1
Total	207	207

MSC - WSMR OPERATIONS

	65	66
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	11	11
All other GS	134	134
Wage Board	-	-
Total	150	150

MSC - FLORIDA OPERATIONS

	65	66
Excepted	1	1
GS-16	1	1
GS-15	19	19
GS-14	42	42
All other GS	406	406
Wage Board	81	81
Total	550	550

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ORGANIZATION AND STAFFING CHART

MANNED SPACECRAFT CENTER

STAFFING SUMMARY

	65	66
Excepted	35	35
GS-16	15	15
GS-15	222	222
GS-14	398	398
All other GS	3,694	3,694
Wage Board	322	322
Total Permanent	4,686	4,686
Temporary	125	125
Total Positions	4,811	4,811

OFFICE OF THE DIRECTOR

	65	66
Excepted	4	4
GS-16	-	-
GS-15	-	-
GS-14	-	-
All other GS	11	11
Wage Board	-	-
Total	15	15

CHIEF OF CENTER MEDICAL PROGRAMS

	65	66
Excepted	1	1
GS-16	-	-
GS-15	1	1
GS-14	-	-
All other GS	4	4
Wage Board	-	-
Total	6	6

AUDIT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All other GS	13	13
Wage Board	-	-
Total	16	16

PUBLIC AFFAIRS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All other GS	52	52
Wage Board	1	1
Total	56	56

RELIABILITY AND QUALITY ASSURANCE OFFICE

	65	66
Excepted	1	1
GS-16	-	-
GS-15	9	9
GS-14	3	3
All other GS	23	23
Wage Board	-	-
Total	36	36

CENTER MEDICAL OFFICE

	65	66
Excepted	-	-
GS-16	1	1
GS-15	3	3
GS-14	2	2
All other GS	29	29
Wage Board	-	-
Total	35	35

LEGAL OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	3	3
All other GS	13	13
Wage Board	-	-
Total	18	18

GEMINI PROGRAM OFFICE

	65	66
Excepted	4	4
GS-16	3	3
GS-15	23	23
GS-14	34	34
All other GS	150	150
Wage Board	-	-
Total	214	214

APOLLO SPACECRAFT PROGRAM OFFICE

	65	66
Excepted	4	4
GS-16	-	-
GS-15	41	41
GS-14	69	69
All other GS	188	188
Wage Board	-	-
Total	302	302

ASSISTANT DIRECTOR FOR FLIGHT OPERATIONS

	65	66
Excepted	1	1
GS-16	1	1
GS-15	3	3
GS-14	3	3
All other GS	23	23
Wage Board	-	-
Total	31	31

ASSISTANT DIRECTOR FOR ADMINISTRATION

	65	66
Excepted	3	3
GS-16	-	-
GS-15	-	-
GS-14	5	5
All other GS	22	22
Wage Board	-	-
Total	30	30

ASSISTANT DIRECTOR FOR ENGINEERING AND DEVELOPMENT

	65	66
Excepted	3	3
GS-16	-	-
GS-15	5	5
GS-14	2	2
All other GS	14	14
Wage Board	-	-
Total	24	24

ASSISTANT DIRECTOR FOR FLIGHT CREW OPERATIONS

	65	66
Excepted	1	1
GS-16	1	1
GS-15	0	0
GS-14	1	1
All other GS	1	1
Wage Board	-	-
Total	4	4

FLIGHT SUPPORT DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	4	4
All other GS	58	58
Wage Board	-	-
Total	63	63

MISSION PLANNING AND ANALYSIS DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	5	5
GS-14	15	15
All other GS	196	196
Wage Board	-	-
Total	216	216

MANAGEMENT ANALYSIS DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All other GS	13	13
Wage Board	-	-
Total	16	16

OFFICE OF LONG RANGE PLANNING

	65	66
Excepted	1	1
GS-16	-	-
GS-15	1	1
GS-14	1	1
All other GS	3	3
Wage Board	-	-
Total	6	6

ASTRONAUT OFFICE

	65	66
Excepted	-	-
GS-16	2	2
GS-15	-	-
GS-14	3	3
All other GS	20	20
Wage Board	-	-
Total	25	25

AIRCRAFT OPERATIONS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	1	1
All other GS	17	17
Wage Board	6	6
Total	25	25

FLIGHT CONTROL DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	6	6
GS-14	10	10
All other GS	167	167
Wage Board	-	-
Total	183	183

LANDING AND RECOVERY DIVISION

	65	66
Excepted	-	-
GS-16	-	-
GS-15	3	3
GS-14	2	2
All other GS	69	69
Wage Board	1	1
Total	75	75

RESOURCES MANAGEMENT DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	3	3
GS-14	11	11
All other GS	134	134
Wage Board	-	-
Total	149	149

PROCUREMENT AND CONTRACTS DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	14	14
All other GS	190	190
Wage Board	1	1
Total	210	210

ADVANCED SPACECRAFT TECHNOLOGY DIVISION

	65	66
Excepted	1	1
GS-16	2	2
GS-15	6	6
GS-14	26	26
All other GS	174	174
Wage Board	-	-
Total	209	209

INFORMATION SYSTEMS DIVISION

	65	66
Excepted	1	1
GS-16	-	-
GS-15	5	5
GS-14	8	8
All other GS	57	57
Wage Board	-	-
Total	71	71

FLIGHT CREW SUPPORT DIVISION

	65	66
Excepted	2	2
GS-16	-	-
GS-15	8	8
GS-14	10	10
All other GS	150	150
Wage Board	1	1
Total	171	171

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1966 ESTIMATES

MANNED SPACECRAFT CENTER

MISSION AND CAPABILITIES:

The primary mission of the Manned Spacecraft Center (established in November 1961) is the development of spacecraft and related equipment for manned space flight programs, the selection and training of flight crews, and the conduct of manned flight operations. The Center currently is engaged in two major space research and development efforts:

Gemini - The Gemini program objectives are to develop an operational capability in manned space flight, and through this capability, to conduct specific experiments and tests which support Apollo, Department of Defense experiments and scientific investigations. This program is time-phased between the short-duration earth-orbital Mercury missions (which were completed in May 1963) and the forthcoming long-duration mission of Apollo. Major objectives are:

(1) To determine man's capability during long-duration space flights,

(2) To develop techniques and provide crew experience in rendezvous and docking,

(3) To experiment with orbital flight maneuvering and extra-vehicular crew activity, and

(4) To conduct scientific experiments.

Apollo Spacecraft - This phase of the presently planned lunar landing program involves utilization of a three-man spacecraft of modular design, capable of extended flights in earth and lunar orbits. The flights will lead to a landing on, and return from, the lunar surface. The actual lunar orbital and lunar landing flights will be preceded by extended earth-orbital flights to:

(1) Provide experience in handling the three-man spacecraft,

(2) Develop rendezvous and docking procedures of the spacecraft and lunar excursion module, and

(3) Conduct scientific experiments.

The Center's mission includes an engineering, development, test and evaluation, and operations capability to support these projects; and to

develop the knowledge required to advance the technology of space and manned spacecraft development. Technology efforts focus on the conception and implementation of a program of applied research and development in the areas of space research, space physics, and life support systems.

SUMMARY OF RESOURCES REQUIREMENTS:

	1964	1965	1966
Number of Positions, end of year..	4,277	4,811	4,811
Average number of All Employees...	3,509	4,524	4,725
Administrative Operations.....	$68,634,000	$91,201,000	$89,658,000

INSTALLATION DESCRIPTION:

The Manned Spacecraft Center is located on Road 528, two miles East of the town of Webster, Texas. The site is approximately 20 miles southeast of downtown Houston, 25 miles northwest of Galveston, and 20 miles southwest of Baytown. A portion of the site borders on Clear Lake, which provides water access to the Gulf of Mexico through Galveston Bay and the Intra-coastal Canal.

Total NASA-owned land consists of 1,600 acres. This land was acquired by two conveyances, one of 600 acres and the other of 1,000, of which 20 acres are reserved for mineral rights by the Humble Oil Company. The property is subject to easements to the Houston Natural Gas Company, Harris County, and the State of Texas. The capital investment of the Manned Spacecraft Center at the Clear Lake site, as of June 30, 1964, was $131,045,200. The Center holds an additional 55,952 acres under use agreement at the White Sands Missile Range, with a capital investment of $14,536,800. Combined capital investment of the Manned Spacecraft Center as of June 30, 1964, was $145,582,000.

ANALYSIS OF RESOURCES REQUIREMENTS BY OBJECT CLASSIFICATION:

		1964	1965	1966
11.	Personnel Compensation.....	$34,497,000	$47,685,000	$49,997,000
12.	Personnel Benefits.....	2,294,000	3,164,000	3,328,000
	Total, personnel costs.....	$36,791,000	$50,849,000	$53,325,000
21.	Travel and Transportation of Persons.....	3,874,000	4,908,000	5,417,000
22.	Transportation of Things.....	1,289,000	1,160,000	944,000
23.	Rents, Communications, and Utilities.....	5,114,000	7,967,000	7,143,000
24.	Printing and Reproduction....	366,000	390,000	390,000
25.	Other Services.....	9,523,000	12,072,000	15,034,000
	Services of other agencies.	1,080,000	665,000	665,000
26.	Supplies and Materials.....	3,427,000	3,889,000	3,889,000

	1964	1965	1966
31. Equipment.....	$6,442,000	$8,453,000	$2,110,000
32. Land and Structures.....	727,000	847,000	740,000
41. Grants, Subsidies, and Contributions.....	-	-	-
42. Insurance Claims and Indemnities.....	1,000	1,000	1,000
Total.....	$68,634,000	$91,201,000	$89,658,000

JUSTIFICATION BY OBJECT CLASSIFICATION:

Personnel Distribution

	1964	1965	1966
Direct Personnel by Program			
Manned Space Flight			
Gemini.....	1,041	1,240	1,240
Apollo.....	1,690	2,006	2,006
Advanced missions.....	65	65	65
Space Science and Applications			
Lunar and planetary exploration.	3	3	3
Advanced Research and Technology			
Nuclear electric systems.....	1	1	1
Space vehicle systems.....	7	7	7
Electronics systems.....	10	10	10
Human factors.....	25	25	25
Chemical propulsion.....	2	2	2
Basic research.....	2	2	2
Technology Utilization.....	5	5	5
Sub-total, direct positions...	2,851	3,366	3,366
Support personnel			
Director and Staff.....	110	111	111
Administration.....	677	655	655
Research and development support..	533	554	554
Sub-total, support positions....	1,320	1,320	1,320
Total, permanent positions.....	4,171	4,686	4,686

	1964	1965	1966
Other positions:			
Positions under cooperative training agreements.....	98	105	105
Other temporary positions.....	8	20	20
Total, all positions.....	4,277	4,811	4,811

Personnel requirements

The personnel requirements of the Manned Spacecraft Center are in direct support of its primary mission to develop spacecraft for manned space flight programs, selection and training of astronauts, and to conduct manned flight operations. In FY 1966 personnel support is required for the Gemini manned flights in addition to Apollo spacecraft boilerplate and checkout flights scheduled for FY 1966.

The programs assigned to the Center therefore have many facets which must be managed and monitored to assure timely attainment of manned spacecraft program objectives.

The Apollo spacecraft program will reach peak activity during the FY 1967-1968 period. This effort involves development, manufacture, and test of the many critical systems and sub-systems. It is also the period during which maximum integration effort is required. The engineering requirements associated with flight and integrated systems ground test will expand rapidly during this period.

Personnel Costs

	1964	1965	1966
Total Positions.....	4,277	4,811	4,811
Permanent.....	4,171	4,686	4,686
Other.....	106	125	125
Personnel Compensation:			
Annual cost of permanent positions.....	$37,237,000	$44,456,000	$44,674,000
Pay above the stated annual rate.	269,000	163,000	208,000
Lapses (deduct).....	-7,116,000	-2,488,000	-511,000
Net cost of permanent positions..	30,390,000	42,131,000	44,371,000
Other personnel compensation.....	4,107,000	5,554,000	5,626,000
Total compensation.....	34,497,000	47,685,000	49,997,000
NASA funded.....	34,497,000	47,685,000	49,997,000
Reimbursable.....	---	---	---

	1964	1965	1966
Total personnel benefits.....	$2,294,000	$3,164,000	$3,328,000
NASA funded.....	2,294,000	3,164,000	3,328,000
Reimbursable.....	---	---	---
Total personnel costs.....	36,791,000	50,849,000	53,325,000
NASA funded.....	36,791,000	50,849,000	53,325,000
Reimbursable.....	---	---	---
Average Number of All Employees (Man Years).....	3,509	4,524	4,725

Personnel Costs - $53,325,000

FY 1966 personnel costs increase $2,476,000 above FY 1965, the result of 201 additional man-years to be realized during FY 1966, and 10 additional military personnel to be assigned to the Center.

Travel and Transportation of Persons - $5,417,000

The estimate for travel and transportation of persons for FY 1966 represents an increase of $509,000 from FY 1965. This increase is primarily attributable to the additional manned flights scheduled for FY 1966. Additional travel will be required to implement extensive development of new training techniques, management of contractor efforts on developing hardware for training purposes, and to accomplish final systems and sub-systems check-outs on Gemini spacecraft. Travel requirements for the Apollo program will be higher with the intensification of the ground test program.

Transportation of Things - $944,000

The FY 1966 estimate is $216,000 lower than the FY 1965 requirements. Since the personnel plan remains the same as in FY 1965, there will be fewer new employees for whom movement of household goods at Government expense will be required. There will also be a reduction in local movement costs.

Rents, Communications, and Utilities - $7,143,000

The FY 1966 estimate reflects a reduction of $824,000 from the FY 1965 estimate. This decrease is due to a reduction in rental costs for automatic data processing equipment in FY 1966 as this type of equipment will be purchased in FY 1965.

Printing and Reproduction - $390,000

Requirements remain at the FY 1965 level for printing, duplicating, binding and microfilming; therefore no increase in funds is being requested for these purposes.

Other Services - $15,699,000

The amount requested for FY 1966 represents an increase of $2,962,000 over fiscal year 1965. of this amount, $800,000 is attributable to increased costs for support operations at the White Sands Missile Range. The balance of the increase of $2,162,000 is attributable to several factors. These are maintenance, repair, and custodial services for newly operational buildings and additions; increased motion picture and photographic support services, including production of documentary films, film cataloguing, and film indexing services for tests and research projects to support the manned flights for fiscal year 1966; increased automatic data processing equipment operation and programming support resulting from increased data processing activity to support the manned flights in FY 1966; and the augmentation of technical documentation services which includes technical report writing, the implementation of documentation and data retrieval systems, and microfilming services in support of the increasing flight activity in FY 1966.

Supplies and Materials - $3,889,000

The requirement for supplies and materials is expected to remain at the FY 1965 level. Therefore, no increase in funding is requested.

Equipment - $2,110,000

The FY 1966 estimate for equipment requirements is $6,343,000 lower than the amount available in FY 1965. This decrease is a result of the purchase in FY 1965 of automatic data processing equipment, rather than continued renting of this type of equipment.

Lands and Structures - $740,000

The FY 1966 estimate covers the requirement for minor construction related to improvement of existing facilities, as well as modifications associated with expanding operations. The FY 1966 estimate is $107,000 less than FY 1965 requirements.

Insurance Claims and Indemnities - $1,000

Funds requested are for settlement of insurance claims and indemnities. This requirement is estimated to remain at the FY 1965 level.

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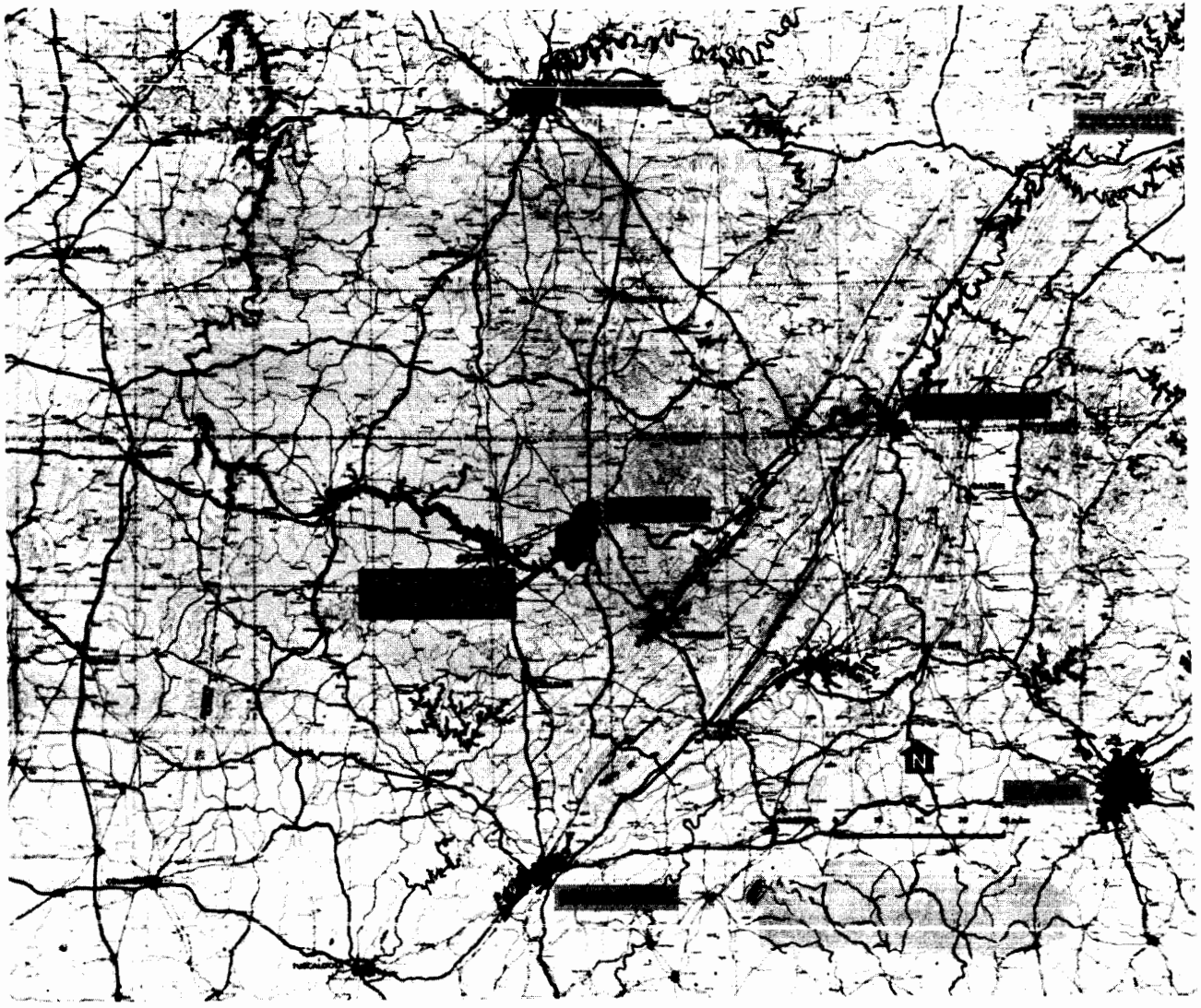
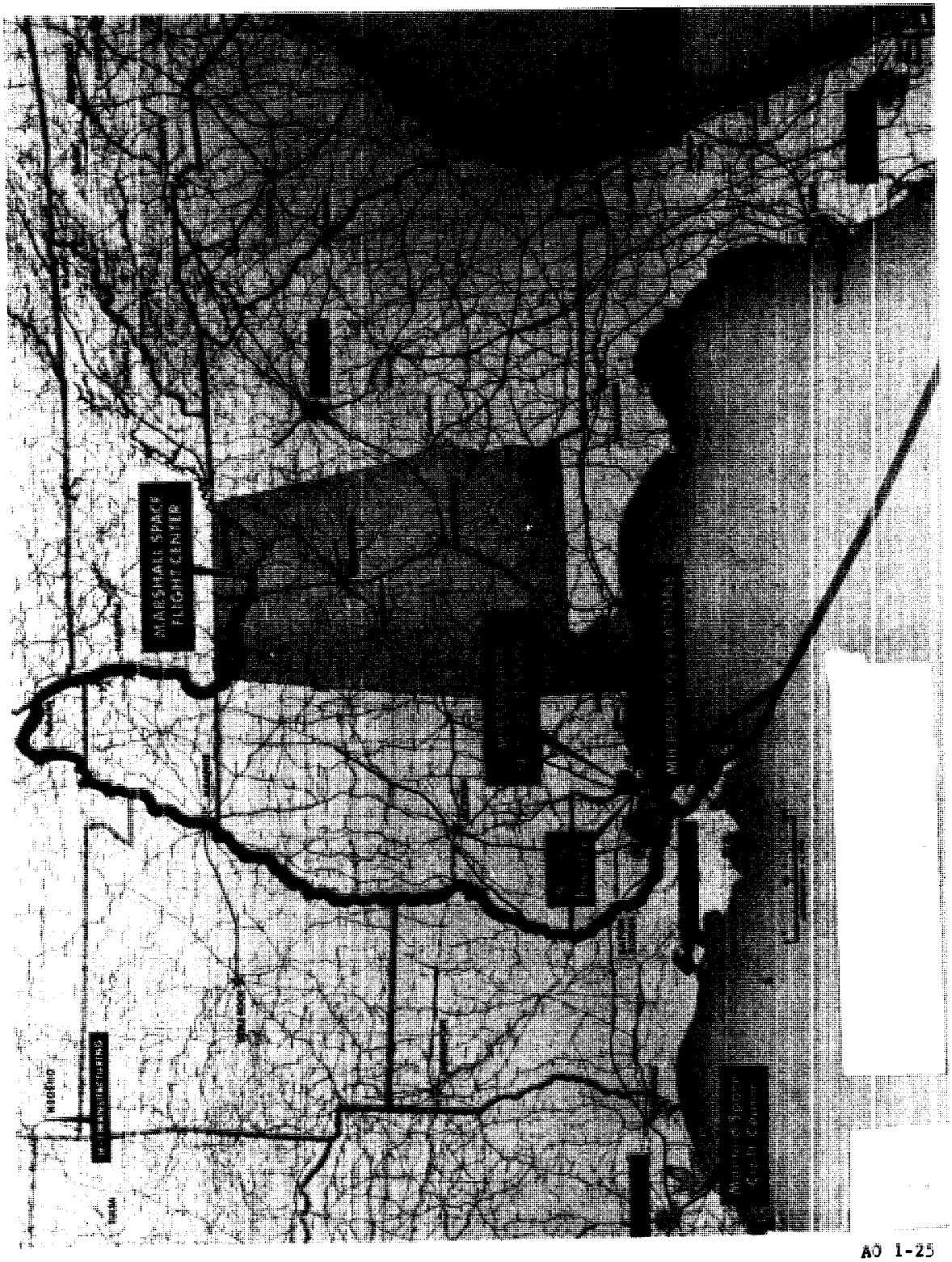
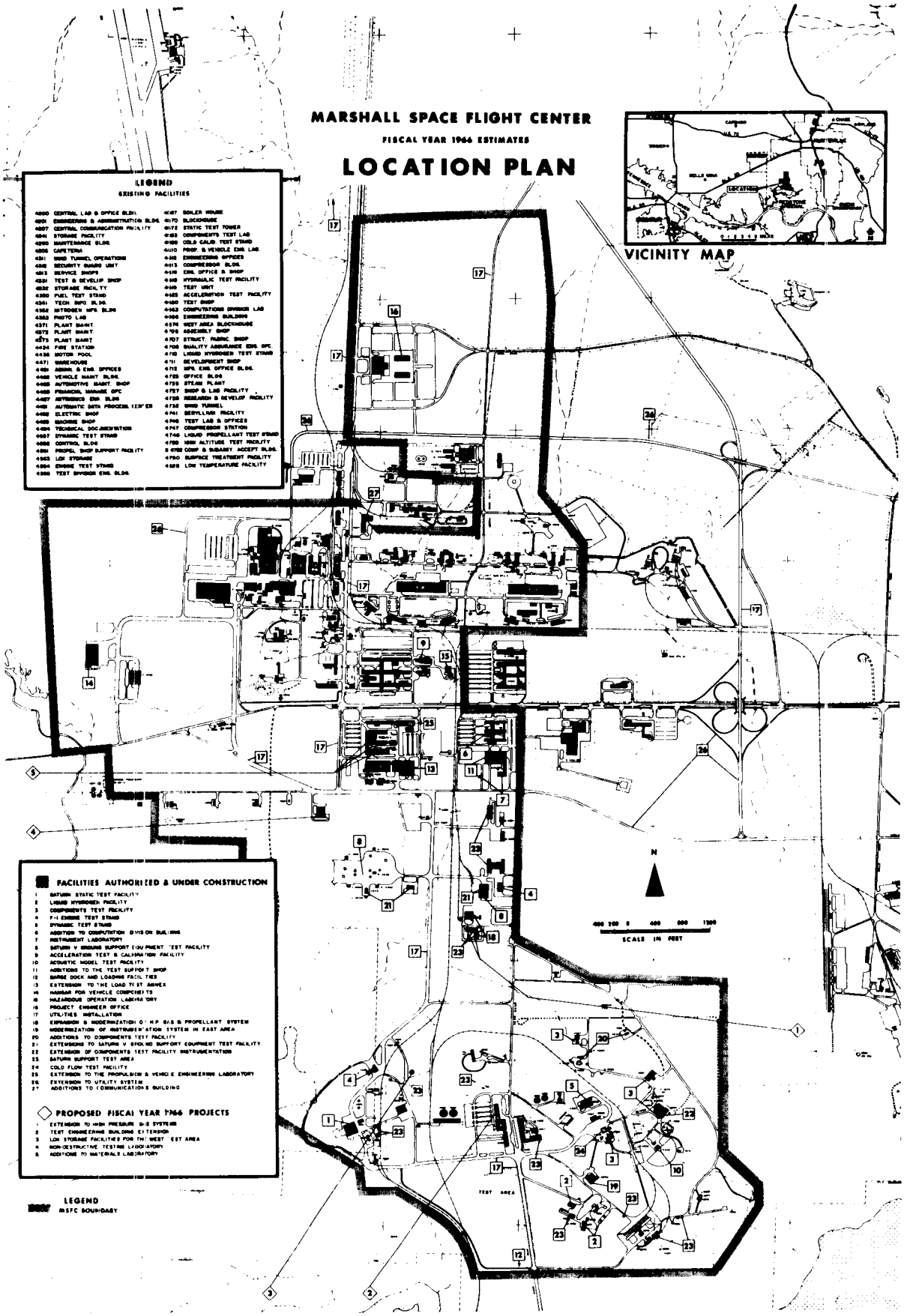
GEORGE C. MARSHALL SPACE FLIGHT CENTER

Huntsville, Alabama



REGIONAL MAP


MARSHALL SPACE FLIGHT CENTER

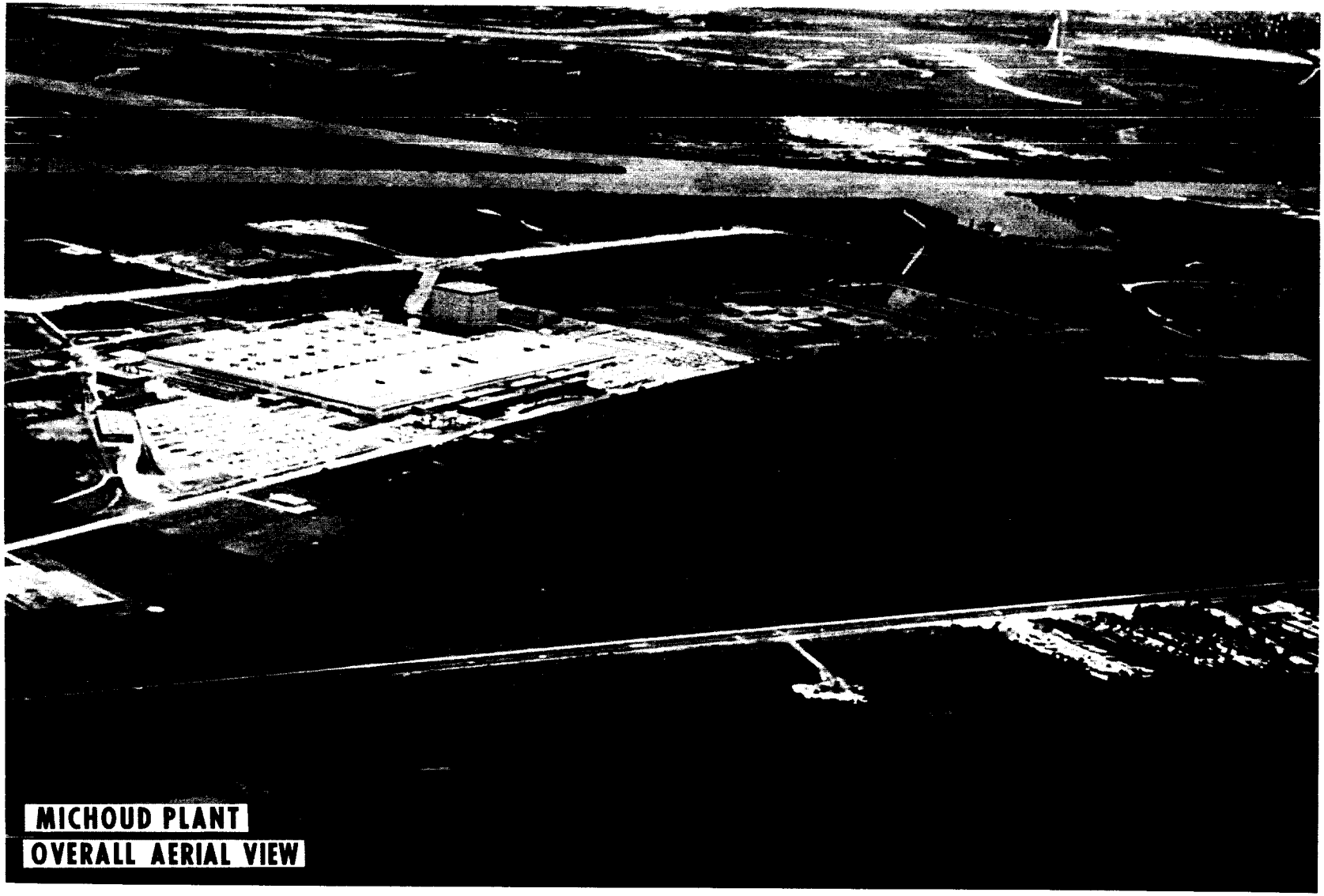

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1966 ESTIMATES
LOCATION PLAN
VICINITY MAP
LEGEND
EXISTING FACILITIES
FACILITIES AUTHORIZED & UNDER CONSTRUCTION
PROPOSED FISCAL YEAR 1966 PROJECTS
LEGEND
MSFC BOUNDARY
TEST AREA
N
SCALE IN FEET

MARSHALL SPACE FLIGHT CENTER
ALL LABORATORIES EXCEPT TEST LAB.

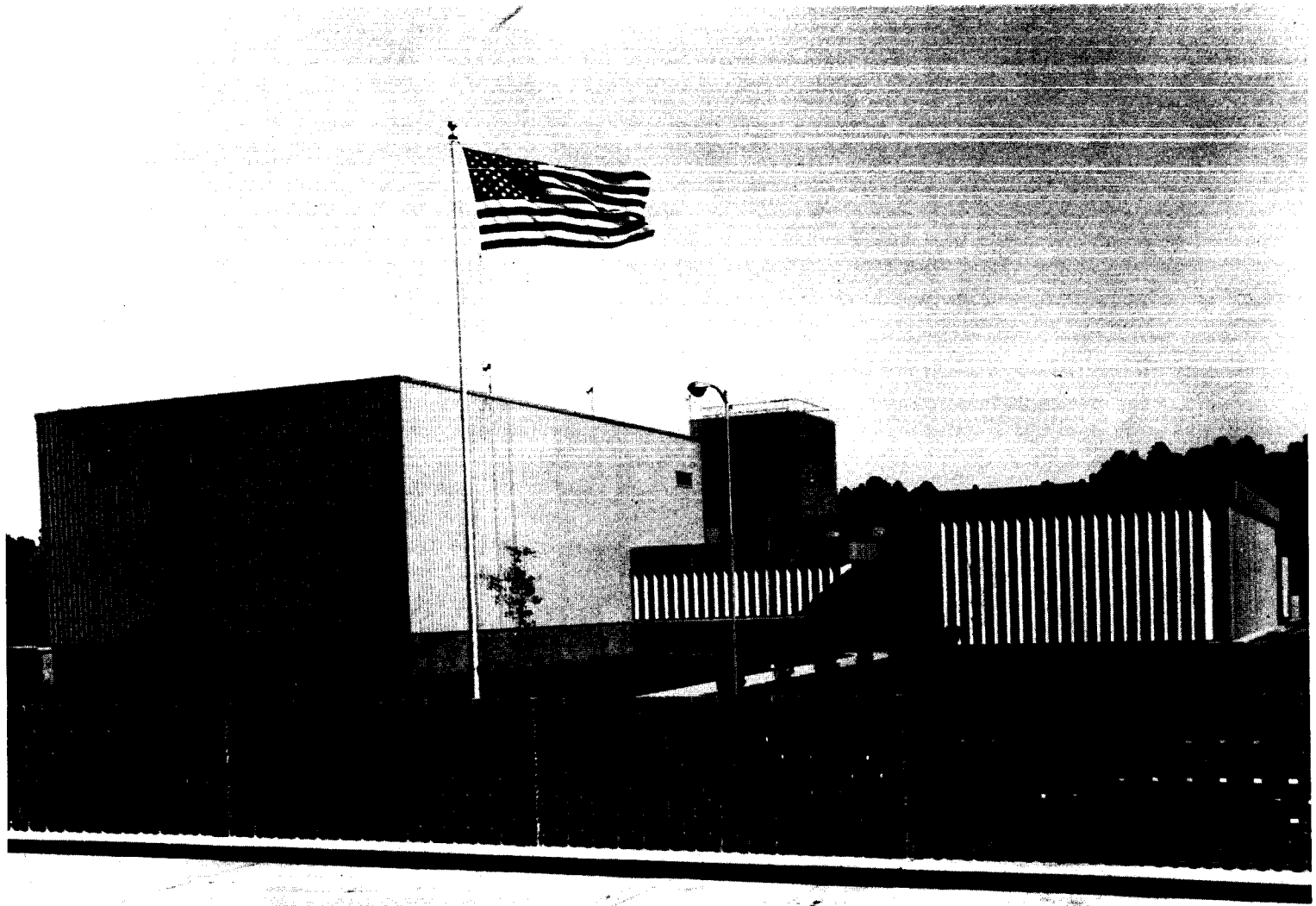
AO 1-27

MARSHALL SPACE FLIGHT CENTER
TEST LABORATORY FACILITIES

MARSHALL SPACE FLIGHT CENTER
TEST COMPLEX FOR SATURN V VEHICLE



MICHOUD PLANT
OVERALL AERIAL VIEW



SLIDELL COMPUTER FACILITY

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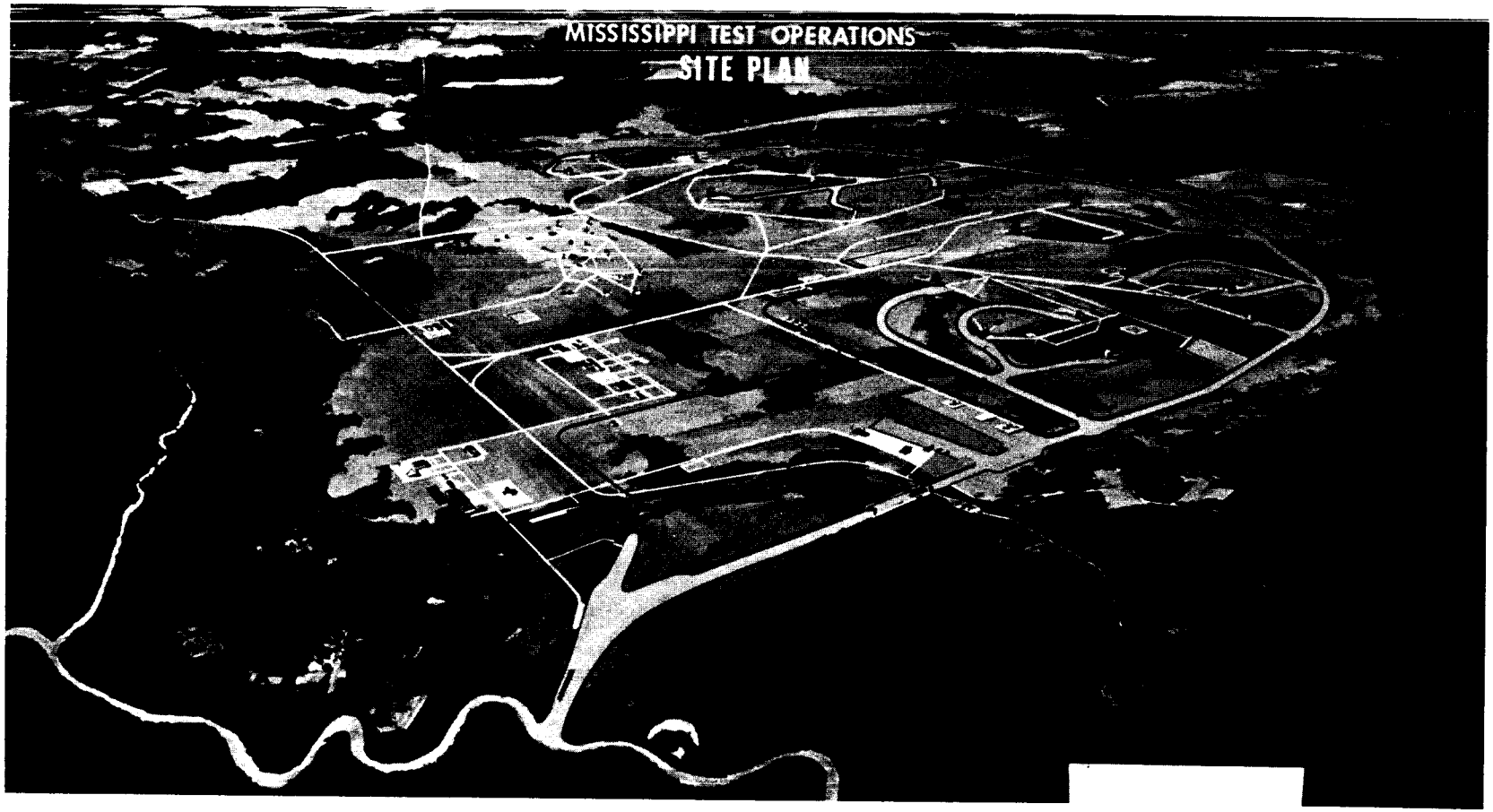
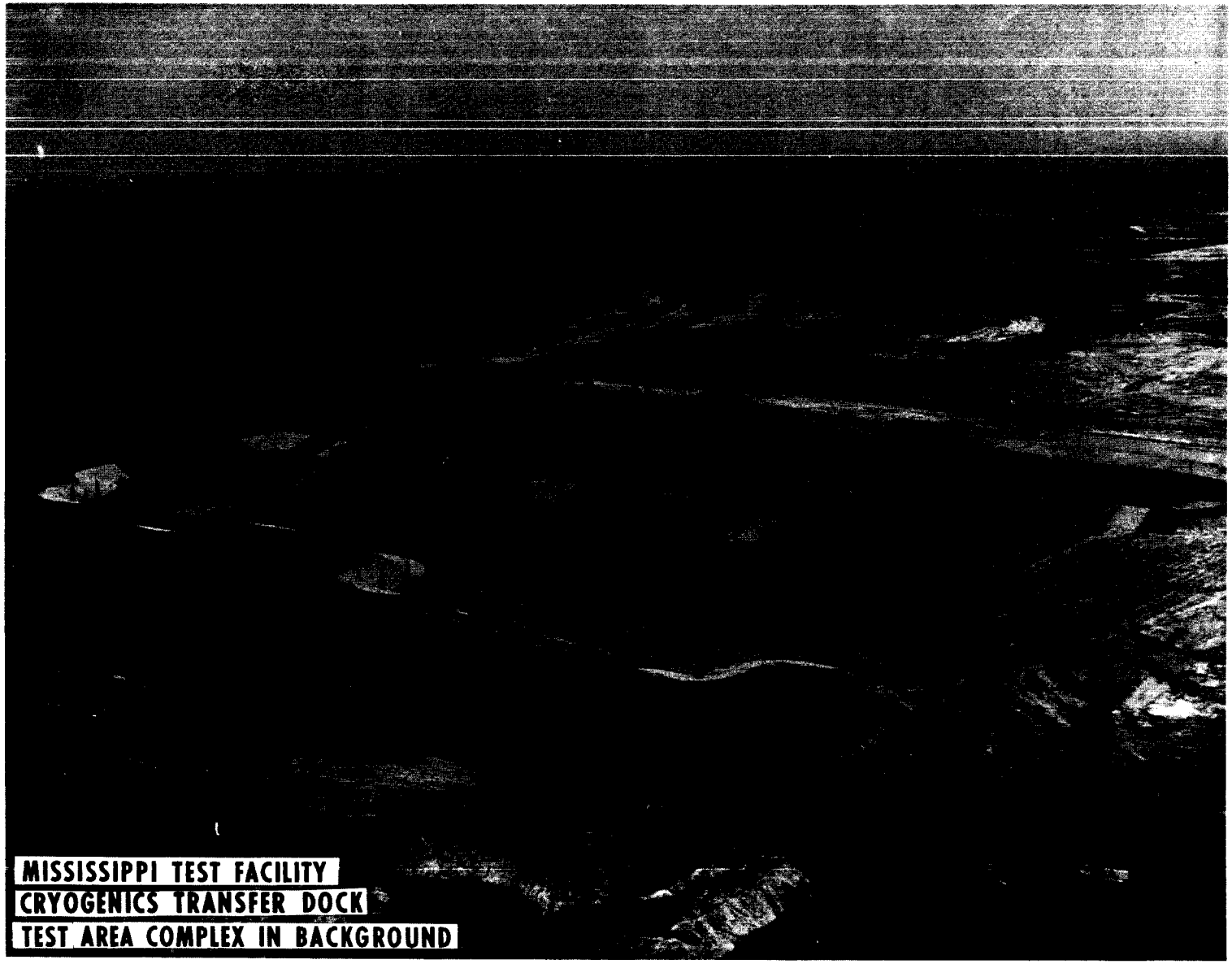

MISSISSIPPI TEST OPERATIONS
SITE PLAN



MISSISSIPPI TEST FACILITY
CRYOGENICS TRANSFER DOCK
TEST AREA COMPLEX IN BACKGROUND

MISSISSIPPI TEST FACILITY
INDUSTRIAL COMPLEX

STAFFING SUMMARY

	65	66
Excepted	54	54
GS-16	41	41
GS-15	390	390
GS-14	663	663
All other GS	4,961	5,061
Wage Board	1,380	1,280
Total Permanent	7,489	7,489
Temporary	169	169
Total Positions	7,658	7,658

DIRECTOR
DEPUTY DIRECTOR
TECH. DEP. DIR. ADMIN.

	65	66
Excepted	6	6
GS-16	-	-
GS-15	5	5
GS-14	1	1
All other GS	12	12
Wage Board	-	-
Total	24	24

ASST. DIR. FOR S&TA
ASST. DIR. FOR FAC. ENGR.
ASST. DIR. FOR P&C

	65	66
Excepted	2	2
GS-16	1	1
GS-15	-	-
GS-14	-	-
All other GS	3	3
Wage Board	-	-
Total	6	6

EXECUTIVE STAFF

	65	66
Excepted	1	1
GS-16	-	-
GS-15	12	12
GS-14	12	12
All other GS	71	71
Wage Board	-	-
Total	96	96

PUBLIC AFFAIRS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	1	1
All other GS	26	26
Wage Board	1	1
Total	29	29

CHIEF COUNSEL

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	6	6
All other GS	15	15
Wage Board	-	-
Total	23	23

LABOR RELATIONS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	1	1
All other GS	1	1
Wage Board	-	-
Total	3	3

PERSONNEL AND COMMUNITY RELATIONS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	6	6
All other GS	90	90
Wage Board	-	-
Total	98	98

MANAGEMENT SERVICES OFFICE

	65	66
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	7	7
All other GS	160	160
Wage Board	39	39
Total	211	211

TECHNICAL SERVICES OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	7	7
All other GS	265	265
Wage Board	310	310
Total	584	584

PURCHASING OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	9	9
All other GS	213	213
Wage Board	-	-
Total	223	223

FACILITIES AND DESIGN OFFICE

	65	66
Excepted	-	-
GS-16	1	1
GS-15	6	6
GS-14	17	17
All other GS	84	84
Wage Board	-	-
Total	108	108

FINANCIAL MANAGEMENT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	6	6
GS-14	10	10
All other GS	181	181
Wage Board	-	-
Total	197	197

NASA AUDIT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All other GS	17	17
Wage Board	-	-
Total	20	20

DIRECTOR
RESEARCH & DEVELOPMENT OPERATIONS

	65	66
Excepted	2	2
GS-16	-	-
GS-15	1	1
GS-14	-	-
All other GS	4	4
Wage Board	-	-
Total	7	7

FUTURE PROJECTS OFFICE

	65	66
Excepted	1	1
GS-16	1	1
GS-15	8	8
GS-14	6	6
All other GS	17	17
Wage Board	-	-
Total	33	33

SATURN-APOLLO SYSTEMS OFFICE

	65	66
Excepted	2	2
GS-16	-	-
GS-15	6	6
GS-14	10	10
All other GS	22	22
Wage Board	-	-
Total	40	40

RESOURCES MANAGEMENT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	3	3
GS-14	6	6
All other GS	41	41
Wage Board	-	-
Total	50	50

AERO-ASTRODYNAMICS LABORATORY

	65	66
Excepted	4	4
GS-16	4	4
GS-15	19	19
GS-14	37	37
All other GS	265	265
Wage Board	6	6
Total	356	356

ASTRIONICS LABORATORY

	65	66
Excepted	8	8
GS-16	4	4
GS-15	25	25
GS-14	96	96
All other GS	572	591
Wage Board	186	167
Total	931	931

COMPUTATION LABORATORY

	65	66
Excepted	4	4
GS-16	2	2
GS-15	11	11
GS-14	23	23
All other GS	134	134
Wage Board	-	-
Total	174	174

MANUFACTURING ENGINEERING LABORATORY

	65	66
Excepted	3	3
GS-16	2	2
GS-15	15	15
GS-14	32	32
All other GS	394	430
Wage Board	374	338
Total	820	820

PROPULSION AND VEHICLE ENGINEERING LABORATORY

	65	66
Excepted	6	6
GS-16	4	4
GS-15	63	63
GS-14	112	112
All other GS	527	536
Wage Board	93	84
Total	805	805

QUALITY AND RELIABILITY ASSURANCE LABORATORY

	65	66
Excepted	2	2
GS-16	2	2
GS-15	32	32
GS-14	55	55
All other GS	511	513
Wage Board	19	17
Total	621	621

RESEARCH PROJECTS LABORATORY

	65	66
Excepted	1	1
GS-16	2	2
GS-15	12	12
GS-14	22	22
All other GS	46	46
Wage Board	-	-
Total	83	83

TEST LABORATORY

	65	66
Excepted	4	4
GS-16	2	2
GS-15	31	31
GS-14	41	41
All other GS	299	333
Wage Board	352	318
Total	729	729

DIRECTOR
INDUSTRIAL OPERATIONS

	65	66
Excepted	2	2
GS-16	-	-
GS-15	1	1
GS-14	-	-
All other GS	8	8
Wage Board	-	-
Total	11	11

CONTRACTS OFFICE

	65	66
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	12	12
All other GS	129	129
Wage Board	-	-
Total	146	146

FACILITIES PROJECTS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	11	11
All other GS	33	34
Wage Board	-	-
Total	45	46

PROJECT LOGISTICS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	6	6
All other GS	5	5
Wage Board	-	-
Total	13	13

RESOURCES MANAGEMENT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	6	6
All other GS	23	23
Wage Board	-	-
Total	30	30

SATURN I/IB PROJECT OFFICE

	65	66
Excepted	1	1
GS-16	4	4
GS-15	13	13
GS-14	22	22
All other GS	124	124
Wage Board	-	-
Total	164	164

SATURN V PROJECT OFFICE

	65	66
Excepted	1	1
GS-16	4	4
GS-15	15	15
GS-14	38	38
All other GS	198	197
Wage Board	-	-
Total	256	255

ENGINE PROJECT OFFICE

	65	66
Excepted	1	1
GS-16	6	6
GS-15	11	11
GS-14	17	17
All other GS	83	82
Wage Board	-	-
Total	118	117

MICHOUD PLANT

	65	66
Excepted	1	1
GS-16	1	1
GS-15	10	10
GS-14	26	26
All other GS	274	273
Wage Board	-	-
Total	312	311

MISSISSIPPI TEST FACILITY

	65	66
Excepted	-	-
GS-16	1	1
GS-15	2	2
GS-14	6	6
All other GS	114	116
Wage Board	-	-
Total	123	125

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ORGANIZATION AND STAFFING CHART

MARSHALL SPACE FLIGHT CENTER

DIRECTOR
DEPUTY DIRECTOR
TECH. DEP. DIR. ADMIN.

	65	66
Excepted	6	6
GS-16	-	-
GS-15	5	5
GS-14	1	1
All other GS	12	12
Wage Board	-	-
Total	24	24

ASST. DIR. FOR S&TA
. DIR. FOR FAC. ENGR.
ASST. DIR. FOR P&C

	65	66
1	2	2
	1	1
	-	-
	-	-
er GS	3	3
ard	-	-
	6	6

EXECUTIVE STAFF

	65	66
ic	1	1
	-	-
	12	12
	12	12
ner GS	71	71
oard	-	-
	96	96

PUBLIC AFFAIRS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	1	1
All other GS	26	26
Wage Board	1	1
Total	29	29

CHIEF COUNSEL

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	6	6
All other GS	15	15
Wage Board	-	-
Total	23	23

LABOR RELATIONS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	1	1
All other GS	1	1
Wage Board	-	-
Total	3	3

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	160
	39
	211

TECHNICAL SERVICES OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	7	7
All other GS	265	265
Wage Board	310	310
Total	584	584

PURCHASING OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	9	9
All other GS	213	213
Wage Board	-	-
Total	223	223

FACILITIES AND DESIGN OFFICE

	65	66
Excepted	-	-
GS-16	1	1
GS-15	6	6
GS-14	17	17
All other GS	84	84
Wage Board	-	-
Total	108	108

FINANCIAL MANAGEMENT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	6	6
GS-14	10	10
All other GS	181	181
Wage Board	-	-
Total	197	197

NASA AUDIT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All other GS	17	17
Wage Board	-	-
Total	20	20

DIRECTOR
INDUSTRIAL OPERATIONS

	65	66
Excepted	2	2
GS-16	-	-
GS-15	1	1
GS-14	-	-
All other GS	8	8
Wage Board	-	-
Total	11	11

E

	66
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	22
	-
	40

RESOURCES MANAGEMENT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	3	3
GS-14	6	6
All other GS	41	41
Wage Board	-	-
Total	50	50

CONTRACTS OFFICE

	65	66
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	12	12
All other GS	129	129
Wage Board	-	-
Total	146	146

FACILITIES PROJECTS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	11	11
All other GS	33	34
Wage Board	-	-
Total	45	46

PROJECT LOGISTICS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	6	6
All other GS	5	5
Wage Board	-	-
Total	13	3

RESOURCES MANAGEMENT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	6	6
All other GS	23	23
Wage Board	-	-
Total	30	30

MANUFACTURING ENGINEERING LABORATORY

	65	66
Excepted	3	3
GS-16	2	2
GS-15	15	15
GS-14	32	32
All other GS	394	430
Wage Board	374	338
Total	820	820

SATURN I/IB PROJECT OFFICE

	65	66
Excepted	1	1
GS-16	4	4
GS-15	13	13
GS-14	22	22
All other GS	124	124
Wage Board	-	-
Total	164	164

SATURN V PROJECT OFFICE

	65	66
Excepted	1	1
GS-16	4	4
GS-15	15	15
GS-14	38	38
All other GS	198	197
Wage Board	-	-
Total	256	255

ENGINE PROJECT OFFICE

	65	66
Excepted	1	1
GS-16	6	6
GS-15	11	11
GS-14	17	17
All other GS	83	82
Wage Board	-	-
Total	118	117

ORY

	66
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	46
	-
	83

TEST LABORATORY

	65	66
Excepted	4	4
GS-16	2	2
GS-15	31	31
GS-14	41	41
All other GS	299	333
Wage Board	352	318
Total	729	729

MICHOUD PLANT

	65	66
Excepted	1	1
GS-16	1	1
GS-15	10	10
GS-14	26	26
All other GS	274	273
Wage Board	-	-
Total	312	311

MISSISSIPPI TEST FACILITY

	65	66
Excepted	-	-
GS-16	1	1
GS-15	2	2
GS-14	6	6
All other GS	114	16
Wage Board	-	-
Total	123	25

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ORGANIZATION AND STAFFING CHART

MARSHALL SPACE FLIGHT CENTER

STAFFING SUMMARY

	65	66
Excepted	54	54
GS-16	41	41
GS-15	390	390
GS-14	663	663
All other GS	4,961	5,061
Wage Board	1,380	1,280
Total Permanent	[illegible]	[illegible]
Temporary	169	169
Total Positions	7,658	7,658

DIRECTOR
DEPUTY DIRECTOR
TECH. DEP. DIR. ADMIN.

	65	66
Excepted	6	6
GS-16	-	-
GS-15	5	5
GS-14	1	1
All other GS	12	12
Wage Board	-	-
Total	24	24

ASST. DIR. FOR SERA
ASST. DIR. FOR FAC. ENGR.
ASST. DIR. FOR P&C

	65	66
Excepted	2	2
GS-16	1	1
GS-15	-	-
GS-14	-	-
All other GS	3	3
Wage Board	-	-
Total	6	6

EXECUTIVE STAFF

	65	66
Excepted	1	1
GS-16	-	-
GS-15	12	12
GS-14	12	12
All other GS	71	71
Wage Board	-	-
Total	96	96

PUBLIC AFFAIRS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	1	1
All other GS	26	26
Wage Board	1	1
Total	29	29

CHIEF COUNSEL

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	6	6
All other GS	15	15
Wage Board	-	-
Total	23	23

LABOR RELATIONS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	1	1
All other GS	1	1
Wage Board	-	-
Total	3	3

PERSONNEL AND COMMUNITY RELATIONS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	6	6
All other GS	90	90
Wage Board	-	-
Total	98	98

MANAGEMENT SERVICES OFFICE

	65	66
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	7	7
All other GS	160	160
Wage Board	39	39
Total	211	211

TECHNICAL SERVICES OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	7	7
All other GS	265	265
Wage Board	310	310
Total	584	584

PURCHASING OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	9	9
All other GS	213	213
Wage Board	-	-
Total	223	223

FACILITIES AND DESIGN OFFICE

	65	66
Excepted	-	-
GS-16	1	1
GS-15	6	6
GS-14	17	17
All other GS	84	84
Wage Board	-	-
Total	108	108

FINANCIAL MANAGEMENT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	6	6
GS-14	10	10
All other GS	181	181
Wage Board	-	-
Total	197	197

NASA AUDIT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All other GS	17	17
Wage Board	-	-
Total	20	20

DIRECTOR
RESEARCH & DEVELOPMENT OPERATIONS

	65	66
Excepted	2	2
GS-16	-	-
GS-15	1	1
GS-14	-	-
All other GS	4	4
Wage Board	-	-
Total	7	7

DIRECTOR
INDUSTRIAL OPERATIONS

	65	66
Excepted	2	2
GS-16	-	-
GS-15	1	1
GS-14	-	-
All other GS	8	8
Wage Board	-	-
Total	11	11

FUTURE PROJECTS OFFICE

	65	66
Excepted	1	1
GS-16	1	1
GS-15	8	8
GS-14	6	6
All other GS	17	17
Wage Board	-	-
Total	33	33

SATURN-APOLLO SYSTEMS OFFICE

	65	66
Excepted	2	2
GS-16	-	-
GS-15	6	6
GS-14	10	10
All other GS	22	22
Wage Board	-	-
Total	40	40

RESOURCES MANAGEMENT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	3	3
GS-14	6	6
All other GS	41	41
Wage Board	-	-
Total	50	50

CONTRACTS OFFICE

	65	66
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	12	12
All other GS	129	129
Wage Board	-	-
Total	146	146

FACILITIES PROJECTS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	11	11
All other GS	33	34
Wage Board	-	-
Total	45	46

PROJECT LOGISTICS OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	6	6
All other GS	5	5
Wage Board	-	-
Total	13	13

RESOURCES MANAGEMENT OFFICE

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	6	6
All other GS	23	23
Wage Board	-	-
Total	30	30

AERO-ASTRODYNAMICS LABORATORY

	65	66
Excepted	4	4
GS-16	4	4
GS-15	40	40
GS-14	37	37
All other GS	265	265
Wage Board	6	6
Total	356	356

ASTRIONICS LABORATORY

	65	66
Excepted	8	8
GS-16	4	4
GS-15	65	65
GS-14	96	96
All other GS	572	591
Wage Board	186	167
Total	931	931

COMPUTATION LABORATORY

	65	66
Excepted	4	4
GS-16	2	2
GS-15	11	11
GS-14	23	23
All other GS	134	134
Wage Board	-	-
Total	174	174

MANUFACTURING ENGINEERING LABORATORY

	65	66
Excepted	3	3
GS-16	2	2
GS-15	15	15
GS-14	32	32
All other GS	394	430
Wage Board	374	338
Total	820	820

SATURN 1/1B PROJECT OFFICE

	65	66
Excepted	1	1
GS-16	4	4
GS-15	13	13
GS-14	22	22
All other GS	124	124
Wage Board	-	-
Total	164	164

SATURN V PROJECT OFFICE

	65	66
Excepted	1	1
GS-16	4	4
GS-15	15	15
GS-14	38	38
All other GS	198	197
Wage Board	-	-
Total	256	255

ENGINE PROJECT OFFICE

	65	66
Excepted	1	1
GS-16	6	6
GS-15	11	11
GS-14	17	17
All other GS	83	82
Wage Board	-	-
Total	118	117

PROPULSION AND VEHICLE ENGINEERING LABORATORY

65 66

QUALITY AND RELIABILITY ASSURANCE LABORATORY

RESEARCH PROJECTS LABORATORY

TEST LABORATORY

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1966 ESTIMATES

GEORGE C. MARSHALL SPACE FLIGHT CENTER

MISSION AND CAPABILITIES:

The George C. Marshall Space Flight Center, which became part of NASA on July 1, 1960, has a long and distinguished history in the field of rocketry which underlies its technical capabilities in the performance of its basic mission. Extensive technical experience has been accumulated as a result of the research and development work conducted on the Redstone, Jupiter, and Pershing Missiles. The early success of the Saturn program stems directly from the practical know-how gained through the years on these earlier systems.

The primary mission of this Center is to develop and provide launch vehicle and space transportation systems to meet the space program requirements. This responsibility extends through all phases of design, fabrication, testing, and production, to integration and coordination of launching of the vehicle and includes studies and research in astronautics. Major emphasis is on contract management, technical guidance, supervision of industrial contractors and overall systems engineering, and systems integration for launch vehicle or space transportation system projects.

Other activities include basic research, product improvement, advancement of launch vehicle technology, particularly in the areas of multi-engine vehicles, and nuclear and electrical propulsion.

Major functions currently assigned include:

a. Project management for developing and producing the following family of large launch vehicles:

(1) The Saturn I, which has advanced the large launch vehicle technology, including the clustered engine principle, liquid hydrogen propulsion and guidance and instrumentation technology.

(2) The Saturn IB, which advances large booster technology in support of Saturn V, assists in Apollo spacecraft development and qualification, and provides the Nation with a carrier for large scientific satellite payloads (approximately 17 tons in low earth orbit).

(3) The Saturn V, which will accomplish manned lunar landing missions, lunar logistics missions, planetary escape missions, and will provide the Nation with a carrier for large scientific satellite payloads of approximately 140 tons in low earth orbit and 47 tons in escape trajectories.

b. Project management for developing propulsion systems for Saturn and other launch vehicles, including:

(1) H-1 engine, 200,000 pound thrust,

(2) J-2 engine, 200,000 pound thrust, and

(3) F-1 engine, 1,500,000 pound thrust.

c. Project management for the development of micrometeoroid satellites which will be flown on Saturn I vehicles to obtain data on frequency and penetration of micrometeoroids in low earth orbit.

d. Advancing the state-of-the-art in large launch vehicles and space systems.

Marshall has an integrated complex of engineering, laboratory, fabrication, and test facilities essential in providing project managers with technical support capability for vehicle systems engineering, and for successful management and technical evaluation of contractors' activities. In addition, Marshall's scientific-engineering personnel perform work in-house on carefully selected projects to maintain a high level of technical proficiency across a wide technological range.

Marshall is responsible for directing operations at the Mississippi Test Facility, the Michoud Plant, and several major contractor plants. The mission of the Mississippi Test Facility is the acceptance test firing and evaluation of large launch vehicle stages. The mission of the Michoud Plant is the manufacture of booster stages for the Saturn family of launch vehicles.

SUMMARY OF RESOURCES REQUIREMENTS:

	1964	1965	1966
Number of positions, end of year.	7,679	7,658	7,658
Average number of all Employees..	7,332	7,546	7,576
Administrative Operations.....	$124,443,000	$140,458,000	$137,387,000

INSTALLATION DESCRIPTION:

Operations of the Marshall Space Center are conducted at four primary locations. The main Marshall Space Flight Center is near Huntsville, Alabama on Army property at the Redstone Arsenal. The Center occupies 1,786 acres under a non-revocable use permit from the Army and 64 leased acres. The capital investment as of June 30, 1964 was $223,843,000. Certain facilities such as the Redstone Arsenal Army Air Field and some utilities are used jointly by NASA and the Army. Within the Center complex, the total area of specialized and support buildings amount to 3,585,116 square feet. Another 619,000 square feet of warehouse facilities belonging to the Army at

Redstone Arsenal are used by the Center. The Huntsville location has deep water access via the Tennessee River, Ohio River, and Mississippi River.

The Mississippi Test Facility is located in southwest Mississippi, approximately 50 miles northeast of New Orleans, Louisiana. The total land area will be 139,095 acres, of which 13,428 acres will make up the actual test area and will be owned by NASA. The remaining 125,667 acres will be held as a buffer zone. In the buffer area, 7,963 acres will be owned in fee, and 117,704 acres will be under restrictive easement. The capital investment for the Mississippi Test Facility as of June 30, 1964 was $57,103,000. Design of the test and support facilities is complete, and the first and second increments are under contract. All facilities in the third increment will be under contract in the first part of calendar year 1965. Test stands will include a dual-position stand for testing the 7,500,000 pound thrust S-IC booster stage and two stands for testing the 1,000,000 pound thrust S-II stages. The site has deep water access for transporting large boosters via the Pearl River and the intra-Coastal Waterway.

The Michoud Plant is located 15 miles East of the center of New Orleans, Louisiana. The plant occupies 839 improved acres (including 14 acres at Slidell, Louisiana), and 72 acres obtained under a use permit from the Army. The capital investment as of June 30, 1964 was $100,651,000. Facilities at the plant comprise a total of 3,202,163 gross square feet, including the main assembly plant, which covers an area of 40 acres under one roof. A new engineering building and the vertical assembly building are complete and occupied. The Michoud plant is on the Gulf intra-Coastal Waterway and has deep-water access via the Mississippi River.

The central computer facility supporting the Michoud Plant and the Mississippi Test Facility is located at Slidell, Louisiana, 20 miles northeast of the Michoud Plant. The building is on a 14-acre site and valued at $3,335,000 as of June 1964. The building has 59,497 square feet housing the computer installation.

ANALYSIS OF RESOURCES REQUIREMENTS BY OBJECT CLASSIFICATION:

		1964	1965	1966
11.	Personnel Compensation...	$72,921,000	$81,344,000	$81,675,000
12.	Personnel Benefits.....	4,926,000	5,475,000	5,531,000
	Total, personnel costs.	$77,847,000	$86,819,000	$87,206,000
21.	Travel and Transportation of Persons.....	3,337,000	3,759,000	3,825,000
22.	Transportation of Things.	583,000	550,000	550,000
23.	Rents, Communications, and Utilities.....	11,780,000	13,231,000	11,786,000
24.	Printing and Reproduction	1,033,000	1,100,000	1,150,000

25. Other Services.....	$13,999,000	$20,052,000	$21,435,000
Services of other agencies.....	2,808,000	2,918,000	2,944,000
26. Supplies and Materials...	5,911,000	6,100,000	6,100,000
31. Equipment.....	3,814,000	4,928,000	1,390,000
32. Land and Structures.....	3,330,000	1,000,000	1,000,000
42. Insurance Claims and Indemnities.....	1,000	1,000	1,000
Total.....	$124,443,000	$140,458,000	$137,387,000

JUSTIFICATION BY OBJECT CLASSIFICATION:

Personnel Distribution

	1964	1965	1966
Direct Personnel by Program			
Manned Space Flight			
Apollo.....	5,302	5,301	5,336
Advanced missions.....	151	151	151
Space Science and Applications			
Physics and astronomy.....	5	14	14
Lunar and planetary exploration.....	17	15	15
Launch vehicle development.	9	-	-
Meteorological satellites..	-	3	3
Advanced Research and Technology			
Electronics systems.....	56	56	56
Human factor systems.....	2	5	5
Nuclear-electric systems...	2	5	5
Nuclear rockets.....	24	13	13
Chemical propulsion.....	17	17	17
Solar and chemical power...	4	15	15
Space vehicle systems.....	165	170	135
Basic research.....	81	81	81
Tracking and Data Acquisition	9	9	9
Technology Utilization	13	13	13

	1964	1965	1966
Sub-total, direct positions....	5,857	5,868	5,868
Support Personnel			
Director and Staff.....	165	184	184
Administration.....	788	745	745
Research and development support.	692	692	692
Sub-total, support positions...	1,645	1,621	1,621
Total, permanent positions.....	7,502	7,489	7,489
Other positions:			
Positions under cooperative training agreements.....	169	169	169
Other temporary positions.....	8	-	-
Total, all positions.....	7,679	7,658	7,658

Personnel requirements

Marshall Space Flight Center personnel requirements for FY 1965 and FY 1966 will continue at the same level as both the Saturn IB and V programs become more active in systems engineering, testing, and other phases as the initial flight dates approach. Many hardware-related milestones are scheduled during this period. Acceptance testing of the first Saturn IB, fabrication of Saturn V ground test and flight stages, and delivery of F-1 and J-2 engines are planned for FY 1965, in addition to two Saturn I launches. FY 1966 will be a critical year in these programs as Marshall Space Flight Center enters into an active phase of ground and flight testing. Three vehicles, including two Saturn IB's, will be launched in FY 1966, contributing to increased emphasis in instrumentation, flight operation, and flight evaluation, as well as redesign effort resulting from problems revealed in flight evaluation. Throughout this period, increasing contractor activity at the Michoud Plant and at contractor plants will require intensified monitoring and quality and reliability assurance inspection by Marshall Space Flight Center personnel. The Mississippi Test Facility, which will become partially operational in FY 1966, will also create an additional workload for the Marshall Space Flight Center.

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Personnel Costs

	1964	1965	1966
Total Positions.....	7,679	7,658	7,658
Permanent.....	7,502	7,489	7,489
Other.....	177	169	169
Personnel Compensation:			
Annual cost of permanent positions.....	$68,967,000	$74,262,000	$74,358,000
Pay above the stated annual rate.....	576,000	298,000	258,000
Lapses (deduct).....	-4,919,000	-1,565,000	-863,000
Net cost of permanent positions.....	64,624,000	72,995,000	73,753,000
Other personnel compensation.	8,302,000	8,352,000	7,925,000
Total compensation.....	72,926,000	81,347,000	81,678,000
NASA funded.....	72,921,000	81,344,000	81,675,000
Reimbursable.....	5,000	3,000	3,000
Personnel benefits.....	4,926,000	5,475,000	5,531,000
NASA funded.....	4,926,000	5,475,000	5,531,000
Reimbursable.....	---	---	---
Total personnel costs.....	77,852,000	86,822,000	87,209,000
NASA funded.....	77,847,000	86,819,000	87,206,000
Reimbursable.....	5,000	3,000	3,000
Average Number of All Employees (Man Years).....	7,332	7,546	7,576

Personnel Costs - $87,206,000

The increase of $387,000 in personnel costs is attributable primarily to an additional 30 man-years to be realized during FY 1966.

Travel and Transportation of Persons - $3,825,000

Travel and transportation of persons is expected to increase in FY 1966 by $66,000. The significant reasons for additional travel funds are: a. The number of launches scheduled for FY 1966 is greater than in FY 1965, resulting in increased test activity; and b. a greater demand for quality control and inspection in the stage, engine, and component development program. These increased activities will require more frequent trips to contractor's plants, test sites, and launch areas.

Transportation of Things - $550,000

The amount required for FY 1966, estimated at the same level as for FY 1965, provides for transportation of household goods, freight, express, drayage, and parcel post.

Rents, Communications, and Utilities - $11,786,000

The estimate for rents, communications, and utilities is $1,445,000 less than FY 1965 requirements. This net reduction results from a decrease in rental of office space, and rental of automatic data processing equipment because of planned procurement. These reductions are partially offset by an increase in utilities.

The requirement for communications is slightly less than the FY 1965 level. Leased lines and long-distance toll costs are expected to be less than in FY 1965, but this reduction will be partially offset by an increase for local telephone and exchange services. The decrease in long-distance toll costs results from the implementation of the "Centrex", which permits personnel located in downtown Huntsville to have access to leased line service. In addition, Federal Telecommunications Service (FTS) is expected to reduce the number of administrative leased lines required.

The FY 1966 requirement for utilities is $251,000 higher than FY 1965. Utilities at the Marshall Space Flight Center are procured from the Army at Redstone Arsenal. The estimate for FY 1966 is based on current Army prices, and is projected to reflect the increase in the number of buildings that must be serviced during FY 1966. The growth in building area is the result of facilities projects that will be completed during FY 1965 and 1966.

Printing and Reproduction - $1,150,000

The amount required in FY 1966 is $50,000 higher than the FY 1965 estimate. This increase is attributable to the increased volume in reproduction of engineering changes, master parts lists, drawing release records, assembly status reports, technical reports, and other technical documentation printing requirements which are in direct support of the Saturn IB, Saturn V, and engine development programs.

Other Services - $24,379,000

Contractor and other Government agency services to supplement the in-house capabilities are furnished on a continuing, seasonal, intermittent or non-recurring basis. An additional $1,409,000 will be required in FY 1966 to provide for these services.

An increase of $447,000 is required for engineering services, technical documentation services, chart and related art work. The major portion of this increase is in the area of technical documentation. This increase is due to implementation of the Apollo Interface Program and the additional effort required to meet demands of the research and development programs. Additional funds required for chart and related art work are attributable to the planned expansion of effort in the Center's PERT and Companion Cost System.

An increase of $565,000 is requested for maintenance and repair of buildings, grounds, and equipment. Increased costs are related to the increased number of facilities becoming available in FY 1965 and FY 1966 that must be maintained, as well as additional office and shop equipment. The requirement to fund a full year's cost for maintenance of automatic data processing equipment also contributes to the increase.

An additional $23,000 is requested in FY 1966 for tuition, technical motion picture services, and other miscellaneous services. This represents a net increase and is required primarily for increased photographic support of the Saturn IB program for technical film reports, and the micrometeoroid program.

An increase of $374,000 is required for chemical cleaning, security guard, janitorial services, refuse handling, laundry, and other miscellaneous custodial services. Security guard, janitorial services, and refuse handling will increase as additional floor space is occupied. Expanded test firing facilities in FY 1966 and the activation of new test areas necessitates the increased chemical cleaning requirement.

Supplies and Materials - $6,100,000

The requirements for supplies and materials are estimated to remain at the same level as fiscal year 1965. Therefore, no additional funds for this purpose is requested.

Equipment - $1,390,000

The amount requested is $3,538,000 less than the amount estimated for FY 1965. This reduction is due to the planned purchase in FY 1965 of automatic data processing equipment in lieu of continued rental.

Land and Structures - $1,000,000

The FY 1966 requirement for minor construction reflects no increase over FY 1965. As changes in the research and development programs occur, or as new technological approaches are developed, modifications are necessary to provide appropriate facilities. There is also a continuing need for funds under this category for installation support facilities, such as improvements to the electrical distribution system.

Insurance Claims and Indemnities - $1,000

Funds requested are for settlement of insurance claims and indemnities. This requirement is expected to remain at the FY 1965 level.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ORGANIZATION AND STAFFING CHART

NASA HEADQUARTERS

STAFFING SUMMARY

NASA-Wide	65	66
Excepted	170	169
GS-16	39	39
GS-15	384	384
GS-14	302	302
All other GS	1,242	1,243
Wage Board	19	19
Total	2,156	2,156
Temporary	65	65
Total Positions	2,221	2,221

ADMINISTRATOR

	65	66
Excepted	5	5
GS-16	-	-
GS-15	-	-
GS-14	-	-
All other GS	7	7
Wage Board	1	1
Total	13	13

LEGISLATIVE AFFAIRS

	65	66
Excepted	3	3
GS-16	-	-
GS-15	4	4
GS-14	2	2
All other GS	20	20
Wage Board	1	1
Total	30	30

INTERNATIONAL AFFAIRS

	65	66
Excepted	2	2
GS-16	1	1
GS-15	3	3
GS-14	-	-
All other GS	21	21
Wage Board	-	-
Total	27	27

EXECUTIVE SECRETARIAT

	65	66
Excepted	1	1
GS-16	-	-
GS-15	2	2
GS-14	3	3
All other GS	29	29
Wage Board	-	-
Total	35	35

POLICY PLANNING

	65	66
Excepted	4	4
GS-16	-	-
GS-15	4	4
GS-14	3	3
All other GS	13	13
Wage Board	-	-
Total	24	24

TECHNOLOGY UTILIZATION

	65	66
Excepted	3	3
GS-16	-	-
GS-15	10	10
GS-14	11	11
All other GS	53	53
Wage Board	-	-
Total	77	77

GENERAL COUNSEL

	65	66
Excepted	5	5
GS-16	-	-
GS-15	11	11
GS-14	8	8
All other GS	27	27
Wage Board	-	-
Total	51	51

PUBLIC AFFAIRS

	65	66
Excepted	3	3
GS-16	-	-
GS-15	16	16
GS-14	23	23
All other GS	73	73
Wage Board	-	-
Total	115	115

ASSOCIATE ADMINISTRATOR

	65	66
Excepted	3	3
GS-16	-	-
GS-15	2	2
GS-14	2	2
All other GS	8	8
Wage Board	-	-
Total	15	15

INDUSTRY AFFAIRS

	65	66
Excepted	5	5
GS-16	1	1
GS-15	15	15
GS-14	25	25
All other GS	79	79
Wage Board	-	-
Total	125	125

PROGRAMMING

	65	66
Excepted	7	7
GS-16	-	-
GS-15	15	15
GS-14	15	15
All other GS	50	50
Wage Board	-	-
Total	87	87

DEFENSE AFFAIRS

	65	66
Excepted	3	3
GS-16	-	-
GS-15	1	1
GS-14	1	1
All other GS	5	5
Wage Board	-	-
Total	10	10

ADMINISTRATION

NASA-Wide	65	66
Excepted	10	10
GS-16	1	1
GS-15	43	43
GS-14	50	50
All other GS	181	185
Wage Board	-	-
Total	285	289

Headquarters Operations		
Excepted	1	1
GS-16	-	-
GS-15	4	4
GS-14	6	6
All other GS	201	197
Wage Board	17	17
Total	229	225

DSACASR*

	65	66
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	11	11
All other GS	8	8
Wage Board	-	-
Total	20	20

TRACKING AND DATA ACQUISITION

	65	66
Excepted	5	5
GS-16	2	2
GS-15	20	20
GS-14	7	7
All other GS	26	26
Wage Board	-	-
Total	60	60

MANNED SPACE FLIGHT

	65	66
Excepted	44	43
GS-16	7	7
GS-15	120	120
GS-14	84	84
All other GS	206	207
Wage Board	-	-
Total	461	461

SPACE SCIENCE AND APPLICATIONS

	65	66
Excepted	33	33
GS-16	14	14
GS-15	53	53
GS-14	26	26
All other GS	144	144
Wage Board	-	-
Total	270	270

ADVANCED RESEARCH AND TECHNOLOGY

	65	66
Excepted	33	33
GS-16	13	13
GS-15	60	60
GS-14	25	25
All other GS	91	91
Wage Board	-	-
Total	222	222

* NASA Staffing for:

Defense Supply Agency Contract Administration Services Regions

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ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1966 ESTIMATES

NASA HEADQUARTERS

MISSION AND CAPABILITIES:

The mission of the Headquarters of the National Aeronautics and Space Administration is to plan and provide executive direction for the programs authorized by the Congress, and to implement the national objectives stated in the National Aeronautics and Space Act of 1958, as amended. The principal statutory functions are:

1. To conduct research into, and for the solution of, problems of flight within and outside the earth's atmosphere and to develop, construct, test, and operate aeronautical and space vehicles for research purposes.

2. To conduct activities required for the exploration of space with manned and unmanned vehicles.

3. To arrange for participation by the scientific community in planning scientific measurements and observations to be made through use of aeronautical and space vehicles, and conduct or arrange for the conduct of such measurements and observations.

4. To provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.

The following offices at Headquarters assist general management in carrying out the technical aspects of this mission:

The Office of Manned Space Flight - Responsible for all NASA activities directly involving manned space flight missions. Programs include Gemini - to develop an operational capability to fly a two-man spacecraft in near-earth orbit for periods up to fourteen days and to learn new techniques, including rendezvous, docking and extra-vehicular activity; Apollo - to develop a three-man operational capability in near-earth orbit, in lunar environment, including manned landing on the lunar surface, and return to earth; and Advanced Missions - to plan a broad program of exploration which will achieve and maintain a position of space leadership for the United States.

This office also has overall institutional responsibility for the three installations primarily concerned with the manned Space flight programs. These installations are: George C. Marshall Space Flight Center, including Mississippi Test Facility, Michoud Plant, and at Slidell where a computer facility is located; the Manned Spacecraft Center, including NASA activities at the White Sands Missile Range; and the John F. Kennedy Space Center.

The Office of Space Science and Applications - Responsible for all NASA programs for the unmanned scientific investigation of space with sounding rockets, earth satellites, and deep space probes to the moon, planets and interplanetary space and for the scientific experiments to be conducted by man in space; for research and development of useful applications of space flight in the areas of meteorology, communications, navigation, geodesy, and for the support of operational systems using these developments; for the development and procurement of the light and medium class of launch vehicles up to and including the Atlas/Centaur; and for the sustaining university program.

In addition to the foregoing, this Office has overall institutional responsibility for the installations primarily involved in carrying out NASA's space science and applications programs. These installations are: Goddard Space Flight Center, Wallops Station, Pacific Launch Operations Office; and the NASA Resident Office at JPL, which administers the NASA contract with the California Institute of Technology for the operation of the Jet Propulsion Laboratory.

The Office of Advanced Research and Technology - Responsible for the planning, direction, execution, evaluation, documentation, and dissemination of the results of all NASA research and technology programs which are conducted primarily to demonstrate the feasibility of a concept, structure, component, or system which may have specific general application to the Nation's aeronautical and space objectives. This Office is also responsible for coordinating NASA's total program of supporting research and technology, which is related to carrying out the specific flight missions in order to avoid unnecessary duplication and to insure that the agency has an integrated and balanced research program.

In addition, this Office has overall institutional responsibility for the research centers primarily involved in carrying out NASA's advanced research programs. These installations are: Ames Research Center, Electronics Research Center, Flight Research Center, Langley Research Center, Lewis Research Center, and the Space Nuclear Propulsion Office.

The Office of Tracking and Data Acquisition - Responsible for the development, implementation, and operation of tracking, data acquisition, communications, and data processing facilities, systems,

and services required for NASA flight programs. In addition, the Office is responsible for the agency-wide coordination of the management of automatic data processing.

SUMMARY OF RESOURCES REQUIREMENTS:

	1964	1965	1966
Number of Positions, end of year.	2,133	2,221	2,221
Average Number of All Employees..	1,944	2,070	2,150
Administrative Operations:			
NASA Headquarters.....	$49,115,000	$52,668,000	$56,103,000
Jet Propulsion Laboratory (purchase of computers).....	---	20,587,000	---
Total, Administrative Operations.....	$49,115,000	$73,255,000	$56,103,000

INSTALLATION DESCRIPTION:

The NASA Headquarters is located at 400 Maryland Avenue, S.W., Washington, D.C., and also occupies other buildings in the District of Columbia and nearby Virginia. Except for space leased in the Universal North Building and a storage area in Virginia, personnel occupy Government-owned buildings.

ANALYSIS OF RESOURCES REQUIREMENTS BY OBJECT CLASSIFICATION:

		1964	1965	1966
11.	Personnel Compensation.....	$22,302,000	$25,897,000	$26,822,000
12.	Personnel Benefits.....	1,678,000	1,834,000	1,912,000
	Total, personnel costs....	$23,980,000	$27,731,000	$28,734,000
21.	Travel and Transportation of Persons.....	2,607,000	2,634,000	2,627,000
22.	Transportation of Things....	456,000	460,000	281,000
23.	Rents, Communications, and Utilities.....	1,969,000	2,058,000	2,218,000
24.	Printing and Reproduction...	1,233,000	1,640,000	1,701,000
25.	Other Services.....	17,747,000	16,767,000	19,875,000
26.	Supplies and Materials.....	566,000	421,000	414,000
31.	Equipment.....	555,000	21,534,000 a/	243,000

a/ Includes $20,587,000 for purchase of ADP equipment for the Jet Propulsion Laboratory, Pasadana, California.

	1964	1965	1966
32. Land and Structures	1,000	---	---
42. Insurance Claims and Indemnities.....	1,000	10,000	10,000
Total.....	$49,115,000	$73,255,000	$56,103,000

The above estimates, other than for personnel compensation and benefits and travel, have been distributed between NASA-wide support functions with all centers benefiting and for operation of Headquarters. The following table shows this comparison by object classification.

Analysis of Funding for NASA-wide Support and Headquarters Operations

Object Class	FY 1965 Total	FY 1965 NASA-wide Support	FY 1965 Hdqrts. Operat.	FY 1966 Total	FY 1966 NASA-wide Support	FY 1966 Hdqrts. Operat.
	(In thousands of dollars)					
22. Transportation of Things.....	$460	$400	$60	$281	$221	$60
23. Rents, Communications and Utilities.....	2,058	882	1,176	2,218	1,116	1,102
24. Printing and Reproduction..	1,640	1,454	186	1,701	1,511	190
25. Other Services..	16,767	15,592	1,175	19,875	18,646	1,229
26. Supplies and Materials.....	421	30	391	414	23	391
31. Equipment.....	21,534	20,699 a/	835	243	74	169
32. Lands and Structures.....	---	---	---	---	---	---
42. Insurance Claims and Indemnities.....	10	---	10	10	---	10
Total.....	$42,890	$39,057	$3,833	$24,742	$21,591	$3,151

a/ Includes $20,587,000 for purchase of ADP equipment for the Jet Propulsion Laboratory, Pasadena, California.

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JUSTIFICATION BY OBJECT CLASSIFICATION:

Personnel Distribution

	1964	1965	1966
Direct Personnel by Program			
Manned Space Flight			
Gemini	73	104	104
Apollo	286	297	297
Advanced missions	60	60	60
Space Science and Applications			
Bioscience	23	23	23
Sustaining university program	68	73	73
Physics and astronomy	56	52	52
Lunar and planetary exploration	54	57	57
Communication satellites	14	10	9
Launch vehicle development	12	13	13
Meteorological satellites	20	20	20
Launch vehicle procurement	14	14	14
Applications technology satellites	3	8	9
Advanced Research and Technology			
Nuclear rockets	27	28	28
Nuclear-electric systems	4	4	4
Chemical propulsion	21	21	21
Space vehicle systems	44	46	46
Electronics systems	35	35	35
Aeronautics	22	26	26
Human factor systems	22	23	23
Basic research	26	27	27
Solar and chemical power	10	12	12
Tracking and Data Acquisition	51	60	60
Technology Utilization	14	13	13
Sub-total, direct positions	959	1,026	1,026

	1964	1965	1966
Support personnel:			
NASA-wide support	865	901	905
Administration	267	229	225
Sub-total, support positions	1,132	1,130	1,130
Total, permanent positions	2,091	2,156	2,156
Other positions:			
Positions under cooperative training agreements	---	---	---
Other temporary positions	42	65	65
Total, all positions	2,133	2,221	2,221

Personnel Costs

	1964	1965	1966
Total Positions	2,133	2,221	2,221
Permanent	2,091	2,156	2,156
Other	42	65	65
Personnel Compensation:			
Annual cost of permanent positions	$22,249,000	$25,652,000	$25,645,000
Pay above the stated annual rate	160,000	99,000	99,000
Lapses (deduct)	-1,448,000	-1,272,000	-355,000
Net cost of permanent positions	20,961,000	24,479,000	25,389,000
Other personnel compensation	1,341,000	1,418,000	1,433,000
Total compensation	22,302,000	25,897,000	26,822,000
NASA funded	22,302,000	25,897,000	26,822,000
Reimbursable	---	---	---
Personnel benefits	1,678,000	1,834,000	1,912,000
NASA funded	1,678,000	1,834,000	1,912,000
Reimbursable	---	---	---
Total personnel costs	23,980,000	27,731,000	28,734,000
NASA funded	23,980,000	27,731,000	28,734,000
Reimbursable	---	---	---
Average Number of All Employees (Man Years)	1,944	2,070	2,150

Personnel Costs - $28,734,000

The personnel costs for FY 1966 are estimated to be $1,003,000 above the requirement for FY 1965, of which $925,000 is for personnel compensation and $78,000 for personnel benefits, to cover the cost of 80 man years resulting from full year employment in FY 1966 of personnel hired in FY 1965.

Travel and Transportation of Persons - $2,627,000

There is a slight decrease below the FY 1965 level for travel and transportation of persons during FY 1966. The estimate includes $2,322,000 for NASA employee travel, of which, $2,150,000 will be used for direction and coordination of program and administrative activities; $107,000 for the contract charter airlift service; $30,000 for costs relating to initial duty stations, temporary assignments and transfers; and $35,000 for meetings of NASA technical committees and working panels. The balance of $305,000 is for non-NASA employee travel of technical and research advisory committees; and for costs of local transportation and rental of passenger motor vehicles.

Transportation of Things - $281,000

The FY 1966 estimate for transportation of things is projected at $179,000 below the FY 1965 level primarily as a result of a reduction in the transportation of exhibits and for cargo airlift costs.

The requirement of $281,000 in FY 1966 under this object class includes $140,000 for the domestic and overseas shipment of exhibits and spacemobiles; $42,000 for the "cargo" portion of the charter airlift service; $56,000 for costs of transportation of household goods and personal effects; and $43,000 for freight, express, drayage and parcel post costs of shipments to NASA installations, and rental of trucks from GSA.

The distribution of $281,000 in FY 1966 includes $221,000 for NASA-wide support and $60,000 for Headquarters operations.

Rents, Communications, and Utilities - $2,218,000

The FY 1966 estimate for rents and communications reflects a net increase of $160,000 over FY 1965 -- $107,000 for rents and $53,000 for communications.

The net increase of $107,000 for rents includes: 1) an increase of $278,000 for rental of space to house the NASA Scientific and Technical Information Facility on a full year basis in FY 1966. This space will be acquired through the General Services Administration during the latter part of FY 1965. In previous years, the rental of space was included as a part of the contract with Documentation, Inc.; and 2) a decrease of $171,000 for rental of ADP equipment.

The increase of $53,000 for communications costs reflects minor increases for local telephone and exchange services, Federal Telecommunications systems lines, telegraph and TWX service and for postage costs.

The request of $2,218,000 in FY 1966 includes $1,116,000 for NASA-wide support and $1,102,000 for Headquarters operations.

The following table reflects changes for this object classification:

	Increase or Decrease
Rents	$+107,000
Space	+278,000
ADP equipment	-171,000
Other equipment	---
Office equipment	---
Communications	+53,000
Leased lines	-16,000
Local telephone and exchange service	+39,000
Long distance tolls	-10,000
FTS charges	+10,000
Telegraph	+10,000
TWX	+10,000
Postage	+10,000
Total	$+160,000

Printing and Reproduction - $1,701,000

The FY 1966 estimates reflect an increase of $61,000 over FY 1965 for these services. About 89 per cent, or $1,511,000 of the $1,701,000 requested covers printing costs for NASA-wide support activities associated with the scientific and technical documentation programs; such as printing of scientific and technical aerospace reports covering world-wide interdisciplinary report literature in the aerospace field, special publications on research program developments and integrated reports of orbital, lunar, and planetary flights; and proceedings of symposia and conferences on selected scientific topics; and for printing of educational media concerning the Agency's program results in formats suitable for dissemination to the educational community and to the general public. The remaining 11 per cent, or $190,000, is required for Headquarters operations for printing and reproduction of forms, regulations and general printing and reproduction services.

About 93 per cent, or $1,577,000 of the FY 1966 estimate is for printing and allied services which will be performed through Government sources. The remaining 7 per cent, or $124,000, is for printing and photostating to be done by commercial sources.

Other Services - $19,875,000

The FY 1966 estimate for other services is $3,108,000 higher than for FY 1965. The following table shows an analysis of the major increases in this area:

	Increases
NASA scientific and technical information facility.....	$800,000
Technical documentation program.....	1,000,000
Scientific information systems development.	200,000
Preparation of manuscript material for specialized scientific and technical publications and monographs.....	490,000
Audio visual processing/depository service.	180,000
International graduate fellowship program..	170,000
Various minor adjustments in other Headquarters programs and projects.....	268,000
Total.....	$3,108,000

Of the net increase of $3,108,000, about 80 per cent, or $2,490,000, is requested for the scientific and technical information program. This includes:

1. $800,000 to provide for the documentation in NASA's contractor-operated Scientific and Technical Information Facility of the greatly increasing volume of scientific and technical data required for direct use in NASA's research and development programs. The FY 1966 workload is expected to be at least 25% greater than the FY 1965 level.

2. $1,000,000 for documentation of world-wide aerospace journal literature, primarily to align the funding of a contract to a full fiscal year basis in FY 1966. In addition, it would provide a small expansion in the program to process this literature for immediate use in the NASA technical programs. The global output of aerospace literature is increasing at an accelerated rate.

3. $200,000 for information systems development to increase the effectiveness of the NASA technical information program and to permit the most economical interchange of NASA computerized documentation output with those of Department of Defense, Atomic Energy Commission, and other government agencies.

4. $490,000 for preparation of manuscript material for specialized scientific and technical publications, handbooks, data compilations, and monographs on aerospace subjects such as radio propagation through re-entry systems, design of meteorological sounding rockets, stabilization standards for interplanetary probes, space probe instrumentation, satellite scientific instrumentation, and launch facilities.

The remaining 20 per cent, or $618,000, includes an increase of $170,000 for the International Graduate Fellowship program sponsored by foreign countries and administered by the National Academy of Sciences; $180,000 for services in connection with the processing, indexing, storage, and distribution of audio visual material including maintenance of control over receipt cataloging and storage of film; and $268,000 for various items such as, reliability and quality assurance studies of selected assessments of hardware design, security reinvestigation program, toxicity studies relating to the NASA-wide occupational medical program, and procurement programs, policies and procedures studies.

Of the total $19,875,000 requested for this object classification in FY 1966, about 94 per cent will be used for NASA-wide activities and 6 per cent for Headquarters Operations.

Supplies and Materials - $414,000

The estimate for FY 1966 for this category is $7,000 less than in FY 1965. Funds requested are for the purchase of expendable and non-expendable items such as: office supplies and materials, pamphlets and documents for the technical documentation and educational services programs, periodical subscriptions for the law and technical libraries, and photographic and drafting supplies.

Of the $414,000 about 6 per cent, or $23,000, is used for NASA-wide activities and 94 per cent, or $391,000 for Headquarters Operations.

Equipment - $243,000

The FY 1966 estimate reflects a reduction from FY 1965 requirements. The principal reason is the non-recurring item of $21,200,000 in FY 1965 for the purchase of ADP equipment ($20,587,000 for the Jet Propulsion Laboratory and $613,000 for NASA Headquarters). In addition, a reduction of $91,000 is estimated for the requirement for the purchase of miscellaneous office and other equipment.

The estimate of $243,000 for office and other equipment in FY 1966 includes $74,000 for the procurement of 10 replacements for existing spacemobiles and for the purchase of models and equipment needed in support of spacemobile lecturers. The balance of $169,000 is required for purchase of office furniture and equipment for Headquarters Operations.

Insurance Claims and Indemnities - $10,000

The FY 1966 requirement is estimated at the same level as for FY 1965. These funds are to cover payment of claims of $2,500 or less under the provisions of 28 U.S.C. 2672 for injury or loss of property, personal injury, or death caused by the negligent or wrongful act or omission of any employee of NASA while acting within the scope of the responsibility of his office or employment.

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1966 ESTIMATES

NORTH EASTERN OFFICE

MISSION AND CAPABILITIES:

The North Eastern Office was merged with the Electronics Research Center effective September 1, 1964. The fiscal year 1965 and 1966 requirements of this office are included with the estimates for the Electronics Research Center.

SUMMARY OF RESOURCES REQUIREMENTS:

	1964	1965	1966
Number of Positions, end of year.	33	---	---
Average Number of All Employees..	30	---	---
Administrative Operations.....	$379,000	---	---

INSTALLATION DESCRIPTION:

The North Eastern Office was located in Cambridge, Massachusetts.

ANALYSIS OF RESOURCES REQUIREMENTS BY OBJECT CLASSIFICATION:

	1964	1965	1966
11. Personnel Compensation.....	$280,000	---	---
12. Personnel Benefits.....	20,000	---	---
Total, personnel costs....	$300,000	---	---
21. Travel and Transportation of Persons.....	27,000	---	---
22. Transportation of Things....	1,000	---	---
23. Rents, Communications, and Utilities.....	28,000	---	---
24. Printing and Reproduction...	4,000	---	---
25. Other Services.....	3,000	---	---
Services of other agencies	3,000	---	---
26. Supplies and Materials.....	10,000	---	---
31. Equipment.....	3,000	---	---
Total.....	$379,000	---	---

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JUSTIFICATION BY OBJECT CLASSIFICATION:

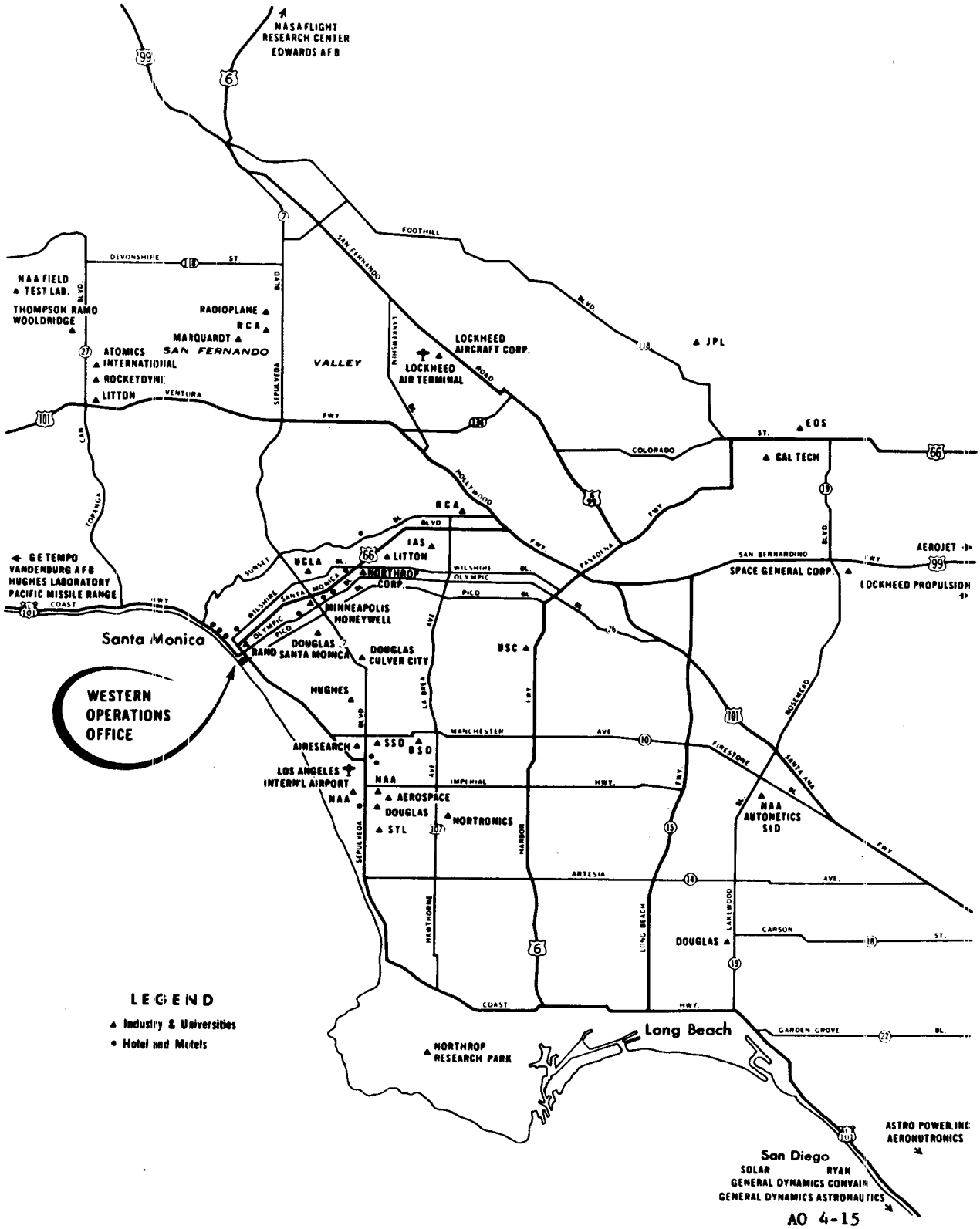
Personnel Distribution

Support personnel

	1964	1965	1966
Director and staff.....	2	---	---
NASA-wide support.....	30	---	---
Sub-total, support positions....	32	---	---
Total, permanent positions.....	32	---	---
Other positions:			
Positions under cooperative training agreements.....	--	---	---
Other temporary positions.....	1	---	---
Total, all positions.....	33	---	---

Personnel Costs

	1964	1965	1966
Total Positions.....	33	---	---
Permanent.....	32	---	---
Other.....	1		
Personnel Compensation:			
Annual cost of permanent positions	$305,000	---	---
Pay above the stated annual rate..	2,000	---	---
Lapses (deduct).....	-39,000	---	---
Net cost of permanent positions...	268,000	---	---
Other personnel compensation.....	12,000	---	---
Total compensation.....	280,000	---	---
NASA funded.....	280,000	---	---
Reimbursable.....	---	---	---
Personnel benefits.....	20,000	---	---
NASA funded.....	20,000	---	---
Reimbursable.....	---	---	---
Total personnel costs.....	300,000	---	---
NASA funded.....	300,000	---	---
Reimbursable.....	---	---	---
Average Number of All Employees (Man Years).....	30	---	---


NASA FLIGHT RESEARCH CENTER EDWARDS AFB
NAA FIELD TEST LAB.
THOMPSON RAMO WOOLDRIDGE
RADIOPLANE
RCA
MARQUARDT
ATOMICS INTERNATIONAL
ROCKETDYNE
LITTON
SAN FERNANDO VALLEY
LOCKHEED AIRCRAFT CORP.
LOCKHEED AIR TERMINAL
JPL
EOS
CAL TECH
RCA
IAS
LITTON
UCLA
NORTHROP CORP.
MINNEAPOLIS HONEYWELL
DOUGLAS SANTA MONICA
RAND
DOUGLAS CULVER CITY
USC
HUGHES
AIRESEARCH
SSD
BSD
LOS ANGELES INTERN'L AIRPORT
NAA
AEROSPACE
DOUGLAS
STL
NORTRONICS
NAA AUTONETICS SID
DOUGLAS
GE TEMPO
VANDENBURG AFB
HUGHES LABORATORY
PACIFIC MISSILE RANGE
Santa Monica
WESTERN OPERATIONS OFFICE
SPACE GENERAL CORP.
AEROJET
LOCKHEED PROPULSION
NORTHROP RESEARCH PARK
Long Beach
ASTRO POWER, INC.
AERONUTRONICS
San Diego
SOLAR
RYAN
GENERAL DYNAMICS CONVAIR
GENERAL DYNAMICS ASTRONAUTICS
LEGEND
Industry & Universities
Hotel and Motels

AO 4-15

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ORGANIZATION AND STAFFING CHART

WESTERN OPERATIONS OFFICE

STAFFING SUMMARY

	65	66
Excepted	3	3
GS-16	1	1
GS-15	15	15
GS-14	49	49
All other GS	333	333
Wage Board	-	-
Total Permanent	401	401
Temporary	5	5
Total	406	406

NASA RESIDENCY OFFICE - JPL

	65	66
GS-15	7	7
GS-14	6	6
All other GS	14	14
Total	27	27

DIRECTOR

	65	66
Excepted	2	2
Other GS	5	5
Total	7	7

PROFESSIONAL STAFFING

	65	66
Other GS	2	2
Total	2	2

NASA-O

	65	66
GS-15	2	2
GS-14	6	6
Other GS	129	129
Total	137	137

CONTRACT MANAGEMENT

	65	66
Excepted	1	1
GS-15	-	-
GS-14	6	6
Other GS	48	48
Total	55	55

TECHNICAL DIVISION

	65	66
GS-16	1	1
GS-15	4	4
GS-14	25	25
Other GS	52	52
Total	82	82

LEGAL DIVISION

	65	66
GS-15	2	2
GS-14	4	4
Other GS	4	4
Total	10	10

FINANCIAL MANAGEMENT DIVISION

	65	66
GS-14	1	1
Other GS	23	23
Total	24	24

EDUCATIONAL PROGRAMS

	65	66
GS-14	1	1
Other GS	3	3
Total	4	4

ADMINISTRATIVE SERVICES

	65	66
Other GS	38	38
Total	38	38

PUBLIC INFORMATION

	65	66
Other GS	6	6
Total	6	6

PERSONNEL DIVISION

	65	66
Other GS	9	9
Total	9	9

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ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1966 ESTIMATES

WESTERN OPERATIONS OFFICE

MISSION AND CAPABILITIES:

The primary mission of the Western Operations Office is to provide technical, contractual, and administrative support to NASA field centers and NASA Headquarters for programs and projects located in Southern California and other areas west of Denver. The Western Operations Office functions as a field service in such areas as procurement, technical and contract administration, legal and patent reviews, and personnel, administrative support, and financial management activities in the area west of Denver.

Technical management support as assigned by field centers and NASA project managers includes the technical management and administration of research and development and facilities contracts; monitoring of related quality assurance requirements; quality assurance surveys of industrial plants and organizations; monitoring of advanced technology contracts; negotiation of contracts; procurement of pressurants and propellants for NASA and contractor requirements; and the operation of a contract administration and quality assurance organization for the Apollo and Saturn projects at the North American Aviation, Inc., plant at Downey, California.

The mission of the Western Operations Office also includes administrative support and services for the NASA Resident Office at the Jet Propulsion Laboratory. The Resident Office, physically located at the Jet Propulsion Laboratory in Pasadena, California, has principal contract administration responsibilities for the NASA contract with the California Institute of Technology which operates the Jet Propulsion Laboratory.

SUMMARY OF RESOURCES REQUIREMENTS:

	1964	1965	1966
Number of Positions, end of year...	376	406	406
Average Number of All Employees....	336	390	405
Administrative Operations.....	$4,924,000	$5,989,000	$6,337,000

INSTALLATION DESCRIPTION:

The main Western Operations Office is located at 150 Pico Boulevard, Santa Monica, California. The Office occupies a group of leased buildings and no Government investment in buildings or acreage is involved at this location. In about two years, the main office will move to a new GSA Federal Office Building to be constructed in nearby West Los Angeles.

Over one-third of the Western Operations Office staff is located in Government-owned facilities at Downey, California, which are currently being utilized by the Space Information Systems Division of North American Aviation, Inc. The Government-owned portion of the North American Aviation Downey complex is located on 166 acres and the land and plant acquisition value is approximately $44 million as of June 30, 1964. The responsibility for management of property and facilities was transferred from the Air Force to NASA on July 1, 1964. A few additional Western Operations personnel are assigned to other contractor locations within the Los Angeles area where full time project support is required. The map on page AO 4-15 shows the location of the Western Operations Office in the Los Angeles area and the Downey Operations Office is identified therein as NAA Autonetics - SID.

ANALYSIS OF RESOURCES REQUIREMENTS BY OBJECT CLASSIFICATION:

		1964	1965	1966
11.	Personnel Compensation.....	$3,378,000	$4,155,000	$4,378,000
12.	Personnel Benefits.....	231,000	291,000	304,000
	Total, personnel costs....	$3,609,000	$4,446,000	$4,682,000
21.	Travel and Transportation of Persons.....	243,000	296,000	303,000
22.	Transportation of Things....	13,000	24,000	20,000
23.	Rents, Communications and Utilities.....	315,000	448,000	469,000
24.	Printing and Reproduction...	13,000	17,000	17,000
25.	Other Services.....	456,000	567,000	672,000
	Services of other agencies	173,000	50,000	38,000
26.	Supplies and Materials.....	51,000	65,000	65,000
31.	Equipment.....	51,000	76,000	71,000
32.	Lands and Structures.....	-	-	-
42.	Insurance Claims and Indemnities.....	-	-	-
	Total.....	$4,924,000	$5,989,000	$6,337,000

JUSTIFICATION BY OBJECT CLASSIFICATION:

Personnel Distribution

	1964	1965	1966
Direct Personnel by Program			
Manned Space Flight			
Gemini.....	1	1	1
Apollo.....	146	149	149
Advanced Manned Missions.....	4	4	4

	1964	1965	1966
Space Science and Applications			
Lunar and planetary exploration.....	8	19	19
Communication satellites.....	6	5	5
Launch vehicle development.....	3	4	4
Launch vehicle procurement.....	4	4	4
Meteorological satellites.....	13	15	15
Advanced Research and Technology			
Solar and chemical power.....	27	30	30
Chemical propulsion.....	5	5	5
Space vehicle systems.....	3	3	3
Technology Utilization.....	2	2	2
Sub-total, direct positions.....	222	241	241
Support Personnel			
Director and Staff.....	9	10	10
NASA-wide support.....	144	150	150
Sub-total, support positions.....	153	160	160
Total, permanent positions.....	375	401	401
Other positions:			
Positions under cooperative training agreements.....	-	-	-
Other temporary positions.....	1	5	5
Total, all positions.....	376	406	406

Personnel Costs

	1964	1965	1966
Total Positions.....	376	406	406
Permanent.....	375	401	401
Other.....	1	5	5

	1964	1965	1966
Personnel Compensation:			
Annual cost of permanent positions..	$3,551,000	$4,077,000	$4,078,000
Pay above the stated annual rate....	31,000	16,000	15,000
Lapses (deduct).....	-498,000	-231,000	-1,000
Net cost of permanent positions.....	3,084,000	3,862,000	4,092,000
Other personnel compensation.....	294,000	293,000	286,000
Total compensation.....	3,378,000	4,155,000	4,378,000
NASA funded.....	3,378,000	4,155,000	4,378,000
Reimbursable.....	---	---	---
Personnel benefits.....	231,000	291,000	304,000
NASA funded.....	231,000	291,000	304,000
Reimbursable.....	---	---	---
Total personnel costs.....	3,609,000	4,446,000	4,682,000
NASA funded.....	3,609,000	4,446,000	4,682,000
Reimbursable.....	---	---	---
Average Number of All Employees (Man Years).....	336	390	405

Personnel Compensation and Benefits - $4,682,000

Personnel costs in FY 1966 are estimated to be $236,000 higher than in FY 1965, of which $223,000 is for personnel compensation and $13,000 is for personnel benefits. The higher estimate primarily reflects full year employment in FY 1966 for personnel hired during the last half of FY 1965.

Travel and Transportation of Persons - $303,000

Employee travel requirements are estimated to increase $7,000 in FY 1966 due to a larger professional staff on-board at the end of FY 1965. The total estimate includes $256,000 for the travel of staff personnel. This amount is needed for program and administrative direction and coordination, for attendance at NASA technical meetings and working panels; and for costs of temporary assignments and transfers and travel to initial duty stations. The balance of $47,000 covers expenses of local transportation and toll charges and the rental of passenger motor vehicles from the General Services Administration.

Transportation of Things - $20,000

The FY 1966 estimate is projected $4,000 below the FY 1965 requirements primarily for movement of household goods for new employees and for local drayage costs.

The estimate of $20,000 consists of $14,000 for movement of household and personal effects; $4,000 for commercial shipments by land, water, and air; and $2,000 for local drayage and parcel post.

Rents, Communications and Utilities - $469,000

The estimate of $469,000 for this category is $21,000 higher than for FY 1965. The FY 1966 request includes $190,000 for the commercial lease of real estate and the term rental of equipment. This is the same funding level as the projected FY 1965 requirement. These rental costs cover the lease of 45,120 square feet of building space for $170,000 or an average annual cost of $3.75 a square foot. The balance of the estimate, amounting to $20,000, is needed for the rental of office and other types of equipment.

The cost of communications services is expected to increase $21,000 in FY 1966. The increase includes additional funding of $16,000 for the installation of more leased teletype circuits at the West Coast Communications Center required for effective communication with major project offices located in contractor plants. The remaining $5,000 of the increase is required for local telephone and exchange services. The major categories of communications services requirements are the following:

	FY 1966
Leased lines	$103,000
Long distance tolls	45,000
Local telephone and exchange	90,000
All other communications	30,000
Total	$268,000

The balance of the estimate for FY 1966 is related to the $11,000 required for utilities.

Printing and Reproduction - $17,000

Funding of FY 1966 requirements for the printing and reproduction of technical and administrative reports, publications and forms is expected to remain at the FY 1965 level. Approximately 90 per cent of the estimate, or $15,000, is for commercial printing of technical documents and related materials. The remaining $2,000 will cover printing of administrative and educational materials by other Government agencies.

Other Services - $672,000

The estimate for other services in FY 1966 reflects an increase of $105,000 over FY 1965 requirements, of which $50,000 is for supplementary technical support in evaluating advanced technological data required for accomplishment of mission operations, $42,000 is for enlarging the capacity of the reliable electrical connections school to meet the increasing demand

of aerospace contractors for certified instructors to train their production employees for compliance with more stringent quality assurance requirements. The balance of the increase, amounting to $13,000, will be used to finance the operation of the technical reference library on a full year basis and for various minor contractual services of a non-recurring nature.

The following table shows FY 1966 funding requirements by category of service:

ADP equipment operation	$50,000
Custodial services	19,000
Advanced technology support	50,000
JPL administrative aircraft lease and operation	247,000
Technical reference library	65,000
Reliable electrical connections school	210,000
Miscellaneous minor services	31,000
Total	$672,000

Services of Other Agencies - $38,000

Reimbursable services provided by other Government agencies are estimated to decrease $12,000 in FY 1966 to $33,000 as a result of a projected reduction in the requirement for contract administration services by the NASA resident office at the Jet Propulsion Laboratory. An additional $5,000 is required to support continuation of consulting engineering services to the resident office by the Army Corps of Engineers.

Supplies and Materials - $65,000

The FY 1966 requirement for supplies and materials is expected to remain at the FY 1965 level. $53,000 of the amount requested is for office use; the remaining $12,000 will be used for procurement of expendable electrical, photographic, maintenance and operating supplies. Purchase of non-expendable items will be necessary only for inventory replacement.

Equipment - $71,000

The amount of $71,000 requested is to provide for the purchase of passenger-carrying vehicles, photographic and non-capitalized equipment, and replacement of unserviceable office equipment and furniture. The FY 1966 requirements for these items is $5,000 less than in FY 1965.

U. S. GOVERNMENT PRINTING OFFICE : 1965 O - 761-934

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