National Aeronautics and Space Administration

BUDGET ESTIMATES

FISCAL YEAR 1964

Volume I

RESEARCH, DEVELOPMENT, AND OPERATION

SUMMARY TABLES AND INSTALLATION PRESENTATIONS

PERSONNEL COST ESTIMATES

OPERATION OF INSTALLATIONS ESTIMATES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

SUMMARY OF NEW OBLIGATIONAL AUTHORITY

	Fiscal Year 1962	Fiscal Year 1963	Fiscal Year 1964
SALARIES AND EXPENSES.....	$(206,750,000)	-	-
RESEARCH AND DEVELOPMENT..	(1,302,500,000)	-	-
RESEARCH, DEVELOPMENT, AND OPERATION.....	1,509,250,000	$2,897,878,000	$4,912,000,000
CONSTRUCTION OF FACILITIES	316,000,000	776,237,000	800,000,000
TOTAL APPROPRIATIONS....	$1,825,250,000 a/	$3,674,115,000	$5,712,000,000

a/Includes Supplemental Appropriation as follows:
$82,500,000 Research, Development, and Operation
$71,000,000 Construction of Facilities

NATIONAL AERONAUTICS AND SPACE AMINISTRATION

FISCAL YEAR 1964 ESTIMATES

APPROPRIATION SUMMARY

	Salaries and Expenses	Research and Development	Research, Development, and Operation	Construction of Facilities	Total
FISCAL YEAR 1962					
Independent Offices Appropriation Act, 1962 (75 Stat. 355).	($206,750,000)	($1,220,000,000)	$1,426,750,000	$245,000,000	$1,671,750,000
Supplemental Appropriation Act, 1962 (75 Stat. 742).....	(a/+9,340,000)	(a/ -9,340,000)	-	-	-
Second Supplemental Appropriation Act, 1962 (76 Stat. 212).	(-)	(82,500,000)	82,500,000	71,000,000	153,500,000
Total appropriations.....	($216,090,000)	($1,293,160,000)	$1,509,250,000	$316,000,000	$1,825,250,000
NASA Appropriation Transfers (75 Stat. 355).....	(-2,000,000)	(-7,752,000)	-9,752,000	+9,752,000	-
Transfer to General Services Administration (75 Stat. 353).....	(-319,845)	(-)	-319,845	-	-319,845
Appropriation (adjusted).....	($213,770,155)	($1,285,408,000)	$1,499,178,155	$325,752,000	$1,824,930,155

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FISCAL YEAR 1964 ESTIMATES

APPROPRIATION SUMMARY

	Salaries and Expenses	Research and Development	Research, Development, and Operation	Construction of Facilities	Total
FISCAL YEAR 1963					
Independent Offices Appropriation Act, 1963 (76 Stat. 730-1).....	-	-	$2,897,878,000	$776,237,000	$3,674,115,000
NASA Appropriation Transfers (76 Stat. 730-1).....	-	-	+38,812,000	-38,812,000	
Transfer to General Services Administration (76 Stat. 728).....	-	-	-801,615	-	-801,615
Appropriation (adjusted).....	-	-	$2,935,888,385	$737,425,000	$3,673,313,385
FISCAL YEAR 1964					
Appropriation request	-	-	$4,912,000,000	$800,000,000	$5,712,000,000

a/Transfer not to exceed $10 million from "Research and development" to "Salaries and expenses", authorized under this Act.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

SUMMARY OF RESEARCH, DEVELOPMENT, AND OPERATION PROGRAM
BY BUDGET ACTIVITY

	Fiscal Year 1962	Fiscal Year 1963	Fiscal Year 1964
1. MANNED SPACE FLIGHT:			
(a) Spacecraft Development and Operations.....	$ 193,192,000	$ 766,696,000	$1,647,441,000
(b) Launch Vehicle Development.....	468,048,155	852,808,717	1,319,454,000
(c) Supporting programs...	16,544,000	87,515,000	226,746,000
2. SPACE APPLICATIONS:			
(a) Meteorology.....	39,696,000	64,289,000	73,085,000
(b) Communications.....	35,591,000	49,049,000	55,771,000
(c) Other Applications....	950,000	4,763,000	7,703,000
3. UNMANNED INVESTIGATIONS IN SPACE:			
(a) Spacecraft Development and Operation.....	288,484,000	425,713,000	605,233,000
(b) Launch Vehicle Development.....	100,858,000	121,495,000	149,532,000
4. SPACE RESEARCH AND TECHNOLOGY:			
(a) Launch Vehicles and Spacecraft.....	88,356,000	148,708,000	195,080,000
(b) Propulsion and Space Power.....	105,624,000	193,781,000	268,783,000
5. AIRCRAFT TECHNOLOGY.....	28,773,000	43,990,000	45,126,000
6. SUPPORTING OPERATIONS:			
(a) Tracking and Data Acquisition.....	83,832,000	159,781,000	261,608,000
(b) Facility, Training and Research Grants..	13,547,000	31,666,000	56,438,000
TOTAL PLAN.....	$1,463,495,155	$2,950,254,717	$4,912,000,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

SUMMARY OF RESEARCH, DEVELOPMENT, AND OPERATION BUDGET PLAN

PROGRAMS	Fiscal Year 1962	Fiscal Year 1963	Fiscal Year 1964
OFFICE OF MANNED SPACE FLIGHT	$677,784,155	$1,707,019,717	$3,193,641,000
Manned Spacecraft Systems....	193,192,000	766,696,000	1,647,441,000
Launch Vehicle and Propulsion Systems.....	468,048,155	852,808,717	1,319,454,000
Aerospace Medicine.....	10,130,000	10,811,000	21,840,000
Integration and Checkout.....	1,745,000	41,834,000	157,378,000
Systems Engineering.....	4,669,000	34,870,000	47,528,000
OFFICE OF APPLICATIONS	76,237,000	118,101,000	136,559,000
Meteorological Satellites....	39,696,000	64,289,000	73,085,000
Communications Satellities...	35,591,000	49,049,000	55,771,000
Advanced Application Satellites.....	73,000	1,003,000	1,604,000
Industrial Applications.....	877,000	3,760,000	6,099,000
OFFICE OF SPACE SCIENCES	402,889,000	578,874,000	811,203,000
Geophysics and Astronomy.....	119,771,000	174,209,000	232,624,000
Lunar and Planetary Exploration.....	164,631,000	226,392,000	331,270,000
Bioscience.....	4,082,000	25,112,000	41,339,000
Launch Vehicle Development...	100,858,000	121,495,000	149,532,000
Facility, Training and Research Grants.....	13,547,000	31,666,000	56,438,000
OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY	222,753,000	386,479,000	508,989,000
Space Vehicle Systems.....	58,869,000	89,758,000	111,407,000
Electronic Systems.....	24,491,000	44,875,000	59,286,000
Human Factor Systems.....	4,996,000	14,075,000	24,387,000
Nuclear-Electric Systems.....	38,194,000	61,098,000	89,605,000
Nuclear Rockets.....	38,010,000	89,248,000	118,919,000
Chemical Propulsion.....	17,164,000	25,119,000	35,075,000
Space Power.....	12,256,000	18,316,000	25,184,000
Aeronautics.....	28,773,000	43,990,000	45,126,000
OFFICE OF TRACKING AND DATA ACQUISITION			
Tracking and Data Acquisition	83,832,000	159,781,000	261,608,000
Total Plan.....	$1,463,495,155	$2,950,254,717	$4,912,000,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

SUMMARY OF RESEARCH, DEVELOPMENT, AND OPERATION BUDGET PLAN

	Fiscal Year 1962	Fiscal Year 1963	Fiscal Year 1964
RECONCILIATION OF FINANCING TO PLAN			
"Research and development" appropriation (adjusted)...	$(1,285,408,000)	-	-
"Salaries and expenses" appropriation (adjusted)...	(213,770,155)	-	-
"Research, development, and operation" appropriation (adjusted).....	1,499,178,155	$2,935,888,385	$4,912,000,000
Unobligated balance brought forward available to finance new plans.....	9,631,332	14,366,332	-
Unobligated balance transferred to "Construction of facilities".....	-30,948,000	-	-
Unobligated balance carried forward available to finance subsequent year plans.....	-14,366,332	-	-
Total Financing.....	$1,463,495,155	$2,950,254,717	$4,912,000,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RESEARCH, DEVELOPMENT, AND OPERATION

FISCAL YEAR 1964 BUDGET ESTIMATES

	FISCAL YEAR 1962 ACTUAL				FISCAL YEAR 1963 ESTIMATE				FISCAL YEAR 1964 ESTIMATE			
	Research and Development Program	Personnel Costs	Operation of Installations	Total	Research and Development Program	Personnel Costs	Operation of Installations	Total	Research and Development Program	Personnel Costs	Operation of Installations	Total
OFFICE OF MANNED SPACE FLIGHT	$ 563,050,000	$ 64,415,000	$ 50,319,155	$ 677,784,155	$1,514,578,000	$ 109,926,000	$ 82,515,717	$ 1,707,019,717	$ 2,931,800,000	$ 139,112,000	$ 122,729,000	$ 3,193,641,000
Manned Spacecraft Systems	166,801,000	12,739,000	13,652,000	193,192,000	708,521,000	30,282,000	27,893,000	766,696,000	1,556,600,000	47,976,000	42,865,000	1,647,441,000
Launch Vehicle and Propulsion Systems	386,153,000	48,574,000	33,321,155	468,048,155	734,057,000	72,291,000	46,460,717	852,808,717	1,168,500,000	82,243,000	68,711,000	1,319,454,000
Aerospace Medicine	7,854,000	1,040,000	1,236,000	10,130,000	7,000,000	1,815,000	1,996,000	10,811,000	16,700,000	2,430,000	2,710,000	21,840,000
Integration and Checkout	1,250,000	216,000	279,000	1,745,000	38,500,000	1,405,000	1,929,000	41,834,000	153,000,000	1,703,000	2,675,000	157,378,000
Systems Engineering	992,000	1,846,000	1,831,000	4,669,000	26,500,000	4,133,000	4,237,000	34,870,000	37,000,000	4,760,000	5,768,000	47,528,000
OFFICE OF APPLICATIONS	67,838,000	3,905,000	4,494,000	76,237,000	104,200,000	6,695,000	7,206,000	118,101,000	119,300,000	8,242,000	9,017,000	136,559,000
Meteorological Satellites	34,433,000	2,406,000	2,857,000	39,696,000	57,315,000	3,291,000	3,683,000	64,289,000	63,700,000	4,537,000	4,848,000	73,085,000
Communication Satellites	33,105,000	1,179,000	1,307,000	35,591,000	43,715,000	2,644,000	2,690,000	49,049,000	51,100,000	2,293,000	2,378,000	55,771,000
Advanced Applications Satellites	-0-	32,000	41,000	73,000	800,000	85,000	118,000	1,003,000	1,000,000	232,000	372,000	1,604,000
Industrial Applications	300,000	288,000	289,000	877,000	2,370,000	675,000	715,000	3,760,000	3,500,000	1,180,000	1,419,000	6,099,000
OFFICE OF SPACE SCIENCES	361,229,000	20,929,000	20,731,000	402,889,000	525,279,000	28,023,000	25,572,000	578,874,000	737,900,000	38,586,000	34,717,000	811,203,000
Geophysics and Astronomy	97,775,000	10,091,000	11,905,000	119,771,000	144,500,000	14,566,000	15,143,000	174,209,000	194,400,000	19,033,000	19,191,000	232,624,000
Lunar and Planetary Exploration	161,784,000	1,446,000	1,401,000	164,631,000	221,179,000	2,830,000	2,383,000	226,392,000	322,600,000	4,757,000	3,913,000	331,270,000
Bioscience	3,048,000	519,000	515,000	4,082,000	21,000,000	2,486,000	1,626,000	25,112,000	35,200,000	3,628,000	2,511,000	41,339,000
Launch Vehicle Development	85,661,000	8,617,000	6,580,000	100,858,000	108,000,000	7,694,000	5,801,000	121,495,000	130,700,000	10,615,000	8,217,000	149,532,000
Facility, Training and Research Grants	12,961,000	256,000	330,000	13,547,000	30,600,000	447,000	619,000	31,666,000	55,000,000	553,000	885,000	56,438,000
OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY	91,592,000	78,584,000	52,577,000	222,753,000	235,450,000	101,017,000	50,012,000	386,479,000	331,200,000	118,307,000	59,482,000	508,989,000
Space Vehicle Systems	20,762,000	22,821,000	15,286,000	58,869,000	45,931,000	28,699,000	15,128,000	89,758,000	61,962,000	32,644,000	16,801,000	111,407,000
Electronic Systems	4,933,000	11,721,000	7,837,000	24,491,000	20,696,000	15,576,000	8,603,000	44,875,000	30,362,000	19,034,000	9,890,000	59,286,000
Human Factor Systems	2,404,000	1,546,000	1,046,000	4,996,000	10,060,000	2,480,000	1,535,000	14,075,000	18,200,000	3,635,000	2,552,000	24,387,000
Nuclear-Electric Systems	20,458,000	10,492,000	7,244,000	38,194,000	43,531,000	12,204,000	5,363,000	61,098,000	68,768,000	14,373,000	6,464,000	89,605,000
Nuclear Rockets	26,776,000	6,766,000	4,468,000	38,010,000	71,826,000	12,194,000	5,228,000	89,248,000	96,687,000	15,170,000	7,062,000	118,919,000
Chemical Propulsion	7,003,000	6,087,000	4,074,000	17,164,000	14,469,000	7,285,000	3,365,000	25,119,000	22,497,000	8,558,000	4,020,000	35,075,000
Space Power	6,302,000	3,512,000	2,442,000	12,256,000	10,859,000	5,111,000	2,346,000	18,316,000	16,524,000	5,934,000	2,726,000	25,184,000
Aeronautics	2,954,000	15,639,000	10,180,000	28,773,000	18,078,000	17,468,000	8,444,000	43,990,000	16,200,000	18,959,000	9,967,000	45,126,000
OFFICE OF TRACKING AND DATA ACQUISITION	67,302,000	7,678,000	8,852,000	83,832,000	135,842,000	11,994,000	11,945,000	159,781,000	231,500,000	15,221,000	14,887,000	261,608,000
Tracking and Data Acquisition	67,302,000	7,678,000	8,852,000	83,832,000	135,842,000	11,994,000	11,945,000	159,781,000	231,500,000	15,221,000	14,887,000	261,608,000
Total Plan	$1,151,011,000	$175,511,000	$136,973,155	$1,463,495,155	$2,515,349,000	$257,655,000	$177,250,717	$2,950,254,717	$4,351,700,000	$319,468,000	$240,832,000	$4,912,000,000

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NATIONAL AERONAUTICS SPACE ADMINISTRATION

RESEARCH, DEVELOPMENT, AND OPERATION

FISCAL YEAR 1964 BUDGET ESTIMATES

SUMMARY OF PERSONNEL AND PERSONNEL COSTS BY INSTALLATION

	Fiscal Year 1962		Fiscal Year 1963		Fiscal Year 1964	
	Permanent Positions	Cost	Permanent Positions	Cost	Permanent Positions	Cost
NASA Headquarters.....	1,360	$10,885,351	1,900	$20,208,000	2,300	$25,417,000
Ames Research Center.....	1,674	13,358,000	2,025	17,194,000	2,309	20,789,000
Flight Research Center.....	524	4,441,400	575	5,364,000	593	5,935,000
Goddard Space Flight Center.....	2,414	17,765,823	3,200	27,478,000	3,700	34,931,000
Langley Research Center.....	3,770	28,737,000	4,025	34,254,000	4,296	37,760,000
Launch Operations Center.....	333	2,998,965	800	5,533,000	1,200	11,088,000
Lewis Research Center.....	3,678	27,583,000	4,658	39,645,000	5,128	48,707,000
Manned Spacecraft Center.....	1,620	11,565,840	3,196	26,454,000	3,980	38,361,000
Marshall Space Flight Center....	6,194	54,051,836	7,062	73,599,000	7,492	81,739,000
North Eastern Office.....	---	---	30	220,000	40	453,000
Pacific Launch Operations Office	6	54,035	15	157,000	22	210,000
Space Nuclear Propulsion Office.	40	203,000	106	946,000	160	1,771,000
Wallops Station.....	407	2,930,750	465	3,569,000	530	4,360,000
Western Operations Office.....	136	936,000	440	2,779,000	500	5,222,000
Electronics Research Center.....	---	---	50	255,000	250	2,725,000
Total.....	22,156	$175,511,000	28,547	$257,655,000	32,500	$319,468,000
Reimbursable.....	(140)	862,691	(106)	1,000,000	(104)	999,000
Total.....	22,156	$176,373,691	28,547	$258,655,000	32,500	$320,467,000

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NATIONAL AERONAUTICS SPACE ADMINISTRATION

RESEARCH, DEVELOPMENT, AND OPERATION

FISCAL YEAR 1964 BUDGET ESTIMATES

SUMMARY OF COSTS FOR OPERATION OF INSTALLATIONS

	Fiscal Year 1962	Fiscal Year 1963	Fiscal Year 1964
NASA Headquarters	$14,040,442	$28,000,717	$40,077,000
Ames Research Center	9,113,000	8,400,000	10,500,000
Flight Research Center	2,792,600	2,173,000	4,450,000
Goddard Space Flight Center	20,534,539	27,410,000	32,995,000
Langley Research Center	17,857,000	16,460,000	16,255,000
Launch Operations Center	3,403,973	10,300,000	26,100,000
Lewis Research Center	17,725,000	14,000,000	17,050,000
Manned Spacecraft Center	12,271,160	23,700,000	32,900,000
Marshall Space Flight Center	34,576,858	39,500,000	50,590,000
North Eastern Office	---	133,000	190,000
Pacific Launch Operations Office	61,333	495,000	620,000
Space Nuclear Propulsion Office	72,000	221,000	505,000
Wallops Station	4,086,250	5,231,000	6,100,000
Western Operations Office	439,000	1,077,000	1,700,000
Electronics Research Center	---	150,000	800,000
Total	$136,973,155	$177,250,717	$240,832,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

NASA HEADQUARTERS

MISSION:

The mission of the Headquarters of the National Aeronautics and Space Administration is planning and providing executive direction for the programs established to implement the national objectives stated in the National Aeronautics and Space Act of 1958 (72 Stat. 426), as amended, which are:

(1) To conduct research into problems of flight within and outside the earth's atmosphere with a view to their practical solution;

(2) To develop, construct, test, and operate aeronautical and space vehicles for research purposes;

(3) To conduct such activities as may be required for the exploration of space;

(4) To arrange for participation by the scientific community in planning scientific measurements and observations to be made; and

(5) To provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.

The Headquarters is organized around broad program areas for which four program offices, supported by a technical staff office, are responsible to NASA General Management as follows:

The Office of Manned Space Flight is responsible for the planning, direction, and execution of all NASA activities directly involving manned space flight missions, including supporting development; the operational and logistic systems and aerospace medicine required for man to perform useful missions in space; and development of the large launch vehicles required by the space program.

The Office of Space Sciences is responsible for the development, direction, and execution of programs for the study of the environment and geophysical properties of the earth, moon and planets using scientific spacecraft and instrumentation; the cosmological origin and evolution of the universe; and the effects on human

life of solar and other high energy particles and fields. This includes responsibility for the development of the light and medium size launch vehicles necessary for NASA space programs. This office also manages NASA's facility, training and research grants program.

The Office of Advanced Research and Technology is responsible for the planning, direction, execution, and evaluation of all NASA advanced research and technological programs conducted primarily to demonstrate the feasibility of a concept, structure, component, or system that may have general application to NASA aeronautical or space objectives. Although mission-oriented research and technology is the responsibility of the other program offices, this office is responsible for maintaining an overall view of the total NASA program for research and technology.

The Office of Applications is responsible for the planning, direction, and execution of the NASA program for identifying and developing peaceful uses of space technology to the status of general applications. This includes concepts, techniques, devices and materials evolving from NASA space and aeronautical programs that may have direct commercial and industrial applicability; and the development, demonstration and operation of satellite systems which have commercial or general welfare potentialities, such as meteorological and communications satellites.

The Office of Tracking and Data Acquisition provides technical supporting services to the program offices, is responsible for the development and operation of tracking and data acquisition facilities, systems, equipment, and instrumentation necessary to acquire, record, process, reduce and transmit technical and scientific data and information from NASA flight missions.

The Administrator of NASA is assisted by several specialized staffs in carrying out his broad responsibilities in the areas of legal requirements; inventions and contributions; congressional, public, and international relations; long-range planning; and overall management. The Associate Administrator, as NASA general manager, is assisted in the planning, direction and coordination of the activities of the program offices and field installations by three Deputy Associate Administrators and technical and administrative supporting staffs in the Office of Programs and the Office of Administration.

LOCATION:

The location of NASA Headquarters is Washington, D. C.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	1,360	1,900	2,300
Personnel costs.....	$10,885,351	$20,208,000	$25,417,000
Operation of installation....	14,040,442	28,000,717	40,077,000
Total installation costs.	$24,925,793	$48,208,717	$65,494,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART:
NASA HEADQUARTERS

SUMMARY

	62	63	64
Headquarters:			
Excepted	137	178	178
GS-15	204	342	379
GS-14	164	292	377
Other GS	824	1028	1269
WB Personnel	17	18	21
Total	1346	1858	2224
Field:			
GS-15	-	5	7
GS-14	2	8	18
Other GS	12	29	51
Total	14	42	76

ADMINISTRATOR

	62	63	64
Excepted	3	2	2
GS 15	--	1	2
Other GS	3	5	5
WB Personnel	1	1	1
Total	7	9	10

EXECUTIVE OFFICER

	62	63	64
Excepted	3	1	1
GS 15	1	2	3
GS 14	3	4	4
Other GS	9	16	19
Total	16	23	27

LEGISLATIVE AFFAIRS

	62	63	64
Excepted	1	1	1
GS 15	2	3	3
GS 14	1	3	3
Other GS	11	20	20
WB Personnel	1	1	1
Total	16	28	28

PUBLIC AFFAIRS

	62	63	64
Excepted	2	2	2
GS 15	--	3	3
GS 14	3	3	3
Other GS	4	7	8
Total	9	15	16

INVENTIONS AND CONTRIBUTIONS BOARD

	62	63	64
GS 15	1	1	1
GS 14	1	1	1
Other GS	3	6	7
Total	5	8	9

GENERAL COUNSEL

	62	63	64
Excepted	5	5	5
GS 15	5	7	8
GS 14	7	6	8
Other GS	21	25	26
Total	38	43	47

MANAGEMENT DEVELOPMENT

	62	63	64
Excepted	1	1	1
GS 14	--	1	2
Other GS	1	2	2
Total	2	4	5

PLANS AND PROGRAM EVALUATION

	62	63	64
Excepted	5	5	5
GS-15	3	5	5
GS-14	1	1	2
Other GS	6	5	4
Total	15	16	16

INTERNATIONAL PROGRAMS

	62	63	64
Excepted	2	2	2
GS 15	2	2	3
GS 14	--	1	1
Other GS	13	18	19
Total	17	23	25

PUBLIC SERVICES AND INFORMATION

	62	63	64
Excepted	1	1	1
GS 15	3	3	3
GS 14	1	3	4
Other GS	18	21	21
Total	23	28	29

EDUCATIONAL PROGRAMS AND SERVICES

	62	63	64
Excepted	1	1	1
GS 15	8	13	13
GS 14	10	12	15
Other GS	35	46	71
Total	54	72	100

SCIENTIFIC AND TECHNICAL INFORMATION

	62	63	64
Excepted	1	1	1
GS 15	5	5	5
GS 14	2	4	4
Other GS	39	46	65
Total	47	56	75

ASSOCIATE ADMINISTRATOR

	62	63	64
Excepted	2	3	3
GS 15	--	2	2
GS 14	2	4	4
Other GS	5	7	7
Total	9	16	16

PROGRAMS

	62	63	64
Excepted	9	11	11
GS 15	15	17	17
GS 14	11	12	13
Other GS	36	57	59
Total	71	97	100

TRACKING AND DATA ACQUISITION

	62	63	64
Excepted	5	7	7
GS 15	10	12	12
GS 14	8	10	12
Other GS	11	18	29
Total	34	47	60

ADMINISTRATION

	62	63	64
Headquarters:			
Excepted	11	15	15
GS-15	32	40	49
GS-14	34	52	69
Other GS	326	365	391
WB Personnel	15	16	19
Total	418	488	543
Field: *			
GS-15	-	5	7
GS-14	2	8	18
Other GS	12	29	51
Total	14	42	76

SPACE SCIENCES

	62	63	64
Excepted	24	29	29
GS-15	23	26	27
GS-14	15	36	43
Other GS	78	99	139
Total	140	190	238

ADVANCED RESEARCH AND TECHNOLOGY

	62	63	64
Excepted	24	32	32
GS 15	43	52	62
GS 14	15	23	34
Other GS	59	83	97
Total	141	190	225

APPLICATIONS

	62	63	64
Excepted	6	9	9
GS-15	7	15	25
GS-14	6	10	12
Other GS	15	21	29
Total	34	55	75

MANNED SPACE FLIGHT

	62	63	64
Excepted	31	50	50
GS 15	44	133	136
GS 14	44	106	143
Other GS	131	161	251
Total	250	450	580

* Field complement indicates positions for audit, contract administration, personnel recruitment, and inspection activities for personnel physically located outside of Washington but who are responsible directly to Headquarters.

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RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

D = Direct
S = Support
T = Total

	Number of Personnel								
	1962			1963			1964		
	D	S	T	D	S	T	D	S	T
MANNED SPACECRAFT SYSTEMS	70	89	159	143	145	288	203	197	400
LAUNCH VEHICLE AND PROPULSION SYSTEMS	81	103	184	117	121	238	140	134	274
AEROSPACE MEDICINE	32	40	72	35	36	71	39	37	76
INTEGRATION AND CHECKOUT	12	15	27	64	66	130	76	74	150
SYSTEMS ENGINEERING	55	70	125	97	100	197	117	113	230
METEOROLOGICAL SATELLITES	12	15	27	16	16	32	19	19	38
COMMUNICATIONS SATELLITES	12	15	27	16	16	32	19	19	38
ADVANCED APPLICATIONS SATELLITES	2	2	4	4	4	8	11	10	21
INDUSTRIAL APPLICATIONS	8	11	19	19	20	39	32	30	62
GEOPHYSICS AND ASTRONOMY	45	58	103	59	60	119	69	67	136
LUNAR AND PLANETARY EXPLORATION	37	46	83	50	51	101	58	55	113
BIOSCIENCE	14	18	32	19	21	40	24	23	47
LAUNCH VEHICLE DEVELOPMENT	30	39	69	41	42	83	49	47	96
FACILITY, TRAINING AND RESEARCH GRANTS	14	18	32	21	21	42	25	25	50
SPACE VEHICLE SYSTEMS	31	39	70	40	41	81	53	51	104
ELECTRONIC SYSTEMS	24	31	55	30	31	61	32	30	62
HUMAN FACTOR SYSTEMS	1	2	3	15	15	30	29	28	57
NUCLEAR-ELECTRIC SYSTEMS	28	36	64	31	32	63	36	34	70
NUCLEAR ROCKETS	12	15	27	13	13	26	13	13	26
CHEMICAL PROPULSION	16	19	35	24	25	49	29	28	57
SPACE POWER	11	14	25	12	12	24	14	14	28
AERONAUTICS	18	23	41	25	26	51	24	23	47
TRACKING AND DATA ACQUISITION	34	43	77	47	48	95	60	58	118

Headquarters personnel have been distributed from the program level shown above to projects on a pro-rata basis. Detailed information on programs and projects may be found by consulting the Index to Volume II, Research, Development, and Operation.

The estimates for the fiscal year 1964 for headquarters offices proposes a year-end permanent staffing level of 2,300 positions, an increase of 400 over the current fiscal year. The additional positions are needed to support the proposed expansion of NASA programs and will be used primarily to strengthen the various program offices. The increased number of positions requested for NASA Headquarters in support of research, development and construction programs is summarized as follows:

Program planning, direction, coordination and related scientific and technical support.....	311
Other technical and administrative support:	
To strengthen Washington staff.....	55
To strengthen field complement positions for audit, contract administration and inspection activities for personnel physically located outside Washington but who are responsible directly to Headquarters.....	34
Total.....	400

Office of Manned Space Flight

Additional positions are required principally for the effective management, coordination, and control of the technical content, resources, and schedules of such programs and projects as the Saturn B and Advanced Saturn launch vehicles; Gemini and Apollo spacecraft and operations; Apollo systems development, mission analysis, integration, checkout and reliability assessment, life support systems; and launch and test facilities construction.

A sizeable portion of the increase relates to the systems areas - manned spacecraft, launch vehicles and propulsion, systems engineering, and integration and checkout. Also, staff working in the Apollo spacecraft development area is not able to cover adequately the technical evaluation of all of the spacecraft systems for the command and service modules and the lunar excursion module. The guidance and navigation system being developed for the command and service modules and the lunar excursion module have already entered the hardware phase for some elements. This activity will increase sharply in the remainder of fiscal year 1963 and during fiscal year 1964.

In the operations area, considerable attention must now be devoted to the coordination of the ground operational support systems with Atlantic Missile Range launch activities, the worldwide tracking network and the spacecraft communications systems. The operations area also includes timely provision of the integrated Mission Control Center, the nerve center of the Gemini rendezvous missions and all the Apollo missions, and extensive astronaut training facilities and mission simulators.

During fiscal year 1964, the continuing Saturn and Saturn B effort will be accompanied by a rapid acceleration of the pace of effort on Advanced Saturn hardware and facilities development.

The Aerospace Medicine program planning provides for the development and monitoring of the life support effort required to obtain the biomedical knowledge and equipment needed to accomplish successful manned space flight. Part of the increase requested for fiscal year 1964 will be needed as a consequence of the requirement for a timely analysis of final data from project Mercury and the One-day mission, the need to meet the schedules established for projects Gemini and Apollo, and to cope with the complex problems of the first multi-manned flights.

The Integration and Checkout area concerns the development of overall integration analysis, reliability assessment and checkout guidelines and procedures for the NASA Centers and their contractors, and monitoring of efforts in these activities for all systems essential to project Apollo. It includes direct technical supervision of a support contractor engaged in information collection, compilation, and distribution; in preparation of documentation necessary to implement guidelines and procedures; and in the development of checkout equipment.

Systems Engineering responsibilities extend over all manned space flight activities, and are concerned with technical planning, studies of alternative approaches, and development planning before, and accompanying, actual systems development. Also included are the development of mission objectives, overall systems specifications, overall test planning, analysis and review of alternatives on which major mission and system design decisions are based.

Office of Applications

Additional personnel are required for meteorological and communications satellite systems management in order to meet the increased workload related to operational satellites. These personnel will perform analysis and evaluation of advanced systems, undertake systems design studies, and monitor active projects. Particular emphasis will be given to insuring that NASA plans for participation in international programs for the utilization and regulation of communications satellites are properly formulated.

The industrial applications program was initiated during the fiscal year 1963 for the major purpose of making available to the general economy of the United States the beneficial innovations arising from space research, techniques, materials, and devices. The additional personnel involved will assure the identification and dissemination of these benefits arising from NASA's in-house and contractual efforts.

Additional personnel are needed for the relatively new advanced applications satellites area, which is concerned with applications of space science and technology to new fields of effort, including new applications of satellite technology.

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Office of Space Sciences

The geophysics and astronomy program activity is divided into two major organizational components -- the scientific program offices and the flight program offices. In the scientific program offices, it is proposed to strengthen the astronomy and solar physics, chemistry, and the physics area. For the flight program offices, it is proposed to strengthen management of astronomical observations, solar observations, geophysical observatories and explorers, monitors and sounding rockets.

Increases are proposed for the Office of Lunar and Planetary Programs in connection with the Mariner and Ranger programs, fields and particles and planetary atmospheres experiments and advanced programs.

Several additional positions are proposed for the bioscience program for the conduct of biological explorations of the moon and other planets, including life detection and environmental factor analysis equipment planned for the Mariner, Surveyor, or other spacecraft. For the Office of Grants and Research Contracts, it is proposed to strengthen the staff in connection with the increased workload directly related to the expansion of NASA programs. In connection with the launch vehicles and propulsion programs, several additional personnel are required in connection with the Centaur system integration and launch operations, advanced project programs in connection with studies and systems analysis, and launch operations coordination and engineering.

Office of Advanced Research and Technology

Personnel increases are proposed for the areas of new program responsibility, such as biological sciences, and for the expansion and acceleration of program activity in the areas of advanced space vehicles, nuclear and electric propulsion systems, and chemical and space power propulsion systems. Additional emphasis will also be given to requirements for maintaining scheduled launch dates for certain projects which are rapidly approaching flight readiness. The Office of Advanced Research and Technology is constantly faced with the unique problem of directing program activities at every NASA field center, which requires additional personnel to control, coordinate, and review all program functions to assure the effective use of funds and to avoid costly duplication of effort.

Office of Tracking and Data Acquisition

As a result of increased activities in program support, advanced systems, network operations and facilities, personnel increases are proposed for this office during fiscal year 1964. The Office of Tracking and Data Acquisition has assumed increased responsibilities with regard to supervision of program activity at a number of additional field centers: Manned Spacecraft Center, Launch Operations Center, and Flight Research Center, in addition to supervising work at the Jet Propulsion Laboratory, Goddard Space Flight Center, and Wallops Station. The office has also assumed the planning and imple-

mentation of the Apollo network, which will be far greater than the Mercury network in scope. The Office must, in addition, give increased attention to data processing and computing on planning procedures required for overall program coordination. Under the advanced systems program, the Office is also responsible for direction of the supporting research effort in the tracking and data acquisition area at seven centers.

Staff Offices

A few additional positions are required to strengthen or round out staff functions and supporting technical and administrative activities. These include strengthening of: (1) scientific and technical information programs, educational programs and services; (2) several administrative activities principally in the area of contract administration, auditing, and inspection services primarily at field locations; (3) centralized administrative support services to NASA Headquarters; and (4) financial management activities which include the establishment of a comprehensive program for the development of an integrated financial management and reporting system for agency-wide application.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

AMES RESEARCH CENTER

MISSION:

The mission of the Ames Research Center includes both research and project management. The research effort is directed at studies leading to an understanding of a wide range of phenomena in the physical sciences, the space sciences, and the life sciences. In project management, the Center has the responsibility for the Pioneer project, aimed at providing scientific observations of phenomena in interplanetary space with an unmanned spacecraft, and the Biosatellite, which will explore the biological effects of the space environment on earth organisms.

Research in the physical sciences includes studies in entry and environmental physics, guidance and control systems, and aeronautics. The work in entry and environmental physics includes basic studies of the physics of high-temperature gases; the stability, control and performance of a wide range of spacecraft configurations; and of materials and structures for spacecraft. In the area of gas physics, particular emphasis is placed on problems associated with flight into earth and other planetary atmospheres. This effort has aided the design of the Mercury, Gemini, and Apollo spacecraft, the design of Mars entry vehicles, and the design of ballistic missiles. The work in guidance and control systems is broad in nature and is applicable to manned and unmanned spacecraft, as well as aircraft. Current emphasis in guidance systems is directed mainly at manned vehicles and in particular Apollo and follow-on manned missions. This includes an intensive effort in the area of mid-course navigation and terminal guidance with a smaller effort directed at studies involving lunar approach, lunar landing, and rendezvous. The research in control systems is directed at examining various techniques applicable to satellite attitude stabilization and techniques applicable to vertical and short take-off (V/STOL) aircraft, the supersonic transport, and the Apollo spacecraft. The research program in aeronautics is directed at studies of the problems associated with hypersonic research aircraft, supersonic aircraft with particular emphasis on the supersonic transport, and a wide variety of V/STOL vehicles. This includes wind-tunnel studies of piloting problems with numerous fixed-based, moving base, and flight simulators.

Research in the space sciences includes studies in the fields of solar physics, planetary environments, and geophysics. This includes both ground-based experiments and experiments requiring specialized instruments aboard satellites and space probes. The work covers studies pertaining to magnetic fields and plasmas in space, studies to determine the composition and structure of planetary atmospheres, and studies in astrophysical magnetohydrodynamics.

Research in the life sciences includes three major areas: basic research in the physiological and behavioral sciences concerned with obtaining a basic understanding of the effects of terrestrial and extraterrestrial environments and of space flight stresses upon living organisms; studies in exobiology oriented towards the prediction, detection and study of extraterrestrial life forms; and research in the human factors aspects of the relationships between man and the machines which will transport him into space and support him during lunar and planetary exploration.

The Center has many facilities for simulating both atmospheric and space flight from the very lowest speeds up to and above escape speeds. These range from conventional wind tunnels to ballistic and light gas guns. Specialized facilities are used for study of man-machine integration and bioscience programs. Laboratory work is supplemented by flight operations and by experiments launched into space from the various NASA launch areas. The staff includes technical experts in the fields of aerodynamics, fluid and flight mechanics, materials and structures, space sciences, measurement and control, data systems, thermodynamics and electronics.

LOCATION:

The Ames Research Center is located at Moffett Field, California, approximately 35 miles southeast of San Francisco, 15 miles northwest of San Jose and 2 miles northeast of Mountain View.

LAND:

Ames occupies 115 acres, all of which is owned by NASA, within the boundaries of Moffett Field Naval Air Station. Certain facilities, such as the runways and sewage disposal, are used jointly by NASA and the Navy.

PLANT VALUE:

The plant value as of June 30, 1962 was $130,849,000. This is based upon actual cost or value at the time of acquisition and does not represent current replacement value today.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	1,674	2,025	2,309
Personnel costs.....	$13,358,000	$17,194,000	$20,789,000
Operation of installation....	9,113,000	8,400,000	10,500,000
Subtotal	$22,471,000	$25,594,000	$31,289,000

	1962	1963	1964
Construction program.....	$6,564,000	$14,200,000	$13,076,000
Total installation costs..	$29,035,000	$39,794,000	$44,365,000

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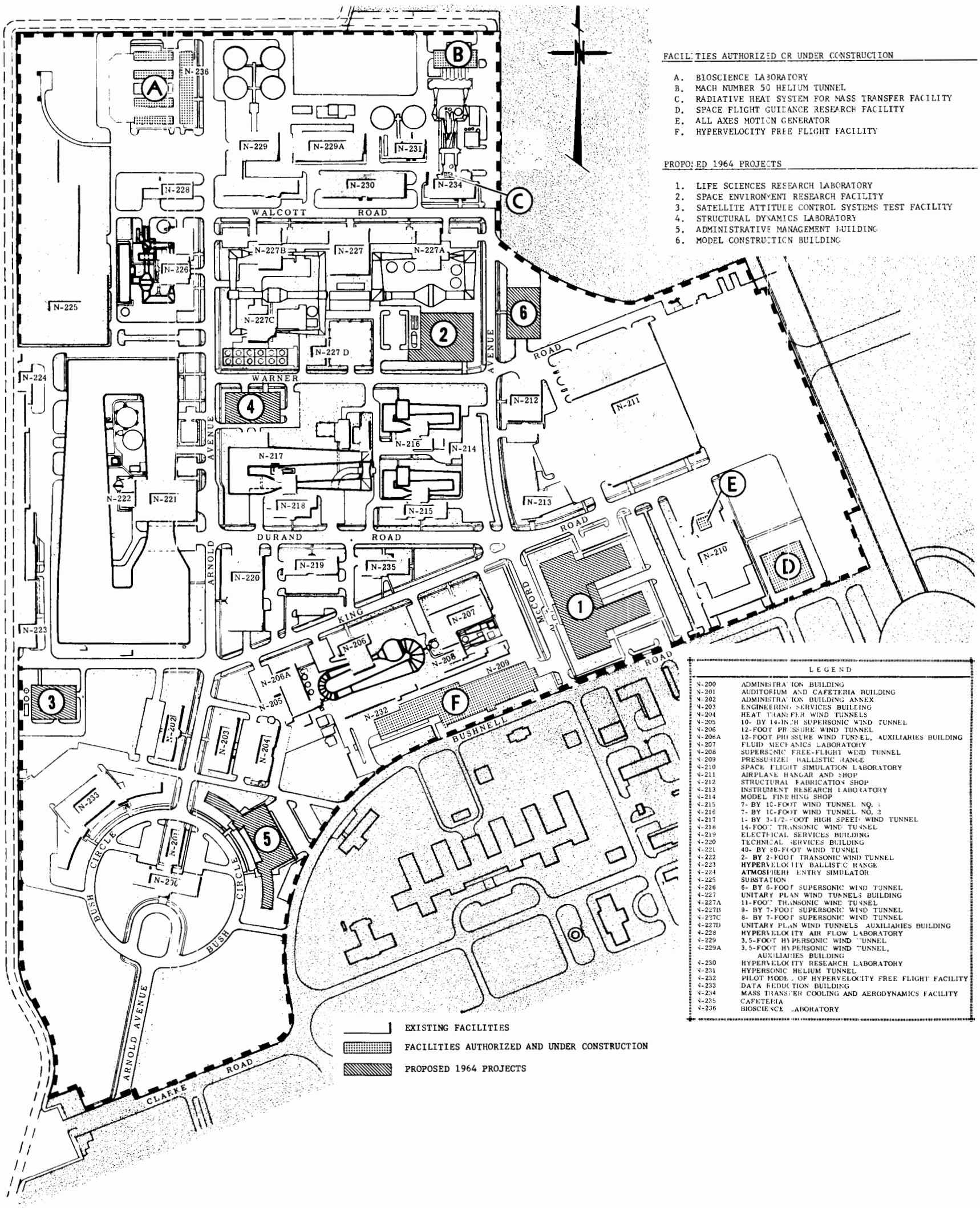
AMES RESEARCH CENTER
FISCAL YEAR 1964 ESTIMATES

LOCATION PLAN



LEGEND

N-200	ADMINISTRATION BUILDING
N-201	AUDITORIUM AND CAFETERIA BUILDING
N-202	ADMINISTRATION BUILDING ANNEX
N-203	ENGINEERING SERVICES BUILDING
N-204	HEAT TRANSFER WIND TUNNELS
N-205	10- BY 14-INCH SUPERSONIC WIND TUNNEL
N-206	12-FOOT PRESSURE WIND TUNNEL
N-206A	12-FOOT PRESSURE WIND TUNNEL, AUXILIARIES BUILDING
N-207	FLUID MECHANICS LABORATORY
N-208	SUPERSONIC FREE-FLIGHT WIND TUNNEL
N-209	PRESSURIZED BALLISTIC RANGE
N-210	SPACE FLIGHT SIMULATION LABORATORY
N-211	AIRPLANE HANGAR AND SHOP
N-212	STRUCTURAL FABRICATION SHOP
N-213	INSTRUMENT RESEARCH LABORATORY
N-214	MODEL FINISHING SHOP
N-215	7- BY 10-FOOT WIND TUNNEL NO. 1
N-216	7- BY 10-FOOT WIND TUNNEL NO. 2
N-217	1- BY 3-1/2-FOOT HIGH SPEED WIND TUNNEL
N-218	14-FOOT TRANSONIC WIND TUNNEL
N-219	ELECTRICAL SERVICES BUILDING
N-220	TECHNICAL SERVICES BUILDING
N-221	40- BY 80-FOOT WIND TUNNEL
N-222	2- BY 2-FOOT TRANSONIC WIND TUNNEL
N-223	HYPERVELOCITY BALLISTIC RANGE
N-224	ATMOSPHERE ENTRY SIMULATOR
N-225	SUBSTATION
N-226	6- BY 6-FOOT SUPERSONIC WIND TUNNEL
N-227	UNITARY PLAN WIND TUNNELS BUILDING
N-227A	11-FOOT TRANSONIC WIND TUNNEL
N-227B	9- BY 7-FOOT SUPERSONIC WIND TUNNEL
N-227C	8- BY 7-FOOT SUPERSONIC WIND TUNNEL
N-227D	UNITARY PLAN WIND TUNNELS AUXILIARIES BUILDING
N-228	HYPERVELOCITY AIR FLOW LABORATORY
N-229	3.5-FOOT HYPERSONIC WIND TUNNEL
N-229A	3.5-FOOT HYPERSONIC WIND TUNNEL, AUXILIARIES BUILDING
N-230	HYPERVELOCITY RESEARCH LABORATORY
N-231	HYPERSONIC HELIUM TUNNEL
N-232	PILOT MODEL OF HYPERVELOCITY FREE FLIGHT FACILITY
N-233	DATA REDUCTION BUILDING
N-234	MASS TRANSFER COOLING AND AERODYNAMICS FACILITY
N-235	CAFETERIA
N-236	BIOSCIENCE LABORATORY

AMES RESEARCH CENTER
Moffett Field, California

AERIAL VIEW

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART:
AMES RESEARCH CENTER

STAFFING SUMMARY

	1962	1963	1964
Excepted	27	30	30
GS-15	78	85	91
GS-14	94	100	100
Other GS	797	1032	1226
WB	678	798	862
Total	1674	2025	2309

DIRECTOR

	1962	1963	1964
Excepted	3	3	3
GS-15	2	2	3
Other GS	5	5	5
Total	10	10	11

BUDGET OFFICE

	1962	1963	1964
GS-15	1	1	2
GS-14	1	1	2
Other GS	1	1	1
Total	3	3	5

PUBLIC INFORMATION OFFICE

	1962	1963	1964
GS-14	1	1	1
Other GS	2	3	3
Total	3	4	4

APPLICATIONS OFFICE

	1962	1963	1964
GS-15	-	1	1
Other GS	-	2	3
Total	-	3	4

ASSISTANT DIRECTOR

	1962	1963	1964
Excepted	1	1	1
GS-15	1	2	3
Other GS	1	1	1
Total	3	4	5

ASSISTANT DIRECTOR

	1962	1963	1964
Excepted	1	1	1
GS-15	2	2	3
Other GS	1	1	1
Total	4	4	5

ASSISTANT DIRECTOR
LIFE SCIENCES

	1962	1963	1964
Excepted	2	2	2
GS-15	1	1	1
GS-14	1	1	1
Other GS	8	15	26
WB	2	5	8
Total	14	24	38

ASSISTANT DIRECTOR
ADMINISTRATIVE SERVICES

	1962	1963	1964
Excepted	1	1	1
GS-15	-	1	1
GS-14	-	1	1
Other GS	1	3	3
Total	2	6	6

VEHICLE-ENVIRONMENT DIVISION

	1962	1963	1964
Excepted	2	2	2
GS-15	13	13	13
GS-14	16	16	15
Other GS	95	98	99
WB	43	50	51
Total	169	179	180

AERO-THERMODYNAMICS DIVISION

	1962	1963	1964
Excepted	7	7	7
GS-15	16	17	16
GS-14	18	16	17
Other GS	130	140	141
WB	47	54	60
Total	218	234	241

SPACE SCIENCE DIVISION

	1962	1963	1964
Excepted	-	1	1
GS-15	-	1	1
GS-14	-	4	4
Other GS	-	47	70
WB	-	--	5
Total	-	53	81

FULL-SCALE & SYSTEMS RESEARCH DIVISION

	1962	1963	1964
Excepted	2	2	2
GS-15	17	17	17
GS-14	20	21	20
Other GS	94	103	105
WB	20	21	24
Total	153	164	168

UNITARY DIVISION

	1962	1963	1964
Excepted	1	1	1
GS-15	7	7	7
GS-14	7	7	7
Other GS	59	68	65
WB	40	42	42
Total	114	125	122

INSTRUMENTATION DIVISION

	1962	1963	1964
Excepted	2	2	2
GS-15	4	5	5
GS-14	6	6	6
Other GS	111	135	137
WB	115	132	137
Total	238	280	287

EXOBIOLOGY DIVISION

	1962	1963	1964
Excepted	1	1	1
GS-15	2	2	3
GS-14	3	3	3
Other GS	7	18	42
Total	13	24	49

ENVIRONMENTAL BIOLOGY DIVISION

	1962	1963	1964
Excepted	1	3	3
GS-15	-	1	3
GS-14	3	5	5
Other GS	14	46	86
Total	18	57	97

BIOTECHNOLOGY DIVISION

	1962	1963	1964
Excepted	2	2	2
GS-15	4	4	4
GS-14	4	4	4
Other GS	14	29	62
Total	24	39	72

ADMINISTRATIVE SERVICE DIVISION

	1962	1963	1964
Other GS	37	49	55
WB	7	8	10
Total	44	57	65

FISCAL DIVISION

	1962	1963	1964
GS-14	1	1	1
Other GS	49	64	72
Total	50	65	73

PERSONNEL DIVISION

	1962	1963	1964
GS-14	1	1	1
Other GS	37	46	52
Total	38	47	53

PROCUREMENT AND SUPPLY DIVISION

	1962	1963	1964
GS-15	1	1	1
GS-14	1	1	1
Other GS	36	56	63
WB	19	21	24
Total	57	79	89

TECHNICAL SERVICES DIVISION

	1962	1963	1964
GS-15	2	2	2
GS-14	1	1	1
Other GS	2	2	3
WB	325	358	427
Total	330	363	433

RESEARCH FACILITIES & EQUIPMENT DIVISION

	1962	1963	1964
Excepted	1	1	1
GS-15	5	5	5
GS-14	9	9	9
Other GS	94	119	132
WB	60	67	74
Total	169	201	221

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RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
INDUSTRIAL APPLICATIONS	Direct	-	3	4

The Office of Applications is the focal point at Ames for all Center contributions to the Industrial Applications program. The staff has identified some 40 potential innovations from a backlog expected to exceed 100. Examples of innovations already documented in detail and being disseminated are "A Method for Making Thin-wall Metal Castings," "An Ultrasonic Electroforming Process," "A Silent-Chain Friction Drive," "A Biomedical Amplifier," and several new types of pressure transducers. Examples of innovations to receive early attention are several new miniaturized types of medical apparatus, reflective metals and coatings, and several innovations in the field of electric arc technology expected to have wide application in the chemical, petroleum, and other processing industries. The Center is assisting several research institutes under contract to NASA in the documentation and evaluation of specific innovations, preparatory to disseminating the information to industry. In addition to the identification and documentation functions, this Office arranges and participates in discussions between research staff members and industrial representatives interested in applying new technology being generated in the space program.

GEOPHYSICS AND ASTRONOMY

Supporting research and technology	Direct	-	15	32
	Support	-	9	18
	Total	-	24	50

The Center's work in this area includes studies on the development of improved plasma probes for use on future satellites and space probes, development of instrumentation techniques capable of producing solar magnetograms with high time resolution, theoretical studies in ionospheric and radio physics, ground-based studies of solar magnetic fields, and studies directed at the support of improved astronomy from earth-orbiting satellites.

Sounding rockets	Direct	-	4	-
	Support	-	2	-
	Total	-	6	-

The use of sounding rockets is planned to study planetary atmospheres and to determine the distribution of molecular hydrogen in interstellar space.

		Number of Personnel		
		1962	1963	1964
LUNAR AND PLANETARY EXPLORATION				
Supporting research and technology	Direct	-	33	68
	Support	-	21	28
	Total	-	54	96

The Center's work covers study of problems due to cold welding associated with capsule separation after exposure to the space environment, the use of entry capsule motion and heating data to determine atmospheric structure and gas properties of planetary atmospheres, and the study of the chemical physics of the formation of chemical complexes, free radicals, and their molecular constitution in interplanetary space, on comets and the planets. The design and construction of a very low frequency radiometer, the development and construction of a micrometeoroid detector for use in sounding rocket investigations of micrometeoroids of lunar origin, and the improvement of sensors for measuring planetary and interplanetary magnetic fields have been initiated. Theoretical studies of models of the interiors of the outer planets, investigation of impact and erosion processes in rock and mineral dusts resulting from microparticle impact, and study of the physical and photometric properties of rock fragments and mineral dusts in a high vacuum environment are encompassed within this project. Studies are also being undertaken to provide preliminary design of a future solar probe which will allow monitoring of particle flux and field characteristics initiated by the sun.

Ranger	Direct	-	1	-
	Support	-	1	-
	Total	-	2	-

This effort covered the development of a proton analyzer experiment for Ranger.

Mariner	Direct	-	2	2

This work was to develop a proton analyzer experiment for Mariner.

Pioneer	Direct	-	20	25
	Support	-	5	10
	Total	-	25	35

Ames will exercise project management of Pioneer, a project specifically intended to provide scientific observations of phenomena in interplanetary space through the use of unmanned spacecraft.

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		Number of Personnel		
		1962	1963	1964
BIOSCIENCE				
Supporting research and technology	Direct	28	110	158
	Support	4	36	78
	Total	32	146	236

This project at Ames consists of two general areas of research, one concerned with the basic problems of physiological and behavioral sciences and the other with the problems of extraterrestrial life studies. The physiological and behavioral science research program includes experiments to obtain information concerning the effects of outer space and planetary environments on living systems and processes. Basic studies in brain mechanisms are being undertaken, including neurophysiology, neuroendocrinology, and neuroanatomy, as well as hormone chemistry and studies in experimental psychology. Basic studies are also being performed in the area of radiobiology and stress tolerance as related to both in-flight and planetary environments.

The extraterrestrial life research program undertakes basic research related to the prediction, detection and study of extraterrestrial life. Though basic in orientation, this program is of a dual nature. On the one hand, experiments utilizing the basic approach obtain information concerning the origin and evolution of organic molecules and subsequent life synthesis in various extraterrestrial environments. On the other hand, both in-flight and ground-based experiments are performed to identify and study terrestrial and extraterrestrial life, through the design, development and utilization of biological sampling devices to be flown to the moon and planets on future spacecraft.

Biosatellite	Direct	-	80	80
	Support	-	13	13
	Total	-	93	93

Ames will be responsible for project management of the Biosatellite project. The project is aimed at determining the fundamental biological effects of outer space environmental factors, especially decreased gravity and weightlessness, high-energy heavy particle cosmic radiation, and removal from the earth's rotation. New life support and environmental control systems will be tested.

SPACE VEHICLE SYSTEMS

Supporting research and technology	Direct	434	420	430
	Support	213	221	241
	Total	647	641	671

		Number of Personnel		
		1962	1963	1964

Ames has been carrying on aerodynamic performance, stability, control and heating studies on a number of entry shapes for some time. Present effort is devoted to extending that work to cover the speed and Reynolds number range representative of reentry from a lunar mission. As a part of this work, Ames is conducting wind tunnel and ballistic range investigations in support of projects Apollo and Gemini for the Manned Spacecraft Center. The aerotheromodynamic characteristics of vehicles in other planetary atmospheres are also under investigation. A knowledge of the aerodynamics of shapes suitable for entry probes in gas mixtures representative of the atmospheres of Venus and Mars will be essential in the design of probes intended to investigate these planets. The Center is also carrying on an investigation on the micrometeoroid impact hazard to space vehicle structures. This is a continuing effort to produce impacts between small particles (approximately 100 microns) traveling at meteoric velocities (50,000 feet per second or more) and the multiple sheet structures that have shown promise in tests with larger particles traveling at somewhat lower velocities. Another environmental effect under investigation at Ames is the effect of the space environment on coatings used for thermal control. A flight investigation of the emissivity stability of various coatings has been carried out on the Orbiting Solar Observatory and additional flight investigations will be made on other satellites. In the area of launch vehicle loads and structures, the Center is conducting studies of aerodynamic forces, stability, control, and static and fluctuating pressure distributions on various NASA and DOD launch vehicles. Research is also being carried out on the dynamic response of launch vehicles to ground winds loads.

ELECTRONIC SYSTEMS

Supporting research and technology	Direct	208	322	335
	Support	148	157	162
	Total	456	479	497

The research effort in this area includes studies of guidance systems, control systems, instrumentation, data handling and processing, and tracking and data acquisition. The work in guidance systems is directed mainly at manned vehicles. The major effort is on Apollo and Apollo-like vehicles with particular emphasis in the area of orbit establishment, midcourse navigation and terminal guidance. The studies directed at the Apollo vehicle are being conducted in close cooperation with the Manned Spacecraft Center and the Massachusetts Institute of Technology.

The research falls into three major categories: derivation of guidance and navigation techniques, development and demonstration of physical techniques to supply and process the pertinent information, and simulation of the whole system including the crew. The research on control systems is in turn divided into two separate categories. The effort on unmanned

		Number of Personnel		
		1962	1963	1964

satellites includes studies of attitude stabilization systems for spacecraft such as Nimbus and the Orbiting Geophysical, Astronomical and Solar Observatories. Control and stabilization studies of piloted craft include supersonic aircraft, hypersonic aircraft, TFX, and Apollo, making use of various simulators and variable-stability aircraft.

Research in instrumentation is directed at satisfying the various requirements of the many different types of ground-based facilities, and at developing instruments required for research of planetary atmospheres and solar phenomena from earth-based observatories, satellites and space probes. Research in data handling and processing is aimed at the development of advanced computing devices for ground-based simulators and for use on board spacecraft. Tracking and data acquisition studies are concerned with techniques and components and the improvement of advanced electronic devices such as TV equipment for position determination.

HUMAN FACTOR SYSTEMS

Supporting research and technology	Direct	114	137	154
	Support	27	32	84
	Total	141	169	238

Research at Ames is concerned with all aspects of the relationship between man and the machine systems which will be used to transport him into space and to support him during lunar or planetary explorations. Studies are underway to determine man's performance capabilities and capacities under normal as well as environmental conditions of unusual stress represented by aerospace situations (acceleration, heat, impact, vibration, pressure, and confinement). Evaluations of physiological and psychological tolerance to stress and investigations of methods for increasing stress tolerance are underway. Man-system integration studies are being undertaken to provide information on man's operation of an aerospace vehicle under the various single and combined environmental stresses which will occur during the various phases of flight. These investigations will lead to a quantitative allocation of function between pilot and vehicle control system. In the area of life support requirements, studies are being undertaken to define optimum environmental control systems. The special requirements of diet and heat balance in relation to performance will be investigated. Methods for protection of the operator from the various associated environmental stresses and for providing the optimum physiological monitoring system will be studied.

SPACE POWER

Supporting research and technology	Direct	3	6	6
	Support	2	3	3
	Total	5	9	9

		Number of Personnel		
		1962	1963	1964

The Center effort in space power generation is currently limited to investigation of the effects of high temperature, vacuum, cyclic heating and cooling, and angle of incidence of solar radiation on the operating characteristics of solar cells. This work will continue through fiscal year 1964 and will be extended to include similar investigations of thermoelectric and thermionic devices.

AERONAUTICS

Supporting research and technology	Direct	66	61	60
	Support	29	46	44
	Total	95	107	104

The research effort includes studies in aircraft aerodynamics, loads and structures, air-breathing propulsion systems, and operating problems. Included in this effort is work in support of many DOD projects such as the B-70 and the TFX.

The studies in aerodynamics are directed at an understanding of the problems associated with both military and civil aircraft designed to fly at subsonic, supersonic, and hypersonic speeds. Particular emphasis is being placed in the latter area to obtain the fundamental knowledge of stability and control, aerodynamic heating, and other studies necessary for a possible hypersonic research airplane. The work in loads and structures is aimed primarily at determining the flutter characteristics of thin-gauge, non-aluminum aircraft structures and at obtaining steady-state aircraft loads. The research in propulsion includes both studies of inlet systems for supersonic cruise aircraft and studies directed at developing air-breathing propulsion systems for vehicles suitable for sustained hypersonic flight. Both theoretical and experimental studies are being made. The general research in the area of aircraft operating problems is directed at improvement in the operation and safety of aircraft such as the TFX, as well as work of a more general nature in operational techniques and flying and handling qualities of subsonic, supersonic, and hypersonic aircraft.

Supersonic transport	Direct	117	109	112
	Support	55	56	59
	Total	172	165	171

A concentrated research effort on the problems posed by the supersonic transport is under way at the Center. A large portion of this effort is directed at generalized studies in airframe aerodynamics, inlets, and simulation studies to aid in making a choice between the several design possibilities. These studies make use of complete wind-tunnel models with both fixed and variable geometry for dynamic and static testing as well as

		Number of Personnel		
		1962	1963	1964

large-scale inlet models. Mission analysis studies, based on the best estimate of airline operation, form an integral part of these studies to guide the wind-tunnel programs in obtaining the best compromise for maximum overall performance. Flight studies support this effort using variable-stability aircraft (F-100 and B-26) to examine high-speed and landing dynamics and on-board inertial guidance techniques for all-weather operation.

V/STOL aircraft	Direct	86	65	68
	Support	40	35	35
	Total	126	100	103

A vigorous research effort over the past three or four years has demonstrated the validity of several different approaches to V/STOL (Vertical/Short Take-off and Landing) flight, with varying degrees of acceptability. The types studied include fan-in-fuselage, fan-in-wing, tilt rotor, and tilt wing. The flying test beds resulting from this research have provided the first insight into the flying qualities this class of aircraft must have if it is to be operationally useful. The Center's effort is directed toward obtaining the information necessary to draw general conclusions as to the missions best suited to the several types and to examine each within the scope of the likely mission. These studies take the form of numerous wind-tunnel studies, simulation studies, and studies with flying test beds such as the X-14.

The V/STOL aircraft is dependent on the performance of its various components to a degree far beyond any other aircraft. Thus, careful and detailed studies must be made in the areas of boundary-layer control, variable-camber propellers, variable-pitch stators and rotors for ducted fans, flapping propellers, and jet augmentation, both in wind-tunnels and in flight to extract the greatest percentage of efficiency. This work will involve detailed studies of several systems and the components which form them, the manner in which their operation should be carried out for maximum utilization, and refinement of detail to reach maximum efficiency.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the Index to that volume for the location of detailed project justifications.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

FLIGHT RESEARCH CENTER

MISSION:

The mission of the Flight Research Center is the conduct of research on flight, and the problems of manned flight, both within and outside the atmosphere. The work includes effort on problems of take-off and landing, low speed flight, supersonic and hypersonic flight, and reentry in order to verify predicted characteristics and to identify unexpected problems in actual flight.

The major programs at Flight Research Center include aeronautics projects, in which the problems of the X-15, supersonic transport, paraglider, and hypersonic cruise are investigated; and space vehicle systems projects, in which the flight behavior of advanced reentry vehicles such as lifting bodies is studied. Investigations and flight testing of electronic systems are carried out, including problems of display, guidance and control in advanced flight missions. In the area of biotechnology, man-machine integration problems are studied both in the laboratory and in flight. The Center also maintains a program of continual improvements on systems and sensors used in tracking and data acquisition. Support of the manned flight program is provided to Projects Mercury, Gemini and Apollo through effort on such projects as parachute and paraglider development.

The Flight Research Center has a number of facilities and special equipment for conducting these investigations. Most important are the aircraft, which range from century series fighters used for pilot proficiency and general investigation to X-15 rocket aircraft used for hypersonic research and reentry investigation. As required, special purpose vehicles such as paragliders, variable stability aircraft, or airborne simulators are obtained from contractor, or developed in-house. Specialized laboratory facilities are available to complement the flight activities with proper preliminary research and testing. Simulation equipment is used to guide and assist in the performance of productive flight activities. A three station radar range is operated to support the flight activity. Technical experts in the fields of flight research, aerodynamics, loads and structures, thermodynamics, biotechnology, and electronics comprise the staff.

LOCATION:

The Flight Research Center, Edwards, California, is located at the north end of Edwards Air Force Base. Flight Research Center is 65 miles northeast of Los Angeles, approximately 35 miles northeast of Lancaster, California.

LAND:

Total area comprises 171 acres occupied under lease from the Air Force. Runways are used jointly by Flight Research Center and the Air Force, while some utilities are provided by the Air Force on a reimbursable basis.

PLANT VALUE:

The plant value as of June 30, 1962 was $11,488,000.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	524	575	593
Personnel costs.....	$4,441,400	$5,364,000	$5,935,000
Operation of installation....	2,792,600	2,173,000	4,450,000
Subtotal.....	$7,234,000	$7,537,000	$10,385,000
Construction program.....	110,000	1,697,000	4,081,000
Total installation costs.	$7,344,000	$9,234,000	$14,466,000

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FLIGHT RESEARCH CENTER
FISCAL YEAR 1964 ESTIMATES
LOCATION PLAN

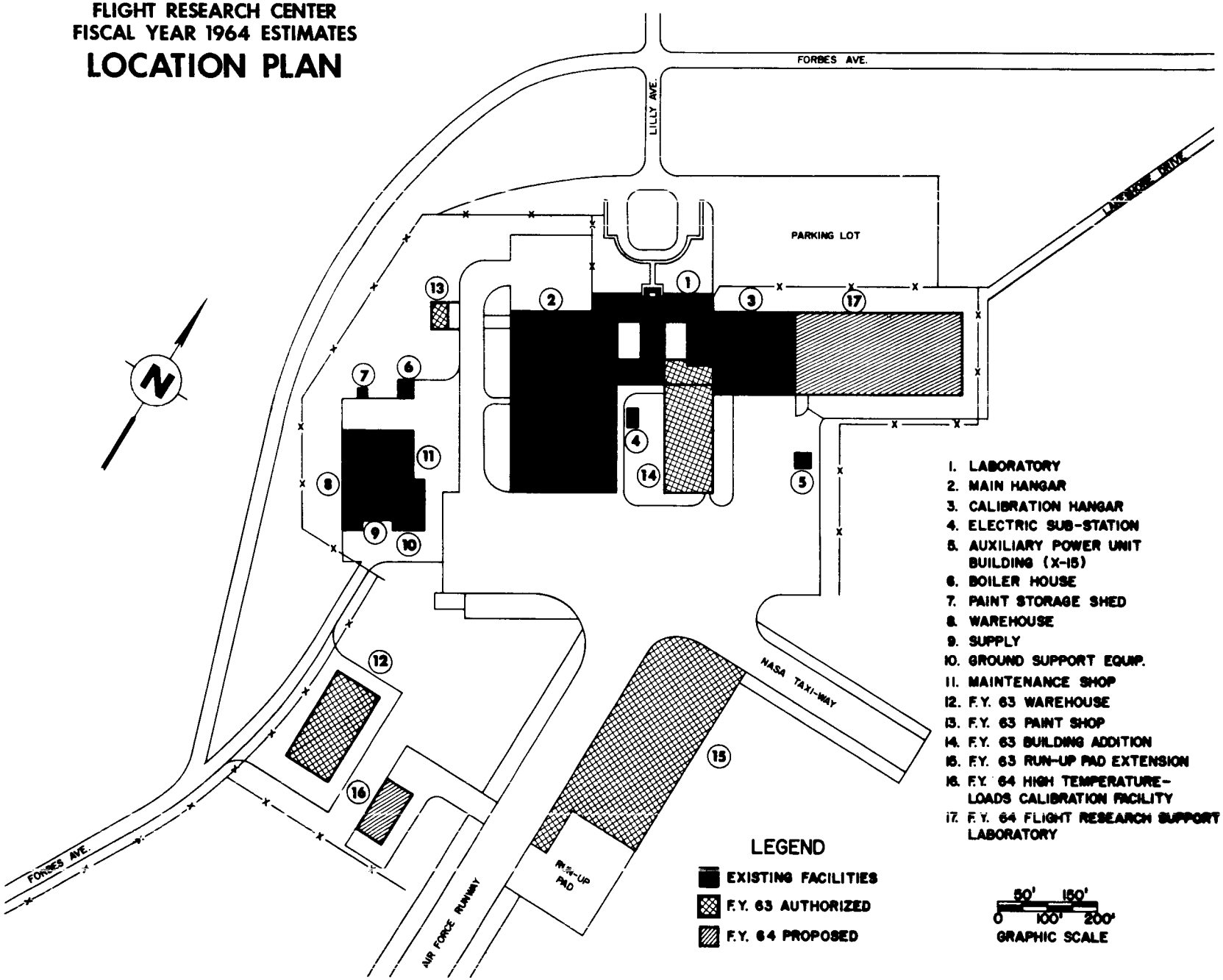
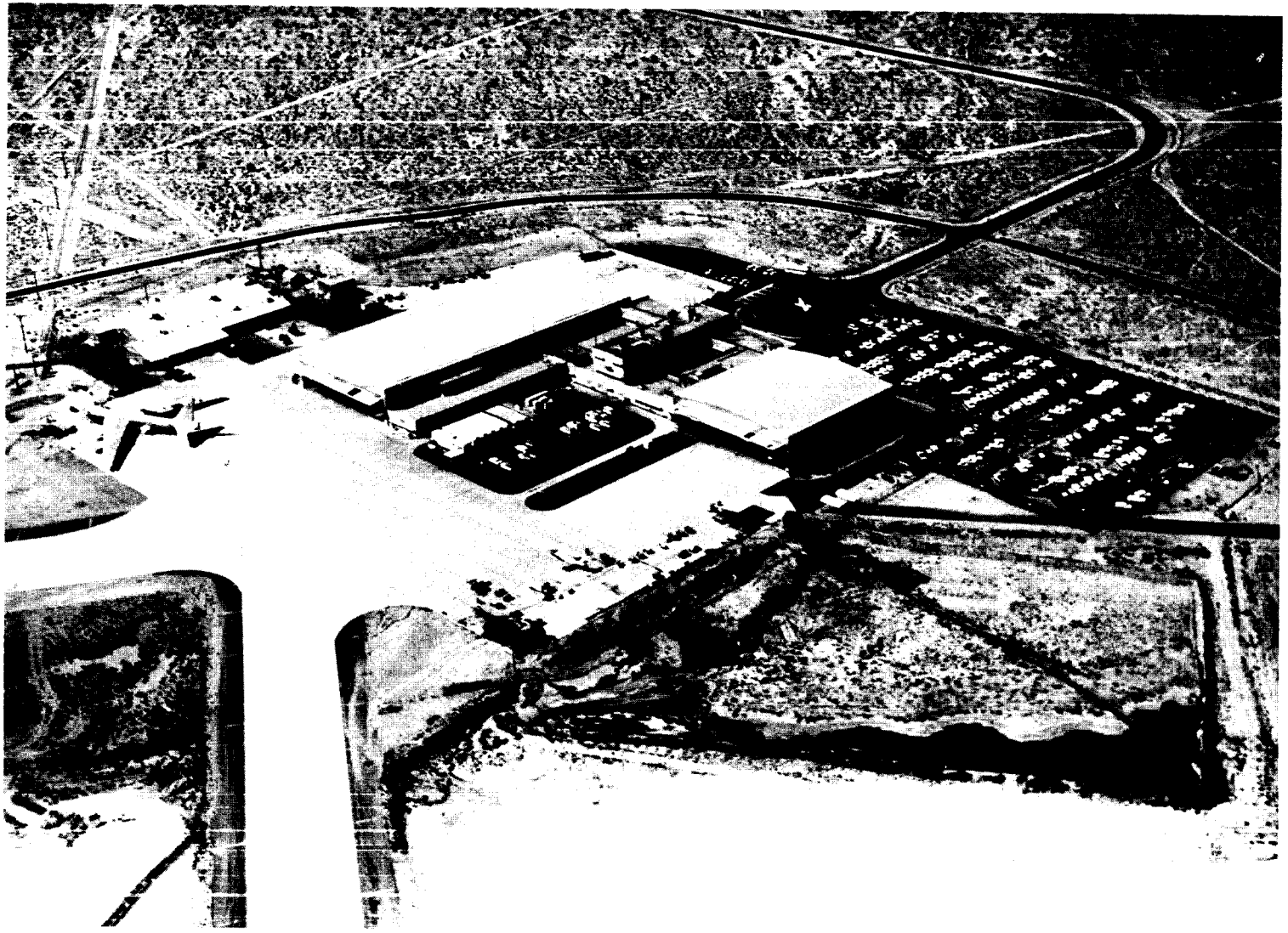


FIG 3

FLIGHT RESEARCH CENTER
Edwards, California



AERIAL VIEW

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART:
FLIGHT RESEARCH CENTER

Staffing Summary

	62	63	64
Excepted	8	7	7
GS-15	15	14	16
GS-14	11	22	20
Other GS	233	262	273
WB	257	270	277
Total	524	575	593

OFFICE OF THE DIRECTOR

	62	63	64
Excepted	3	3	3
GS-15	2	2	2
GS-14	-	-	-
Other GS	2	5	5
Total	7	10	10

RESEARCH DIVISION

	62	63	64
Excepted	2	2	2
GS-15	5	4	4
GS-14	4	7	7
Other GS	83	105	109
WB	-	-	-
Total	94	118	122

ADMINISTRATIVE DIVISION

	62	63	64
GS-15	1	1	1
GS-14	-	3	3
Other GS	55	56	58
WB	32	30	30
Total	88	90	92

FLIGHT OPERATIONS DIVISION

	62	63	64
Excepted	3	2	2
GS-15	4	4	5
GS-14	3	4	3
Other GS	19	22	22
WB	136	143	148
Total	165	175	180

DATA SYSTEMS DIVISION

	62	63	64
GS-15	3	3	4
GS-14	4	8	7
Other GS	74	74	79
WB	89	97	99
Total	170	182	189

RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
MANNED SPACECRAFT SYSTEMS				
Supporting research and technology	Direct	-	-	1

Work at Flight in this area covers theoretical studies of advanced manned space flight mission characteristics.

Gemini	Direct	-	22	28
	Support	-	10	14
	Total	-	32	42

This effort covers the management of the Gemini paraglider, being developed by North American Aircraft Corporation, with flight testing of half-scale and full-scale models at the Flight Research Center.

Apollo	Direct	6	6	7
	Support	-	3	3
	Total	6	9	10

Work at Flight relates to parachute and paraglider development.

INDUSTRIAL APPLICATIONS	Direct	1	1	1

This project covers Flight's participation in NASA's program to identify and disseminate to the industrial community information on new systems, methods, or developments which arise from the civil space program.

GEOPHYSICS AND ASTRONOMY				
Supporting research and technology	Direct	1	1	2
	Support	-	-	1
	Total	1	1	3

Ultra-violet spectra of selected stars will be obtained through the use of special photographic equipment built into an X-15 aircraft.

SPACE VEHICLE SYSTEMS				
Supporting research and technology	Direct	22	21	21
	Support	-	1	1
	Total	22	22	22

General investigations of future missions and zero-g tests will be accomplished within this effort.

		Number of Personnel		
		1962	1963	1964
Space vehicle recovery	Direct	-	-	12
	Support	-	-	2
	Total	-	-	14

This effort encompasses the in-house development of a lifting body recovery vehicle for gliding flight tests. An aircraft-launched, full-scale, wing loading lifting body vehicle will be procured for later tests.

ELECTRONIC SYSTEMS

Supporting research and technology	Direct	16	38	43
	Support	6	21	22
	Total	22	59	65

The effort includes work on airborne and ground based energy management systems, and investigations of manned flight controls and displays. Development of instrumentation for use in flight testing of advanced vehicles, and development of biotechnology instrumentation will be undertaken both in-house and through contract.

HUMAN FACTOR SYSTEMS

Supporting research and technology	Direct	1	3	5
	Support	-	3	4
	Total	1	6	9

The effort in this area is for the purpose of extending present flight and laboratory studies of astronauts in space environments using data obtained from flight tests of the X-15 and other vehicles, including simulators.

AERONAUTICS

Supporting research and technology	Direct	17	14	26
	Support	9	12	12
	Total	26	26	38

The work includes investigations of hypersonic glide and cruise vehicles, handling qualities, landing problems, problems of hypersonic air breathing engines, and operational problems of hypersonic aircraft.

X-15 research aircraft	Direct	294	274	250
	Support	108	77	70
	Total	402	351	320

This project includes the operation, instrumentation, and analyses and reporting of results of X-15 flights.

		Number of Personnel		
		1962	1963	1964
Supersonic transport	Direct	12	25	25
	Support	3	5	5
	Total	15	30	30

Flight Research Center effort includes participation in B-70 flight tests, A3J flight tests, traffic control, sonic boom, and structural studies.

TRACKING AND DATA ACQUISITION

Network operations and equipment and components	Direct	17	22	22
	Support	11	16	16
	Total	28	38	38

These personnel support the operation of the three stations comprising the Aerodynamic Test Range-or Hi-Range-at Ely and Beatty, Nevada, and Edwards, California, which is used during all X-15 flights. Also included is the Center's effort on equipment and component modification and improvement.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the Index to that volume for the location of detailed project justifications.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

GODDARD SPACE FLIGHT CENTER

MISSION:

The Goddard Space Flight Center has been assigned the prime responsibility within NASA for the management of applications satellite projects, unmanned scientific satellite projects, and world-wide NASA tracking and data acquisition operations.

All NASA applications satellites, from Echo to Nimbus, have been managed by Goddard. Currently, three meteorological satellite projects are underway: the TIROS, Nimbus (for research and development purposes) and the Nimbus operational system for the Weather Bureau. In addition to the management of these three projects, Goddard is conducting advanced research on new and improved components for these satellite systems and performing studies on future meteorological satellites.

The focal point for the NASA communications satellite program is at Goddard, where the development and launch of the world's first passive communications satellite, the Echo, was directed. The activity in the area of passive communication satellites is continuing as advanced research, while prime effort is being devoted to active satellites, such as Relay and Syncom. As in the past, Goddard will assist the American Telephone and Telegraph Company with the testing and launching of its Telstar satellite. The development and launch of the first NASA active repeater communications satellite, Relay, was directed by Goddard. Goddard also bears responsibility for the project management of Syncom, a synchronous orbit satellite being built by the Hughes Aircraft Company.

As in the applications area, NASA's progress in unmanned scientific satellites in near earth orbit is due largely to the capabilities of Goddard personnel. Goddard's experience in the management of projects for the design, construction, and flight of unmanned scientific satellites is extensive. The original nucleus of Goddard personnel was the group that built the Vanguard satellites, one of which is still transmitting useful data after almost five years in orbit. In addition Goddard has been responsible for the Explorer series of satellites. In this area Goddard has the management responsibility for such projects as the Orbiting Solar Observatory, Orbiting Astronomical Observatory, Orbiting Geophysical Observatory, and several smaller satellites. In addition, Goddard has participated with other nations in cooperative space projects which have been flown on both orbital launch vehicles and sounding rockets.

Goddard also maintains launch teams for both the Atlantic and Pacific Missile Ranges (AMR and PMR). The AMR team provides management and technical

direction of the field efforts of the Delta program. This team also supervises, monitors and directs the launch vehicle preparation, launch operation and coordinates spacecraft checkout. The PMR team supports launches of Goddard managed projects from that range.

In discharging responsibilities for operating a world-wide tracking, communication and computing system, Goddard operates 13 satellite network stations as well as a manned flight network. In addition, an 85-foot antenna has been constructed in Alaska to meet future requirements for receiving large amounts of data from such Goddard satellites as Nimbus and the Orbiting Geophysical Observatory. Two additional 85-foot antennas are planned for construction in Rosman, North Carolina, and southeast Australia.

LOCATION:

Goddard Space Flight Center is located about 15 miles northeast of Washington, D. C. and about 30 miles southwest of Baltimore, Maryland.

LAND:

The area occupied consists of a main site of approximately 550 acres transferred from the Department of Agriculture to NASA. Three additional areas detached from, but located near the main site are being occupied on a revocable permit granted by the Department of Agriculture. These smaller parcels of land are occupied by the antenna test range (approximately 30 acres), the magnetic test area (approximately 278 acres) and the optical tracking and ground plane facility (approximately 118 acres).

The 550-acre main site area includes approximately 25 acres currently occupied, on a revocable permit, by the National Bureau of Standards' radio station WWV. It is expected that this station will remain until sometime during the fiscal year 1965 at which time the land will revert to the Center.

PLANT VALUE:

The plant value as of June 30, 1962 was $67,722,000.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	2,414 1/	3,200 1/	3,700 1/
Personnel costs.....	$17,765,823	$27,478,000	$34,931,000
Operation of installations....	20,534,539	27,410,000	32,995,000
Subtotal.....	$38,300,362	$54,888,000	$67,926,000

Construction program.....	$12,170,000	$17,556,250	$20,932,000
Total installation costs.	$50,470,362	$72,444,250	$88,858,000

1/ Of the totals, 81, 98, and 98 personnel in fiscal years 1962, 1963, and 1964 respectively are funded from reimbursable sources.

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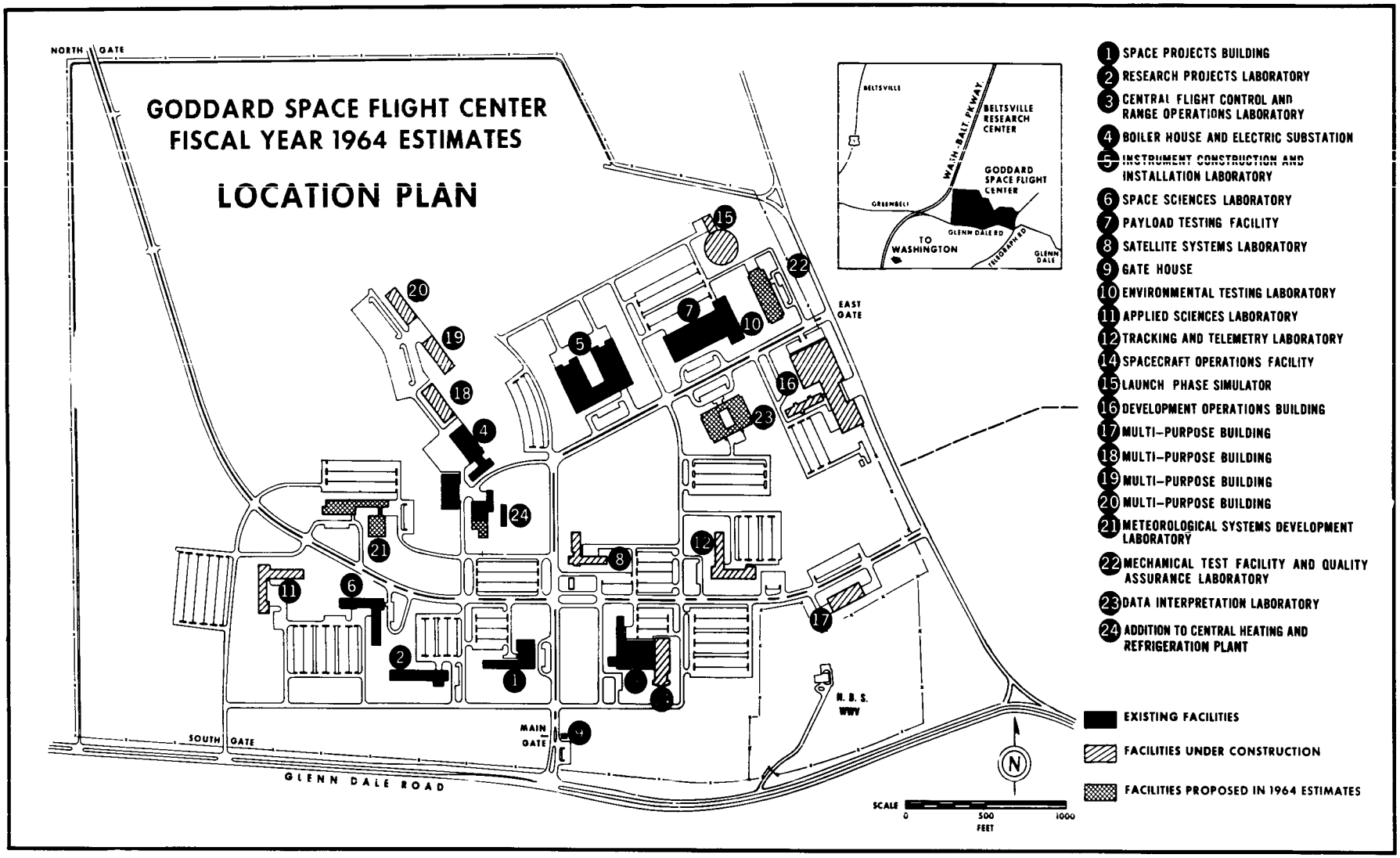
GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1964 ESTIMATES
LOCATION PLAN
NORTH GATE
SOUTH GATE
EAST GATE
MAIN GATE
GLENN DALE ROAD
N. B. S. WWV
BELTSVILLE
BELTSVILLE RESEARCH CENTER
WASH.-BALT. PKWAY
GODDARD SPACE FLIGHT CENTER
GREENBELT
GLENN DALE RD
TO WASHINGTON
TUCKERMAN RD
GLENN DALE
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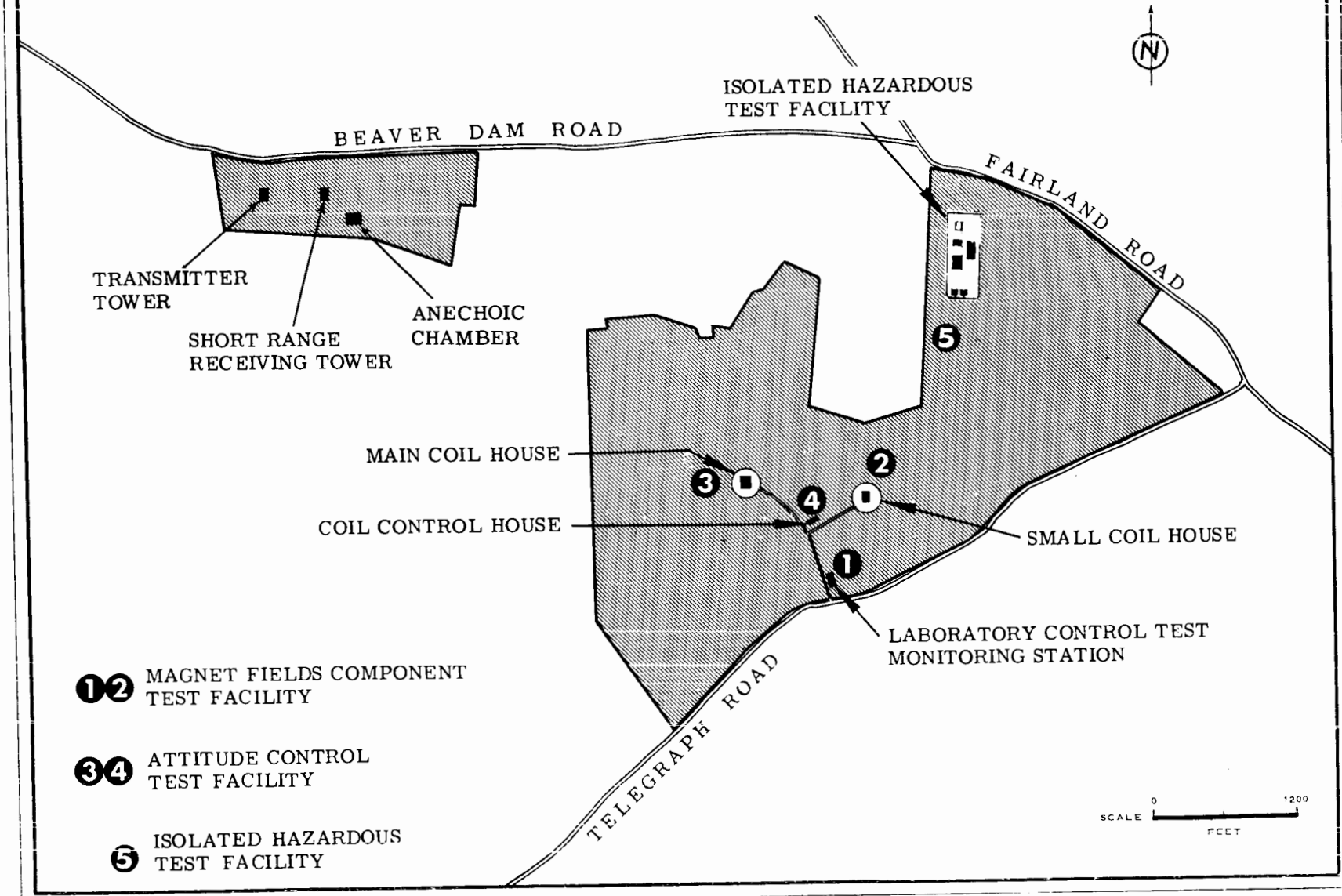
1000
FEET
N
1 SPACE PROJECTS BUILDING
2 RESEARCH PROJECTS LABORATORY
3 CENTRAL FLIGHT CONTROL AND RANGE OPERATIONS LABORATORY
4 BOILER HOUSE AND ELECTRIC SUBSTATION
5 INSTRUMENT CONSTRUCTION AND INSTALLATION LABORATORY
6 SPACE SCIENCES LABORATORY
7 PAYLOAD TESTING FACILITY
8 SATELLITE SYSTEMS LABORATORY
9 GATE HOUSE
10 ENVIRONMENTAL TESTING LABORATORY
11 APPLIED SCIENCES LABORATORY
12 TRACKING AND TELEMETRY LABORATORY
14 SPACECRAFT OPERATIONS FACILITY
15 LAUNCH PHASE SIMULATOR
16 DEVELOPMENT OPERATIONS BUILDING
17 MULTI-PURPOSE BUILDING
18 MULTI-PURPOSE BUILDING
19 MULTI-PURPOSE BUILDING
20 MULTI-PURPOSE BUILDING
21 METEOROLOGICAL SYSTEMS DEVELOPMENT LABORATORY
22 MECHANICAL TEST FACILITY AND QUALITY ASSURANCE LABORATORY
23 DATA INTERPRETATION LABORATORY
24 ADDITION TO CENTRAL HEATING AND REFRIGERATION PLANT
EXISTING FACILITIES
FACILITIES UNDER CONSTRUCTION
FACILITIES PROPOSED IN 1964 ESTIMATES

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1964 ESTIMATES

REMOTE SITE AREAS



GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland

AERIAL VIEW

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART
GODDARD SPACE FLIGHT CENTER

STAFFING SUMMARY

	62	63	64
Excepted	36	38	38
GS-15	93	115	152
GS-14	182	227	291
Other GS	1882	2563	2922
WB	221	257	297
Total	2414	3200	3700

DIRECTOR

	62	63	64
Excepted	2	2	2
GS-15	1	1	1
GS-14	-	-	-
Other GS	4	7	7
WB	-	-	-
Total	7	10	10

OFFICE OF THE ASSISTANT DIRECTOR FOR ADMINISTRATION

	62	63	64
Excepted	2	2	2
GS-15	3	4	4
GS-14	9	9	11
Other GS	68	86	108
WB	-	-	-
Total	82	101	125

ORGANIZATION AND PERSONNEL DIVISION

	62	63	64
Excepted	-	-	-
GS-15	1	1	1
GS-14	3	3	3
Other GS	57	76	96
WB	-	-	-
Total	61	80	100

FINANCIAL MANAGEMENT DIVISION

	62	63	64
Excepted	-	-	-
GS-15	1	2	2
GS-14	2	2	2
Other GS	77	108	131
WB	-	-	-
Total	80	112	135

MANAGEMENT SERVICES DIVISION

	62	63	64
Excepted	-	-	-
GS-15	-	-	-
GS-14	2	2	2
Other GS	46	64	83
WB	9	9	10
Total	57	75	95

PROCUREMENT AND SUPPLY DIVISION

	62	63	64
Excepted	1	1	1
GS-15	1	1	1
GS-14	6	10	13
Other GS	202	244	284
WB	10	14	16
Total	220	270	315

TECHNICAL INFORMATION DIVISION

	62	63	64
Excepted	-	-	-
GS-15	-	-	-
GS-14	-	-	-
Other GS	43	61	79
WB	14	17	21
Total	57	78	100

OFFICE OF TECHNICAL SERVICES

	62	63	64
Excepted	1	1	1
GS-15	-	-	-
GS-14	-	-	-
Other GS	1	3	3
WB	-	-	-
Total	2	4	4

FACILITIES ENGINEERING DIVISION

	62	63	64
Excepted	1	1	1
GS-15	-	1	1
GS-14	6	8	11
Other GS	45	66	75
WB	87	94	107
Total	139	170	195

TEST AND EVALUATION DIVISION

	62	63	64
Excepted	1	1	1
GS-15	3	4	6
GS-14	16	19	23
Other GS	151	192	208
WB	-	-	-
Total	171	216	238

FABRICATION DIVISION

	62	63	64
Excepted	-	-	-
GS-15	1	1	1
GS-14	1	3	4
Other GS	19	31	37
WB	101	123	143
Total	122	158	185

OFFICE OF ASSISTANT DIRECTOR (TRACKING & DATA SYSTEMS)

	62	63	64
Excepted	2	2	2
GS-15	2	4	4
GS-14	2	4	4
Other GS	12	30	35
WB	-	-	-
Total	18	40	45

OPERATIONS AND SUPPORT DIVISION

	62	63	64
Excepted	-	-	-
GS-15	10	10	12
GS-14	7	9	15
Other GS	84	131	147
WB	-	-	-
Total	101	150	174

MANNED SPACE FLIGHT DIVISION

	62	63	64
Excepted	-	-	-
GS-15	8	9	11
GS-14	5	8	12
Other GS	46	83	108
WB	-	-	-
Total	59	100	131

TRACKING SYSTEMS DIVISION

	62	63	64
Excepted	1	1	1
GS-15	7	8	10
GS-14	13	15	19
Other GS	89	126	137
WB	-	-	-
Total	110	150	167

DATA SYSTEMS DIVISION

	62	63	64
Excepted	1	3	3
GS-15	1	4	11
GS-14	9	11	17
Other GS	144	179	209
WB	-	-	-
Total	155	197	240

SPACE DATA ACQUISITION DIVISION

	62	63	64
Excepted	1	1	1
GS-15	5	6	9
GS-14	8	13	19
Other GS	122	195	250
WB	-	-	-
Total	136	215	279

OFFICE OF THE ASSISTANT DIRECTOR (SPACE SCIENCE & SATELLITE APPLICATIONS)

	62	63	64
Excepted	2	2	2
GS-15	2	2	2
GS-14	3	3	3
Other GS	6	7	7
WB	-	-	-
Total	13	14	14

SPACECRAFT SYSTEMS AND PROJECTS DIVISION

	62	63	64
Excepted	6	6	6
GS-15	13	14	17
GS-14	30	33	36
Other GS	133	185	191
WB	-	-	-
Total	182	238	250

THEORETICAL DIVISION

	62	63	64
Excepted	2	2	2
GS-15	5	6	7
GS-14	5	7	10
Other GS	59	70	76
WB	-	-	-
Total	71	85	95

SPACE SCIENCES DIVISION

	62	63	64
Excepted	7	6	6
GS-15	9	10	13
GS-14	15	17	21
Other GS	149	149	150
WB	-	-	-
Total	180	182	190

SPACECRAFT TECHNOLOGY DIVISION

	62	63	64
Excepted	1	1	1
GS-15	9	8	11
GS-14	23	16	20
Other GS	193	105	124
WB	-	-	-
Total	226	130	156

AERONOMY AND METEOROLOGY DIVISION

	62	63	64
Excepted	4	4	4
GS-15	10	13	17
GS-14	16	20	25
Other GS	117	171	174
WB	-	-	-
Total	147	208	220

INTEGRATION AND SOUNDING ROCKET DIVISION

	62	63	64
Excepted	-	1	1
GS-15	-	5	10
GS-14	-	13	17
Other GS	-	166	167
WB	-	-	-
Total	-	185	195

INSTITUTE FOR SPACE STUDIES

	62	63	64
Excepted	1	1	1
GS-15	1	1	1
GS-14	1	2	4
Other GS	15	28	36
WB	-	-	-
Total	18	32	42

GSFC 7

RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
METEOROLOGICAL SATELLITES				
Supporting research and technology	Direct	27	35	54
	Support	23	22	32
	Total	50	57	86

A comprehensive in-house study of the capabilities and reliability of components, sub-systems, systems, and mission requirements of future meteorological satellites is carried on at Goddard. The in-house effort is supplemented by selected outside contracts. Major effort will be devoted to developing new meteorological sensing instruments, such as satellite radars and advanced aerometric experiments, and in finding quicker and more efficient means for data handling. Specific projects will include studies of synchronous meteorological satellites, dielectric tape camera development, day-night television development and the development of improved infra-red detectors.

Tiros	Direct	67	58	70
	Support	50	46	51
	Total	117	104	121

Goddard has been responsible for the development, launch, and tracking and data acquisition of the six Tiros meteorological satellites flown to date. Goddard's effort has included extensive in-house research and development, as well as continuing technical supervision of the work carried on by contract. The Radio Corporation of America has conducted the systems integration of the satellites.

Nimbus	Direct	33	51	70
	Support	27	31	42
	Total	60	82	112

Goddard is the project manager of the NASA Nimbus R&D meteorological satellite. The General Electric Company is responsible for the integration and test of the spacecraft. Goddard's effort includes in-house development on critical subsystems, such as guidance and control devices, to supplement contractual work in areas which are near the boundaries of the present state-of-the-art.

Meteorological sounding rocket systems	Direct	2	-	-
	Support	1	-	-
	Total	3	-	-

		Number of Personnel		
		1962	1963	1964

Launches of meteorological sounding rockets are conducted from several sites in North America. Goddard is responsible for the conduct of the entire technical program, and supplies various experiments including sodium vapor release and rocket grenades. Personnel in 1963 and 1964 are shown under Geophysics and Astronomy, Sounding rockets and geoprobes.

COMMUNICATIONS SATELLITES

Supporting research and technology	Direct	10	58	33
	Support	6	46	29
	Total	16	104	62

Goddard pursues a broad in-house program, supplemented by selected contracts, to study the performance capabilities and reliability of components, subsystems, and systems applicable to current and future communications satellites. The 1964 effort in this area will emphasize finding solutions to problems of advanced active communications satellites, and to the study of materials and structures for advanced passive communications satellites.

Echo	Direct	15	14	6
	Support	12	12	4
	Total	27	26	10

Goddard is the project manager for the Echo passive communications satellite, and is responsible for systems integration, launch, tracking, and data acquisition. The project has included two sub-orbital ballistic launches to test the spacecraft deployment characteristics. The Langley Research Center has also contributed to the development effort in the area of payload fabrication.

Relay	Direct	22	32	16
	Support	17	20	9
	Total	39	52	25

The Relay low-orbit active communications satellite is being developed by the Radio Corporation of America under Goddard's direction. The Goddard effort includes technical supervision of the contractor, launch, tracking of the spacecraft, and acquisition and reduction of data obtained from the experiments flown. The communications experiments to be conducted will also be directed by Goddard personnel.

Syncom	Direct	7	19	15
	Support	6	12	9
	Total	13	31	24

		Number of Personnel		
		1962	1963	1964

Syncom, a 24-hour stationary synchronous-orbit active communications satellite, is being developed by the Hughes Aircraft Corporation. Goddard has been assigned the responsibility for technical guidance, direction and evaluation of the project, and is responsible for the launch and tracking of the spacecraft, and acquisition and reduction of experimental data.

Advanced synchronous communications satellites	Direct	-	-	30
	Support	-	-	17
	Total	-	-	47

This spacecraft will be an advanced active communications spacecraft, launched into a 22,300-mile synchronous orbit. Goddard will be responsible for project management. Development of the spacecraft will be carried out by a contractor, with Goddard's effort devoted to research and development of critical subsystems and technical supervision and direction of the contractor.

INDUSTRIAL APPLICATIONS	Direct	-	-	7
	Support	-	-	4
	Total	-	-	11

The personnel shown in this category represent Goddard's participation in NASA's Industrial Applications program, designed to identify technological advances in the NASA program and disseminate information on them to American industry.

GEOPHYSICS AND ASTRONOMY

Supporting research and technology	Direct	188	145	155
	Support	150	91	91
	Total	338	236	246

The Goddard research program in geophysical and astronomical sciences includes fundamental theoretical studies which analyze data obtained from scientific satellite missions to improve our understanding of the universe and scientific phenomena. Research is carried out to study the requirements of future missions, and to develop the sensors and instrumentation needed for the experiments to be flown.

Geophysics

Explorers and monitors	Direct	163	175	194
	Support	111	121	128
	Total	274	296	322

		Number of Personnel		
		1962	1963	1964

The effort in this category includes all of the unmanned scientific satellites designed to obtain measurements of various geophysical and solar phenomena in the regions of space near to the earth. These satellites contribute substantial knowledge concerning the radiation belts, energetic particles, ionospheric phenomena and atmospheric structures. Goddard has project management responsibility for all the satellites in this category, and carries out substantial in-house efforts on experiment selection, spacecraft development, integration and checkout, tracking, data acquisition and data reduction.

Orbiting geophysical observatory	Direct	74	136	197
	Support	60	86	117
	Total	134	222	314

Goddard is responsible for the management of the OGO project, which encompasses the development and launch of a series of observatory spacecraft designed to carry several experiments in each mission. The prime contractor for the development of the satellites is the Space Technology Laboratory of Redondo Beach, California, although Goddard devotes substantial effort to in-house development of experiments and to technical supervision and evaluation of the contractor's progress in design and development.

Geodesy	Direct	-	-	9
	Support	-	-	6
	Total	-	-	15

NASA's effort on the geodetic satellite (ANNA) will be initiated in 1964. Goddard will be responsible for management of the project, which will include technical direction of the contractor, and evaluation of the contractor's progress in design and development.

Solar physics

Orbiting solar observatory	Direct	34	43	104
	Support	28	28	50
	Total	62	71	154

The OSO spacecraft, a Delta-launched satellite designed to make critical measurements of the sun and solar phenomena, is being developed under Goddard's technical supervision and direction by Ball Brothers Research Corporation of Boulder, Colorado. The Goddard effort on the project includes responsibility for project management, spacecraft experiments, tracking and data acquisition and reduction. The first OSO was successfully launched on March 7, 1962. Effort in 1964 will also be devoted to development of an advanced OSO, to be launched on an Atlas-Agena.

		Number of Personnel		
		1962	1963	1964
Astronomy				
Orbiting astronomical observatory	Direct	33	121	171
	Support	26	75	101
	Total	59	196	272

The OAO is the observatory spacecraft under development by the Grumman Aircraft Corporation of Bethpage, New York, which will be capable of precise pointing at selected astral bodies to obtain detailed measurements of their characteristics from above the obscuring influence of the earth's atmosphere. Goddard has developed and is continuing to devote substantial effort to experiments for the observatories. Goddard is responsible for the project management of OAO, requiring technical supervision of not only the prime contractor, but also the numerous contractors supplying systems, subsystems, components and experiments for the spacecraft.

International satellites	Direct	71	60	57
	Support	40	29	35
	Total	111	89	92

Goddard bears project management responsibility for all of NASA's cooperative international space projects except the Italian San Marco project, which is being conducted by the Langley Research Center. Experiments to be flown on the international satellites have been developed by the cooperating foreign nations, including both the United Kingdom (Ariel) and Canada (Alouette). Goddard carries out the spacecraft integration, test and checkout, supervises launch vehicle integration, and is responsible for tracking and data acquisition. The reduction of data is done by the foreign experimenters in cooperation and coordination with their Goddard counterparts.

Sounding rockets and geoprobes	Direct	90	115	120
	Support	73	72	71
	Total	163	187	191

Sounding rockets and geoprobes are used to probe the regions of the upper atmosphere and ionosphere (200,000 to 800,000 feet) not susceptible to measurements from balloons or ambient measurements from orbiting satellites. These rockets also serve as convenient and relatively inexpensive means of testing new sensors and instrumentation designed for future spacecraft. Goddard's effort in this area includes complete project management responsibility, including experiment design, payload integration, launch, tracking and data readout. Fiscal years 1963 and 1964 effort includes personnel participating in Goddard's meteorological sounding rocket program.

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		Number of Personnel		
		1962	1963	1964
LUNAR AND PLANETARY EXPLORATION				
Supporting research and technology	Direct	15	5	16
	Support	11	4	11
	Total	26	9	27

Goddard personnel in this area are responsible for a research and development effort emphasizing the study of planetary atmospheres and the development of optical, pressure, temperature and acoustic sensors to be flown on future planetary missions to Venus, Mars, and to the moon.

Ranger	Direct	3	2	2
	Support	3	1	1
	Total	6	3	3

Goddard will provide experiments for the Ranger spacecraft, being developed by the Jet Propulsion Laboratory, to measure the magnetic field near the moon, the lunar atmosphere, if any, the micrometeoroid flux and the plasma on or about the moon.

Surveyor	Direct	-	2	2
	Support	-	1	1
	Total	-	3	3

Goddard personnel are developing experiments for the Surveyor orbiter which will monitor the atmospheric pressure near the lunar surface.

Mariner	Direct	1	4	33
	Support	1	2	20
	Total	2	6	53

Goddard is engaged in developing a telescopic experiment and in reentry capsule definition for the Mariner Venus/Mars lander.

LAUNCH VEHICLE DEVELOPMENT				
Operational support	Direct	36	47	47
	Support	25	28	26
	Total	61	75	73

Goddard provides launch support for all Delta vehicle launches from NASA's Launch Operations Center.

		Number of Personnel		
		1962	1963	1964
SPACE VEHICLE SYSTEMS				
Supporting research and technology	Direct	-	55	64
	Support	-	27	29
	Total	-	82	93

Goddard conducts a broad research program in this area devoted to the study of materials, structures and space vehicle environmental factors, to make available on a timely basis the technology on which the success of future space missions will depend.

ELECTRONIC SYSTEMS				
Supporting research and technology	Direct	-	68	70
	Support	-	44	43
	Total	-	112	113

Effort in this category at Goddard includes work on such electronic devices as lasers, a rubidium magnetometer, antenna arrays, and the development of a storage vidicon tube. The research is primarily in-house, although contracts are placed with industrial sources to supplement the effort.

NUCLEAR-ELECTRIC SYSTEMS				
Supporting research and technology	Direct	-	1	2
	Support	-	-	1
	Total	-	1	3

Goddard personnel in this category are engaged in a fundamental research program studying the characteristics and applicability to missions of electric propulsion systems and components through simulation techniques.

CHEMICAL PROPULSION				
Supporting research and technology	Direct	-	4	5
	Support	-	3	2
	Total	-	7	7

This research effort encompasses the study of chemical propulsion problems associated with satellites within Goddard's responsibilities for unmanned scientific and applications satellites.

		Number of Personnel		
		1962	1963	1964
SPACE POWER				
Supporting research and technology	Direct	9	14	14
	Support	7	9	8
	Total	16	23	22

Goddard is engaged in a research and development effort devoted to the study of problems of solar cells and batteries for space power generation, as the problems apply to scientific and applications satellites.

TRACKING AND DATA ACQUISITION				
Supporting research and technology	Direct	165	33	43
	Support	134	21	25
	Total	299	54	68

Goddard carries on an extensive in-house effort to improve the capabilities and reliability of tracking components and systems, and to develop the new systems necessary to track and acquire data from future space missions.

Network operations and equipment and components	Direct	253	601	650
	Support	204	373	383
	Total	457	974	1033

Goddard is responsible for the operation, repair, replacement and maintenance of the satellite network, the manned flight network, network communications and data processing operations. The actual operation of these systems is carried out by contractors. Goddard provides technical supervision and evaluation of contractor effort, and the necessary planning and coordination to insure that the tracking and data acquisition systems are able to respond to the requirements placed on them by the constantly increasing number of space missions. Goddard is also responsible for the construction and installation of new tracking dishes and equipment.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the index to that volume for the location of detailed project justifications.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

JET PROPULSION LABORATORY

MISSION:

The Jet Propulsion Laboratory (JPL) is a government-owned research and development facility, operated for NASA by the California Institute of Technology. The Laboratory carries out research programs and flight projects for NASA, and conceives and executes advanced development and experimental engineering investigations to further the technology required for the nation's space program.

Although a contractor, JPL works under the close direction of the NASA Headquarters and receives support from NASA's Western Operations Office in executing specific tasks and projects. The primary emphasis of the Laboratory's effort has been, and is, on the carrying out of lunar, planetary, and deep space unmanned scientific missions. JPL's lunar program includes two major projects: Ranger and Surveyor. The Ranger spacecraft is designed to examine the surface characteristics of the moon through the use of television. The Surveyor spacecraft, under development by the Hughes Aircraft Corporation, will make more detailed surveys of the lunar characteristics by both low orbit missions around the moon and soft landings on the lunar surface.

The Laboratory is engaged in, and responsible for, the development of unmanned interplanetary spacecraft and related technology to gather fundamental scientific information concerning planetary atmospheres and environments and solar phenomena. The Mariner II, which successfully completed its Venus "fly-by" mission on December 14, 1962, was developed by the Laboratory as part of this planetary program.

The Laboratory also engages in research and development on tracking and data acquisition techniques and equipment. It is responsible for the management of the deep space network, with stations at Goldstone, California; Woomera, Australia; and Johannesburg, South Africa. The network was established to provide a precision tracking and communication network capable of communicating with space vehicles and determining their position in deep space. The station at Goldstone, California, recently established a new record for tracking distance, communicating with the Mariner II spacecraft at a distance of more than 40 million miles.

Supporting research and advanced development programs are conducted in the fields of physics, chemistry, aerodynamics, mathematics and space sciences. These programs have made, and continue to make, substantial contributions to NASA programs in propulsion, tracking and data acquisition, and lunar and planetary exploration.

Many of the advanced studies being conducted at the Laboratory relate closely to space sciences. Advanced development of geophysical instruments to be landed on the moon, theoretical studies of planetary atmospheres, and analysis of particles and fields in deep space from telemetered data are examples of the highly technical research and development being done.

LOCATION:

The Jet Propulsion Laboratory is located in Pasadena, California, approximately twenty miles from downtown Los Angeles. Subsidiary facilities are located at Goldstone, California; Edwards Air Force Base in Muroc, California; and at Table Mountain, California.

LAND:

At Pasadena, California, the Laboratory occupies 163.9 acres of land, 146.9 of which are owned by NASA and 19 leased from the city of Pasadena and commercial sources.

At Goldstone, California, facilities are located on 50 square miles of land occupied under permit from the Army.

At Edwards Air Force Base, Muroc, California, facilities are located on 600 acres of land occupied under permit from the Air Force.

The Table Mountain, California, facilities of the Laboratory are located on 5 acres of land occupied under permit from the Forest Service of the Department of Agriculture.

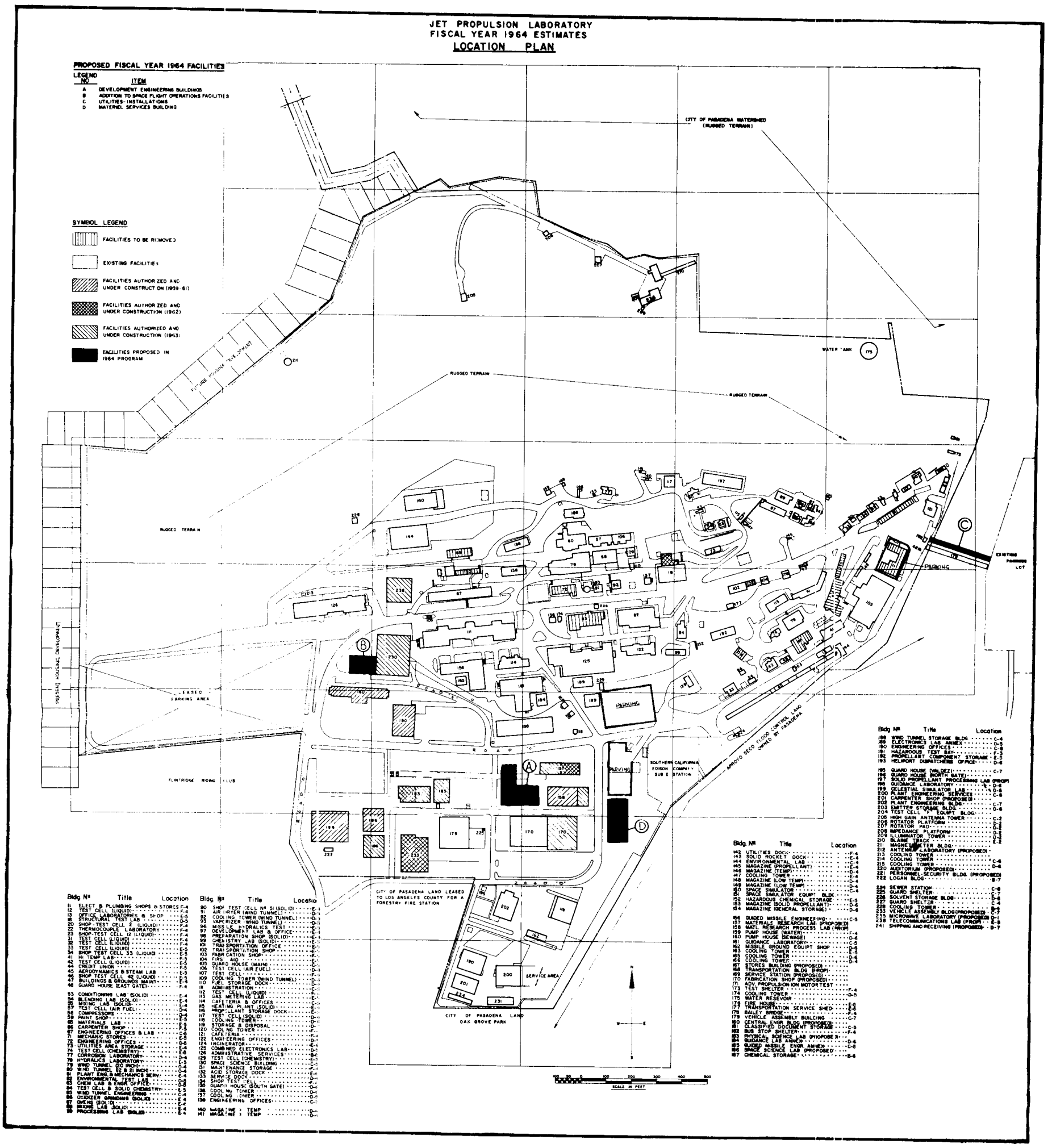
PLANT VALUE:

The plant value as of June 30, 1962, was $57,600,000.

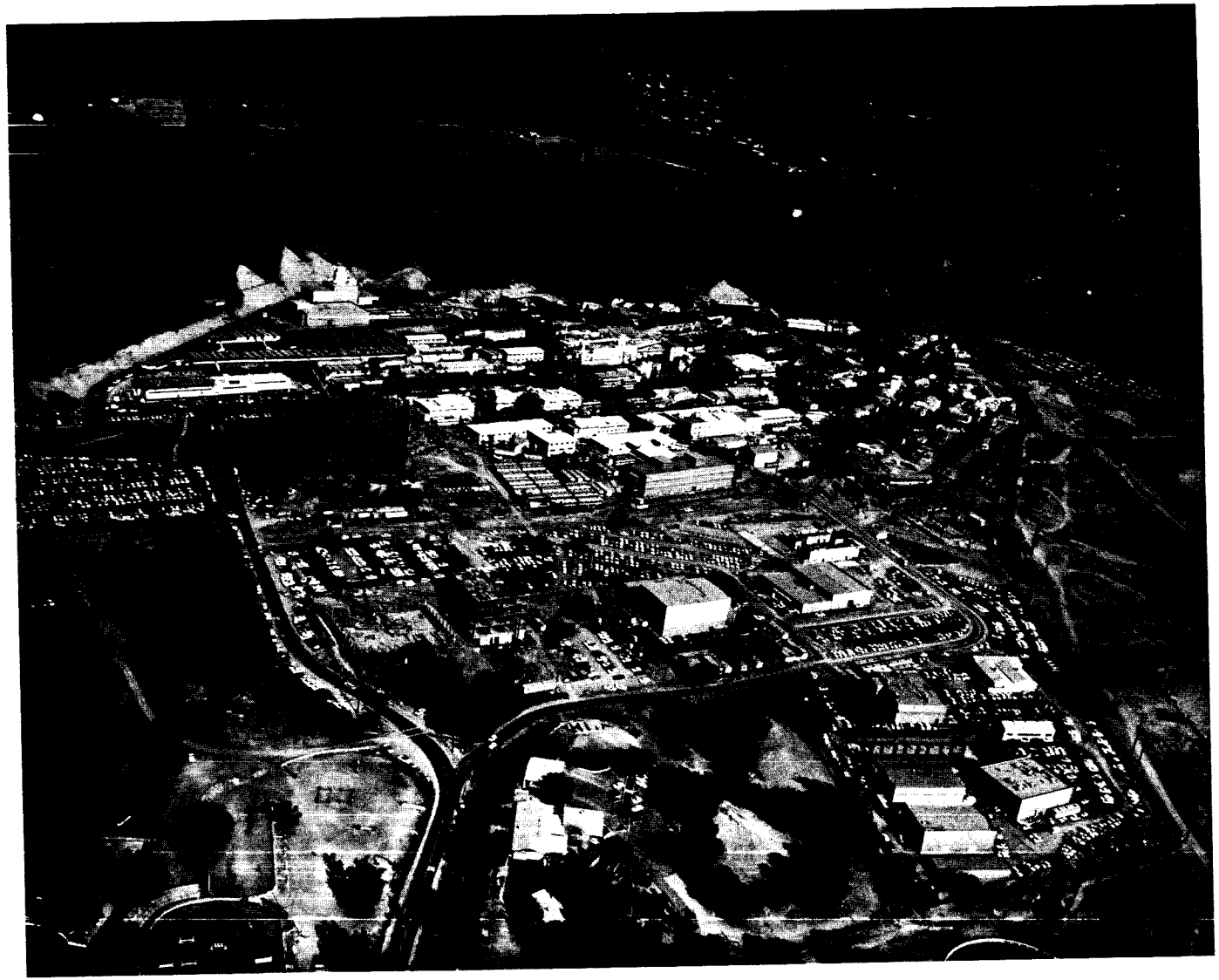
SUMMARY OF RESOURCES REQUESTED:

As a contractor operation, the Jet Propulsion Laboratory funds for personnel costs and operation of installation are not carried as separate requests in the NASA budget.

	1962	1963	1964
Number of permanent employees (end of year).....	3,541	4,134	4,821
Construction program.....	$4,063,800	$10,003,200	$7,000,000


JET PROPULSION LABORATORY
FISCAL YEAR 1964 ESTIMATES
LOCATION PLAN
PROPOSED FISCAL YEAR 1964 FACILITIES
LEGEND NO
ITEM
A DEVELOPMENT ENGINEERING BUILDINGS
B ADDITION TO SPACE FLIGHT OPERATIONS FACILITIES
C UTILITIES - INSTALLATIONS
D MATERNEL SERVICES BUILDING
SYMBOL LEGEND
FACILITIES TO BE REMOVED
EXISTING FACILITIES
FACILITIES AUTHORIZED AND UNDER CONSTRUCTION (1959-61)
FACILITIES AUTHORIZED AND UNDER CONSTRUCTION (1962)
FACILITIES AUTHORIZED AND UNDER CONSTRUCTION (1963)
FACILITIES PROPOSED IN 1964 PROGRAM
CITY OF PASADENA WATERSHED (RUGGED TERRAIN)
RUGGED TERRAIN
WATER TANK
PARKING
LEASED PARKING AREA
FLINTRIDGE RIDING CLUB
SOUTHERN CALIFORNIA EDISON COMPANY SUB STATION
ARROYO SECO FLOOD CONTROL LAND OWNED BY PASADENA
CITY OF PASADENA LAND LEASED TO LOS ANGELES COUNTY FOR A FORESTRY FIRE STATION
CITY OF PASADENA LAND OAK GROVE PARK
SERVICE AREA
SCALE IN FEET
Bldg. Nº Title Location
11 ELECT & PLUMBING SHOPS (STORES) F-4
12 TEST CELL (LIQUID) F-4
13 OFFICE LABORATORIES & SHOP E-5
18 STRUCTURAL TEST LAB D-5
20 SHOP-TEST CELL 2 (LIQUID) F-4
22 THERMOCOUPLE LABORATORY F-4
23 SHOP-TEST CELL 12 (LIQUID) F-4
31 TEST CELL (LIQUID) F-4
32 TEST CELL (LIQUID) F-4
33 TEST CELL (LIQUID) E-5
34 SHOP-TEST CELL 33 (LIQUID) E-5
41 HI TEMP LAB F-5
42 TEST CELL (LIQUID) E-5
44 CREDIT UNION F-5
45 AERODYNAMICS & STEAM LAB E-5
46 SHOP-TEST CELL 42 (LIQUID) E-5
47 BUILDINGS & GROUNDS MAINT E-4
48 GUARD HOUSE (EAST GATE) F-4
53 CONDITIONING LAB (SOLID) E-4
54 BLENDING LAB (SOLID) E-4
55 MIXING LAB (SOLID) E-4
57 TEST CELL (AIR FUEL) D-4
58 COMPRESSORS D-4
59 PAINT SHOP E-5
65 MATERIALS LAB E-5
66 CARPENTER SHOP E-5
67 ENGINEERING OFFICES & LAB C-6
71 MECHANIC STORES E-5
72 ENGINEERING OFFICES D-6
73 UTILITIES AREA STORAGE E-4
74 TEST CELL (CHEMISTRY) E-6
77 CORROSION LABORATORY D-4
78 HYDRAULICS LABORATORY E-5
79 WIND TUNNEL (60 INCH) D-4
80 WIND TUNNEL (12 & 21 INCH) D-4
81 PLANT ENG & MECHANICS SERV E-4
82 ENVIRONMENTAL TEST LAB D-5
83 CHEM LAB & ENGR OFFICE D-5
84 TEST CELL & SOLID CHEMISTRY E-5
85 WIND TUNNEL ENGINEERING C-4
86 CRYOGENIC GRINDING (SOLID) E-4
87 OVENS (SOLID) E-4
88 BRONZE LAB (SOLID) E-4
89 PROCESSING LAB (SOLID) E-4
Bldg. Nº Title Location
90 SHOP-TEST CELL Nº 5 (SOLID) E-5
91 AIR DRYER (WIND TUNNEL) D-5
92 COOLING TOWER (WIND TUNNEL) D-5
93 VAPORIZER (WIND TUNNEL) D-5
94 MISSILE HYDRALICS TEST E-5
97 DEVELOPMENT LAB & OFFICE E-4
98 PREPARATION SHOP (SOLID) E-5
99 CHEMISTRY LAB (SOLID) E-5
101 TRANSPORTATION OFFICE E-5
102 TRANSPORTATION SHOP E-5
103 FABRICATION SHOP E-5
104 FIRST AID E-5
105 GUARD HOUSE (MAIN) C-5
106 TEST CELL (AIR FUEL) D-4
107 TEST CELL F-4
109 COOLING TOWER (WIND TUNNEL) D-4
110 FUEL STORAGE DOCK D-4
111 ADMINISTRATION C-5
112 TEST CELL (LIQUID) F-4
113 GAS METERING LAB E-4
114 CAFETERIA & OFFICES E-5
115 HEATING PLANT (SOLID) E-5
116 PROPELLANT STORAGE DOCK E-4
117 TEST CELL (SOLID) D-4
118 COOLING TOWER D-4
119 STORAGE & DISPOSAL D-4
120 COOLING TOWER F-4
121 CAFETERIA F-4
122 ENGINEERING OFFICES F-4
123 INCINERATOR E-4
125 COMBINED ELECTRONICS LAB D-4
126 ADMINISTRATIVE SERVICES B-4
129 TEST CELL (CHEMISTRY) C-5
130 SPACE SCIENCE BUILDING C-5
131 MAINTENANCE STORAGE F-4
132 ACID STORAGE DOCK E-4
133 SERVICE DOCK D-4
134 SHOP-TEST CELL F-4
135 GUARD HOUSE (SOUTH GATE) D-4
136 COOLING TOWER D-4
137 COOLING TOWER D-4
138 ENGINEERING OFFICES C-5
140 MAGAZINE (TEMP) D-4
141 MAGAZINE (TEMP) D-4
Bldg. Nº Title Location
142 UTILITIES DOCK F-4
143 SOLID ROCKET DOCK E-4
144 ENVIRONMENTAL LAB C-4
145 MAGAZINE (PROPELLANT) E-4
146 MAGAZINE (TEMP) D-4
147 COOLING TOWER E-4
148 MAGAZINE (LOW TEMP) D-4
149 MAGAZINE (LOW TEMP) D-4
150 SPACE SIMULATOR C-4
151 SPACE SIMULATOR (EQUIP) BLDG C-4
152 HAZARDOUS CHEMICAL STORAGE E-5
153 MAGAZINE (SOLID PROPELLANT) E-4
154 MAGAZINE (GENERAL STORAGE) D-6
156 GUIDED MISSILE ENGINEERING C-5
157 MATERIALS RESEARCH LAB (PROPOSED) D-5
158 MATL. RESEARCH PROCESS LAB (PROP) D-5
159 PUMP HOUSE (WATER) F-4
160 PUMP HOUSE (SEWAGE) D-4
161 GUIDANCE LABORATORY C-5
162 MISSILE GROUND EQUIPT SHOP E-5
163 COOLING TOWER D-5
165 COOLING TOWER D-5
166 COOLING TOWER D-4
167 STORES BUILDING (PROPOSED)
168 TRANSPORTATION BLDG (PROP)
169 SERVICE STATION (PROPOSED)
170 FABRICATION SHOP (PROPOSED)
171 ADV. PROPULSION ION MOTOR TEST
173 TEST SHELTER F-4
174 COOLING TOWER D-5
175 WATER RESEVOIR
176 FIRE HOUSE
177 TRANSPORTATION SERVICE SHED D-5
178 BAILEY BRIDGE F-4
179 VEHICLE ASSEMBLY BUILDING C-7
180 CENTRAL ENGR BLDG (PROPOSED)
181 CLASSIFIED DOCUMENT STORAGE C-5
182 BUS STOP SHELTER F-4
183 PHYSICAL SCIENCE LAB (PROPOSED)
184 GUIDANCE LAB ANNEX D-6
185 GUIDED MISSILE ENGR ANNEX C-5
186 SPACE SCIENCE LAB (PROPOSED)
187 CHEMICAL STORAGE B-6
Bldg. Nº Title Location
188 WIND TUNNEL STORAGE BLDG C-4
189 ELECTRONICS LAB ANNEX D-5
190 ENGINEERING OFFICES C-6
191 HAZARDOUS TEST BAY F-3
192 PROPELLANT COMPONENT STORAGE E-5
193 HELIPORT DISPATCHERS OFFICE D-6
195 GUARD HOUSE (VALDEZ) C-7
196 GUARD HOUSE (NORTH GATE) D-6
197 SOLID PROPELLANT PROCESSING LAB (PROP)
198 GUIDANCE LABORATORY D-6
199 CELESTIAL SIMULATOR LAB D-6
200 PLANT ENGINEERING SERVICES C-6
201 CARPENTER SHOP (PROPOSED)
202 PLANT ENGINEERING BLDG C-7
203 EMITTER STORAGE BLDG D-6
204 TEST CELL F-4 EQUIPT BLDG
206 HIGH GAIN ANTENNA TOWER C-2
206 ROTATOR PLATFORM
207 ROTATOR PAD
208 IMPEDANCE PLATFORM
209 ILLUMINATOR TOWER
210 BLAME TRACK E-2
211 MAGNETIC METER BLDG
212 ANTENNA LABORATORY (PROPOSED)
213 COOLING TOWER
214 COOLING TOWER C-6
215 COOLING TOWER D-6
220 AUDITORIUM (PROPOSED)
221 PERSONNEL-SECURITY BLDG (PROPOSED)
222 LOGAN BLDG B-7
224 SEWER STATION C-6
225 GUARD SHELTER C-7
226 SOLVENT STORAGE BLDG D-6
227 GUARD SHELTER C-4
228 COOLING TOWER
233 VEHICLE ASSEMBLY BLDG (PROPOSED)
235 MICROWAVE LABORATORY (PROPOSED)
238 TELECOMMUNICATIONS LAB (PROP) E-6
241 SHIPPING AND RECEIVING (PROPOSED) B-7

JET PROPULSION LABORATORY
Pasadena, California



AERIAL VIEW

RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
COMMUNICATIONS SATELLITES				
Syncom	Direct	15	2	-
	Support	13	2	-
	Total	28	4	-

The JPL effort on this project has included the development of the spacecraft "apogee kick" small solid rocket motor used to inject the spacecraft into a synchronous 22,300 mile orbit from its initial, or "parking" orbit.

LUNAR AND PLANETARY EXPLORATION				
Supporting research and technology	Direct	155	184	202
	Support	117	143	172
	Total	272	327	374

This effort includes feasibility studies of various proposed scientific missions in space; the advanced studies undertaken to develop new and improved spacecraft components, sensors, and instrumentation; interpretation of the results of missions; and fundamental studies in the fields of physics, chemistry and space sciences in areas contributing to the lunar and planetary program.

Ranger	Direct	415	490	390
	Support	380	418	332
	Total	795	908	722

JPL bears primary responsibility for project management of Ranger. The Ranger spacecraft were developed by the Laboratory, with contributions in the form of experiments from other NASA field Centers. JPL is continuing to design and construct the Ranger spacecraft, as described in the Lunar and Planetary program justification.

Surveyor lander	Direct	130	133	154
	Support	111	114	131
	Total	241	247	285

The Surveyor lander, designed for soft landings on the lunar surface, is being designed and built by the Hughes Aircraft Company under a JPL subcontract. JPL's effort provides extensive technical backup to the prime contractor, and insures, through in-house development efforts, that optimum use is made by the contractor of the latest technical developments.

		Number of Personnel		
		1962	1963	1964
Surveyor orbiter	Direct	14	16	77
	Support	13	14	66
	Total	27	30	143

The Surveyor orbiter is also being developed by the Hughes Aircraft Company under subcontract to JPL. As project manager, the Laboratory is responsible for technical supervision of the contractor, including an in-depth analysis of design and development progress, and an in-house technical program to keep both the contractor and the Laboratory abreast of the state-of-the-art.

Mariner Venus fly-by	Direct	362	251	-
	Support	308	214	-
	Total	670	465	-
Mariner Mars fly-by	Direct	210	278	460
	Support	190	237	393
	Total	400	515	853
Mariner Venus/Mars lander	Direct	47	178	524
	Support	40	152	428
	Total	87	330	952

JPL bears project management responsibility for the Mariner projects of the NASA planetary program. Each of the Mariner missions, described in detail in the Lunar and Planetary program justification, requires specific development effort. The Laboratory is executing these projects primarily in-house, with extensive research and technical development on spacecraft, systems, and subsystems design and construction. Instrumentation and sensors adapted to the requirements of the experiments to be flown are also being designed, developed and built.

BIOSCIENCE

Supporting research and technology	Direct	11	15	27
	Support	9	13	21
	Total	20	28	48

JPL is engaged in a program of fundamental research to develop instrumentation, sensors, and techniques to gather information on the existence of life, if any, on extraterrestrial bodies and in the space environment, and to analyze the results of experiments performed using techniques developed.

		Number of Personnel		
		1962	1963	1964
SPACE VEHICLE SYSTEMS				
Supporting research and technology	Direct	140	185	196
	Support	120	158	168
	Total	260	343	364

This JPL effort provides for the operations of a 20 inch supersonic and a 21 inch hypersonic wind tunnel, used to perform research on spacecraft aerodynamics, on work in basic fluid physics, and to support Department of Defense missile research.

ELECTRONIC SYSTEMS				
Supporting research and technology	Direct	52	64	78
	Support	45	54	66
	Total	97	118	144

These personnel are involved in JPL's continuing program to improve spacecraft communications systems, guidance and control devices, with primary emphasis being placed on the development of inertial sensors and systems, including electrostatic gyros, for deep space probes.

NUCLEAR-ELECTRIC SYSTEMS				
Supporting research and technology	Direct	13	35	35
	Support	12	30	30
	Total	25	65	65

Work included in this category is primarily study and research effort leading to possible applications of nuclear power generation and electric propulsion systems to deep space probe spacecraft.

NUCLEAR ROCKETS				
Supporting research and technology	Direct	1	6	6
	Support	-	5	5
	Total	1	11	11

These personnel support JPL's work in advanced nuclear rocket concepts.

CHEMICAL PROPULSION				
Supporting research and technology	Direct	97	129	131
	Support	82	109	110
	Total	179	238	241

		Number of Personnel		
		1962	1963	1964

JPL conducts environmental research on solid rockets, and research on advanced solid propellant combinations, including work on boron, with a goal of higher combustion efficiency and performance. Basic studies of solid rocket operational parameters are also carried out.

The effort on liquid propulsion includes studies of various liquid systems, with emphasis on spacecraft propulsion, and research and development on specific components to improve nozzles, thrust chambers and propellant expulsion devices. The work also provides for research on special materials and components to improve systems reliability.

SPACE POWER

Supporting research and technology	Direct	17	20	21
	Support	13	18	18
	Total	30	38	39

JPL conducts a program under this category of research and technology leading to the development of a solar energy thermionic conversion system suitable for planetary missions, and engages in studies of possible solar cell improvements to afford better resistance to undesirable space environmental effects.

TRACKING AND DATA ACQUISITION

Supporting research and technology	Direct	27	30	37
	Support	24	28	35
	Total	51	58	72

JPL is engaged in a program of advanced technology to improve existing feeds, instrumentation and tracking and data acquisition techniques, and to develop new equipment and techniques to increase the capabilities of tracking systems.

Network operations and equipment and components	Direct	196	211	266
	Support	162	198	242
	Total	358	409	508

JPL's effort in this area encompasses the management of the NASA deep space network, a tracking and data acquisition system of three permanent stations: Goldstone, California; Woomera, Australia; and Johannesburg, South Africa. A mobile tracking station, which can be located to cover the critical phases of the spacecraft trajectory after launch, and a launch tracking station are also included in the network.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the Index to that volume for the location of detailed project justifications.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

LANGLEY RESEARCH CENTER

MISSION:

Langley Research Center conducts scientific investigations on a broad scale in the areas of vehicle configurations, materials and structures, and the mechanics of flight; and concentrates on the problems of space travel and reentry, application of new materials, supersonic and hypersonic flight, and other areas to provide the technical background necessary for the accomplishment of NASA aeronautical and space missions.

Major space programs include research on rendezvous, lunar landing, and reentry including flight programs where the reentry velocities range from 27,000 to 44,000 feet per second; studies of the aerothermodynamics, loads, and structural characteristics of vehicle systems; the design of passive communications satellites such as the inflatable Echo spacecraft; tracking and data acquisition, in which the improvement of subsystems is studied; the generation of new and advanced concepts, such as exploratory investigations of inflatable and erectable manned space stations of the future; and the development and management for research purposes of launch vehicles such as Scout, the first all-solid fueled vehicle to propel a satellite into orbit. Attention is given to the study of systems and techniques for the recovery of vehicles returning to the earth's atmosphere from a space mission.

Aeronautical research is directed toward improvement in the performance, safety, and utility of airborne flight, including the proposed supersonic transport, supersonic military aircraft, helicopters, and low-speed airplanes.

Specialized facilities and equipment are used for structures and materials research programs and for developing basic flight techniques for vehicles operating in the atmosphere and in space. Langley has many facilities for simulating atmospheric flight conditions for both aeronautical and space vehicle research ranging from very low subsonic to extreme hypersonic speeds. Many of the facilities are unique in design, the products of the imagination and pioneering technical contributions of the Langley staff.

Laboratory research is supplemented by free-flight studies with models and full-scale aircraft, and with rocket-propelled research vehicles launched from Wallops Station and other launching sites.

The Langley staff is comprised of technical experts in the fields of aerodynamics, loads and structures, thermodynamics, and electronics.

LOCATION:

The Center, divided into two separate areas by the facilities of Langley Air Force Base, is about 10 miles north of the heart of Hampton, Virginia, and approximately 25 miles north of downtown Norfolk, Virginia.

LAND:

Total area occupied is 772 acres, of which 430 acres are owned by NASA and 342 acres occupied under permit from the Air Force. Runways, some utilities, and certain other facilities are used jointly by NASA and the Air Force.

PLANT VALUE:

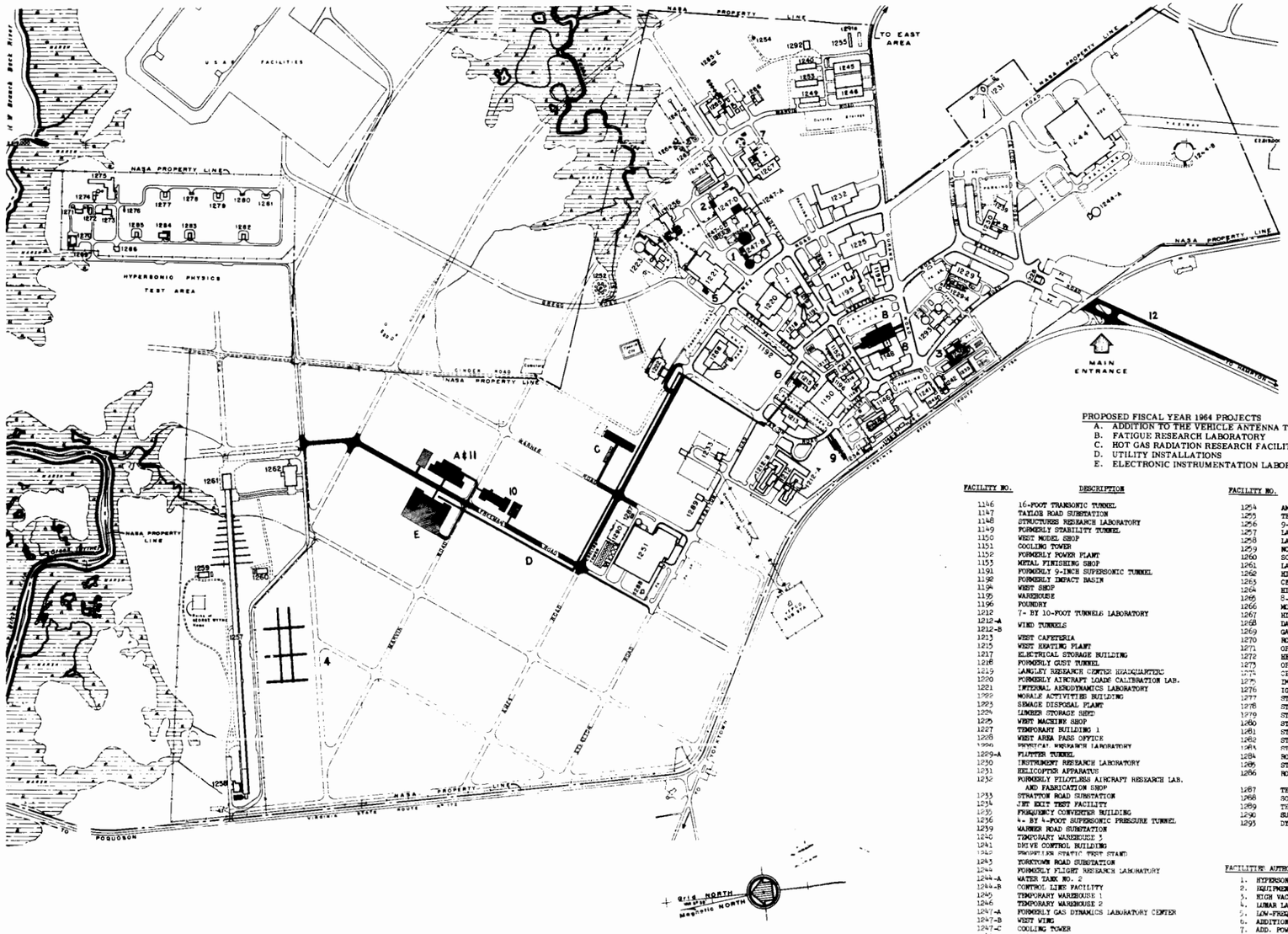
The plant value as of June 30, 1962, was $240,553,000.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	3,770	4,025	4,296
Personnel costs.....	$28,737,000	$34,254,000	$37,760,000
Operation of installation....	17,857,000	16,460,000	16,255,000
Subtotal.....	$46,594,000	$50,714,000	$54,015,000
Construction program.....	6,942,500	8,861,000	9,768,000
Total installation costs.	$53,536,500	$59,575,000	$63,783,000

LANGLEY RESEARCH CENTER
FISCAL YEAR 1964 ESTIMATES

LOCATION PLAN



WEST AREA

PROPOSED FISCAL YEAR 1964 PROJECTS

A. ADDITION TO THE VEHICLE ANTENNA TEST FACILITY
B. FATIGUE RESEARCH LABORATORY
C. HOT GAS RADIATION RESEARCH FACILITY
D. UTILITY INSTALLATIONS
E. ELECTRONIC INSTRUMENTATION LABORATORY

FACILITY NO.	DESCRIPTION
1146	16-FOOT TRANSONIC TUNNEL
1147	TAYLOR ROAD SUBSTATION
1148	STRUCTURES RESEARCH LABORATORY
1149	FORMERLY STABILITY TUNNEL
1150	WEST MODEL SHOP
1151	COOLING TOWER
1152	FORMERLY POWER PLANT
1153	METAL FINISHING SHOP
1191	FORMERLY 9-INCH SUPERSONIC TUNNEL
1192	FORMERLY IMPACT BASIN
1194	WEST SHOP
1195	WAREHOUSE
1196	FOUNDRY
1212	7- BY 10-FOOT TUNNELS LABORATORY
1212-A	WIND TUNNELS
1212-B	
1213	WEST CAFETERIA
1215	WEST HEATING PLANT
1217	ELECTRICAL STORAGE BUILDING
1218	FORMERLY GUST TUNNEL
1219	LANGLEY RESEARCH CENTER HEADQUARTERS
1220	FORMERLY AIRCRAFT LOADS CALIBRATION LAB.
1221	INTERNAL AERODYNAMICS LABORATORY
1222	MORALE ACTIVITIES BUILDING
1223	SEWAGE DISPOSAL PLANT
1224	LUMBER STORAGE SHED
1225	WEST MACHINE SHOP
1227	TEMPORARY BUILDING 1
1228	WEST AREA PASS OFFICE
1229	VEHICULAR RESEARCH LABORATORY
1229-A	FLUTTER TUNNEL
1230	INSTRUMENT RESEARCH LABORATORY
1231	HELICOPTER APPARATUS
1232	FORMERLY PILOTLESS AIRCRAFT RESEARCH LAB. AND FABRICATION SHOP
1233	STRATTON ROAD SUBSTATION
1234	JET EXIT TEST FACILITY
1235	FREQUENCY CONVERTER BUILDING
1236	4- BY 4-FOOT SUPERSONIC PRESSURE TUNNEL
1239	MARMER ROAD SUBSTATION
1240	TEMPORARY WAREHOUSE 3
1241	DRIVE CONTROL BUILDING
1242	PROPELLER STATIC TEST STAND
1243	YORKTOWN ROAD SUBSTATION
1244	FORMERLY FLIGHT RESEARCH LABORATORY
1244-A	WATER TANK NO. 2
1244-B	CONTROL LINE FACILITY
1245	TEMPORARY WAREHOUSE 1
1246	TEMPORARY WAREHOUSE 2
1247-A	FORMERLY GAS DYNAMICS LABORATORY CENTER
1247-B	WEST WING
1247-C	COOLING TOWER
1247-D	EAST WING
1247-E	COMPRESSOR BUILDING
1247-F	AMES ROAD SUBSTATION
1247-G	HIGH-PRESSURE SHOCK TUBE
1249	TEMPORARY WAREHOUSE 4
1251	UNITARY PLAN WIND TUNNEL
1252	WATER TANK NO. 1
1253	TEMPORARY WAREHOUSE 5

FACILITY NO.	DESCRIPTION
1254	AMMUNITION STORAGE 1
1255	TEMPORARY WAREHOUSE 6
1256	9- BY 6-FOOT THERMAL STRUCTURES TUNNEL
1257	LANDING LOADS TRACK
1258	LANDING LOADS TRACK COMPRESSOR BUILDING
1259	NORTH ARRESTING GEAR HOUSING
1260	SOUTH ARRESTING GEAR HOUSING
1261	LANDING LOADS TRACK SHOP
1262	HIGH-SPEED HYDRODYNAMICS OFFICE AND SHOP
1263	CERAMIC-HEATED JET (PILOT MODEL)
1264	HIGH-TEMPERATURE MACH 7 JET (PILOT MODEL)
1265	8-FOOT HIGH-TEMPERATURE STRUCTURES TUNNEL
1266	MOFFETT ROAD SUBSTATION
1267	HIGH-TEMPERATURE MATERIALS LABORATORY
1268	DATA REDUCTION BUILDING
1269	GATE HOUSE (HYPERSONIC PHYSICS TEST AREA)
1270	ROCKET PROPELLANT TEST UNIT, HPTA
1271	OPEN SHED, HPTA
1272	HEATING PLANT, HPTA
1273	OPERATIONS CENTER, HPTA
1274	CERAMIC-HEATED MACH 10 JET, HPTA
1275	IMPACT AND PROJECTILE TEST UNIT, HPTA
1276	IGNITER ASSEMBLY BUILDING, HPTA
1277	STORAGE A
1278	STORAGE B
1279	STORAGE C
1280	STORAGE D
1281	STORAGE E
1282	STORAGE F
1283	STORAGE G
1284	ROCKET PROPELLANT PROCESSING BUILDING, HPTA
1285	STORAGE H
1286	ROCKET ASSEMBLY AND PROPELLANT ALTERATION BUILDING
1287	TEMPORARY SHED
1288	SOLAR ENERGY COLLECTOR
1289	TEMPORARY STORAGE
1290	SUBSTATION
1293	DYNAMICS RESEARCH LABORATORY

FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

1. HYPERSONIC AERO-THERMAL DYNAMICS FACILITY
2. EQUIPMENT FOR MAGNETOPLASMADYNAMICS RESEARCH
3. HIGH VACUUM SPACE STRUCTURES FACILITY
4. LUNAR LANDING RESEARCH FACILITY
5. LOW-FREQUENCY ENVIRONMENTAL NOISE FACILITY
6. ADDITION TO HEATING PLANT
7. ADD. POWER SUPPLY AND IMPROVED ARC CHAMBER FOR 10-MEGAWATT ARC TUNNEL
8. ENVIRONMENTAL RESEARCH FACILITIES FOR SPACECRAFT COMPONENTS AND MATERIALS
9. PARTICLE ACCELERATOR FOR SIMULATION OF MICRO-METEOROID IMPACT
10. STABILIZATION AND CONTROL EQUIPMENT LABORATORY
11. VEHICLE ANTENNA TEST FACILITY
12. WEST AREA APPROACH ROAD

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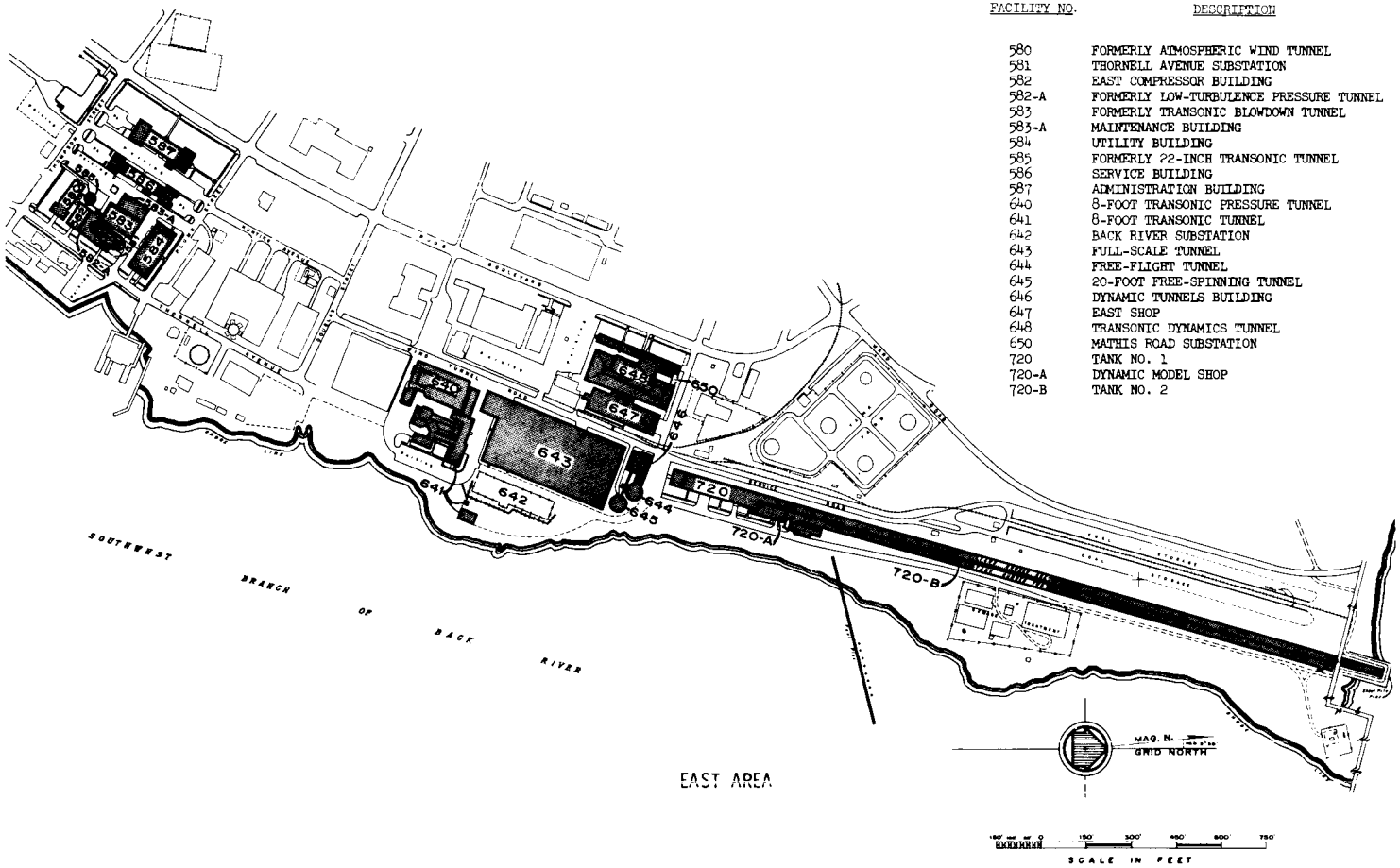
LANGLEY RESEARCH CENTER
FISCAL YEAR 1964 ESTIMATES

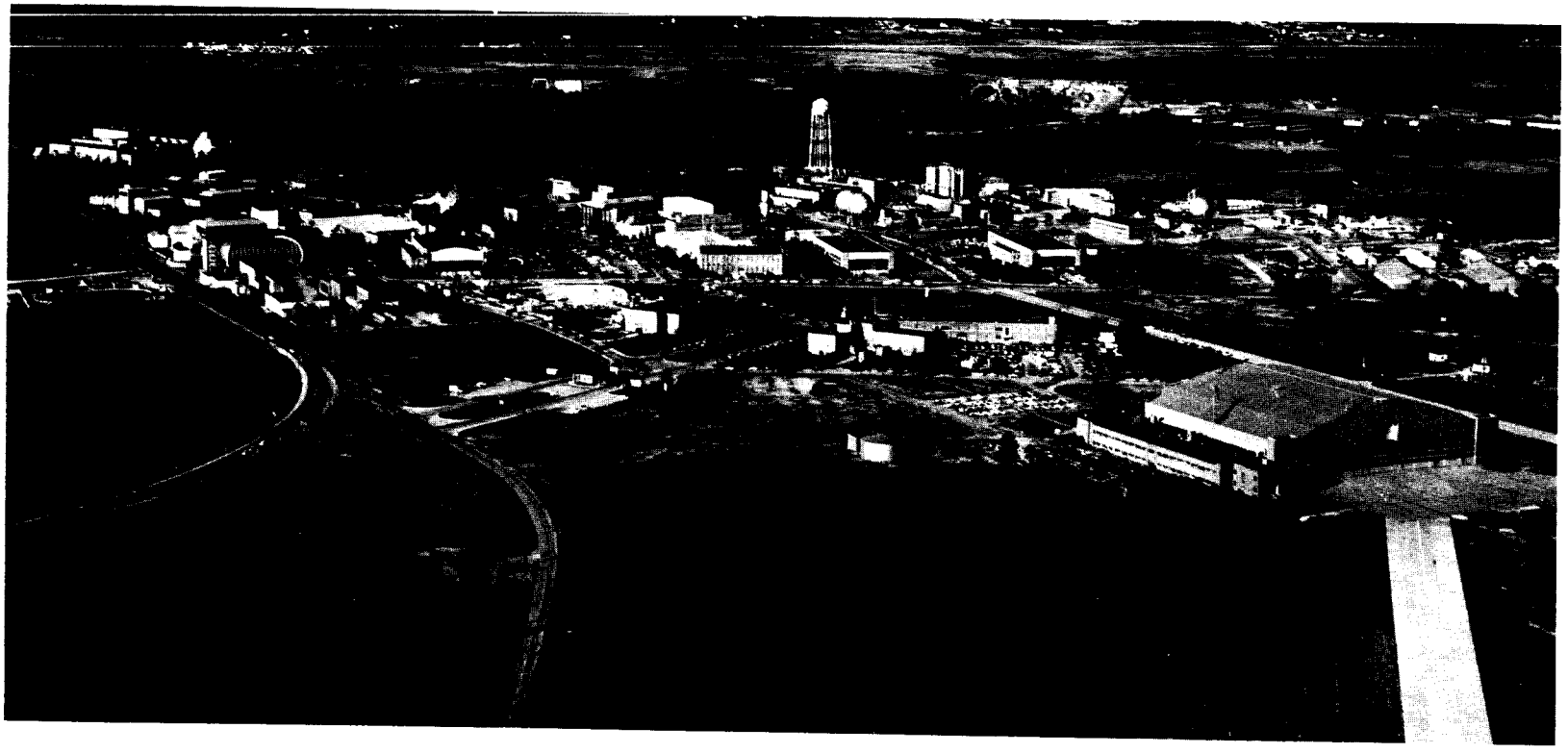
LOCATION PLAN



EAST AREA

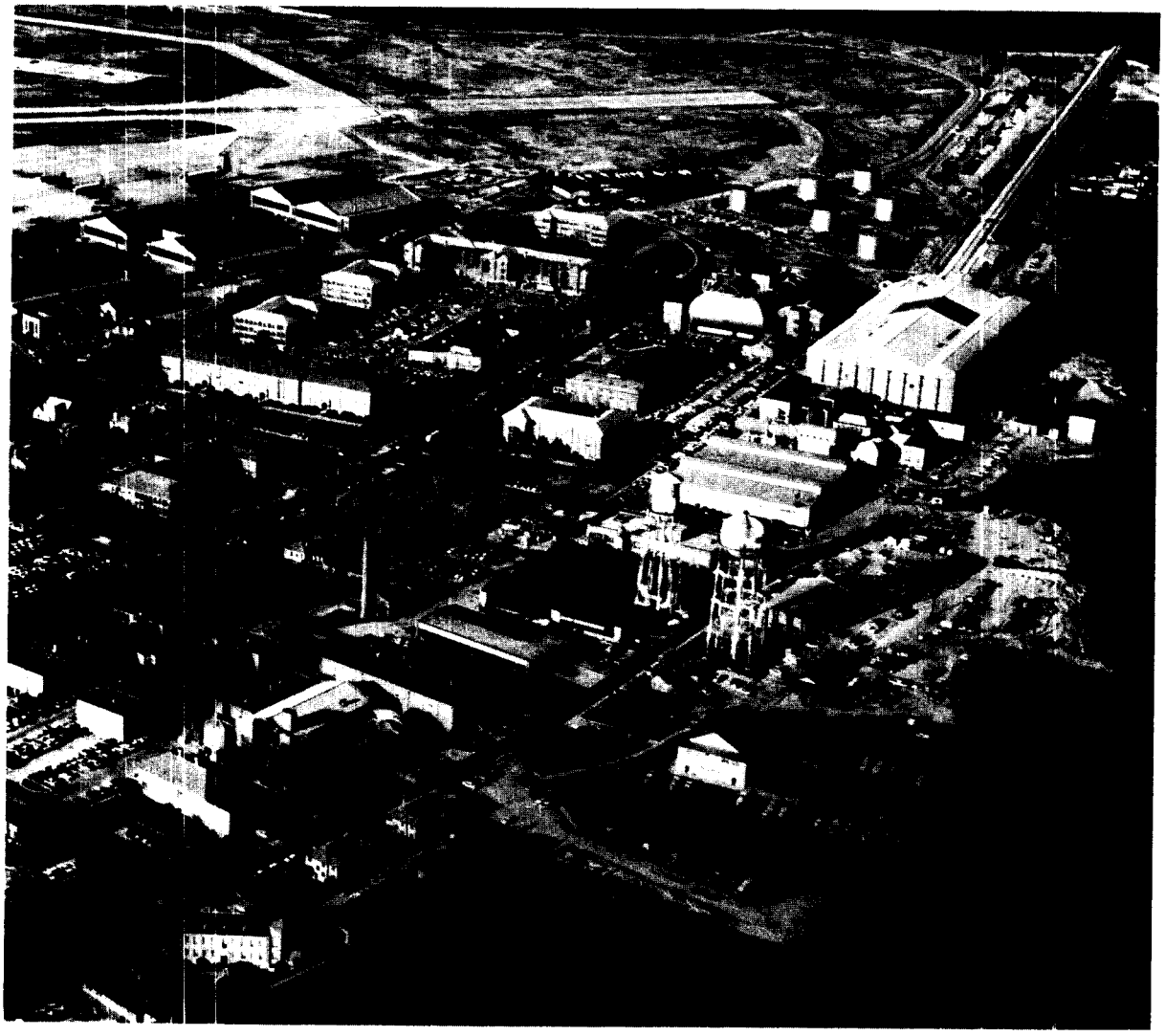
FACILITY NO.	DESCRIPTION
580	FORMERLY ATMOSPHERIC WIND TUNNEL
581	THORNELL AVENUE SUBSTATION
582	EAST COMPRESSOR BUILDING
582-A	FORMERLY LOW-TURBULENCE PRESSURE TUNNEL
583	FORMERLY TRANSONIC BLOWDOWN TUNNEL
583-A	MAINTENANCE BUILDING
584	UTILITY BUILDING
585	FORMERLY 22-INCH TRANSONIC TUNNEL
586	SERVICE BUILDING
587	ADMINISTRATION BUILDING
640	8-FOOT TRANSONIC PRESSURE TUNNEL
641	8-FOOT TRANSONIC TUNNEL
642	BACK RIVER SUBSTATION
643	FULL-SCALE TUNNEL
644	FREE-FLIGHT TUNNEL
645	20-FOOT FREE-SPINNING TUNNEL
646	DYNAMIC TUNNELS BUILDING
647	EAST SHOP
648	TRANSONIC DYNAMICS TUNNEL
650	MATHIS ROAD SUBSTATION
720	TANK NO. 1
720-A	DYNAMIC MODEL SHOP
720-B	TANK NO. 2

LANGLEY RESEARCH CENTER
Hampton, Virginia



AERIAL VIEW - West Area

LANGLEY RESEARCH CENTER
Hampton, Virginia



AERIAL VIEW - East Area

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Organization and staffing chart: LANGLEY RESEARCH CENTER

STAFFING SUMMARY

	62	63	64
Excepted	58	58	58
GS-15	112	122	133
GS-14	176	191	208
Other GS	1957	2132	2364
Wage Board	1207	1542	1533
Total	3770	4025	4296

DIRECTOR
ASSOCIATE DIRECTOR

	62	63	64
Excepted	4	4	4
GS-15	1	1	1
Other GS	3	3	3
Total	8	8	8

FLIGHT REENTRY PROGRAMS OFFICE

	62	63	64
Excepted	2	2	2
GS-15	4	4	4
GS-14	1	1	1
Other GS	11	11	11
Total	18	18	18

COOPERATIVE PROJECTS OFFICE

	62	63	64
Excepted	1	1	1
Total	1	1	1

SCOUT PROJECT GROUP

	62	63	64
GS-15	1	1	1
GS-14	7	8	9
Other GS	25	28	32
Total	33	37	42

RESEARCH STAFF SUPERVISOR

	62	63	64
Excepted	1	1	1
Total	1	1	1

RESEARCH STAFF OFFICE

	62	63	64
GS-15	1	1	1
Other GS	6	6	6
Total	7	7	7

PROGRAM CONTROL ANALYSIS AND BUDGET OFFICE

	62	63	64
GS-15	1	1	1
Other GS	4	4	4
Total	5	5	5

RESEARCH REPORTS DIVISION

	62	63	64
GS-14	1	1	1
Other GS	50	50	50
Total	51	51	51

LRC-PMR FIELD PROJECTS OFFICE

	62	63	64
WB	xx	1	1
Total	xx	1	1

OFFICE OF ASSISTANT DIRECTOR (GROUP 1)

	62	63	64
Excepted	1	1	1
Total	1	1	1

ANALYSIS AND COMPUTATION DIVISION

	62	63	64
Excepted	1	1	1
GS-15	2	3	4
GS-14	4	6	8
Other GS	127	146	170
Wage Board	8	8	8
Total	142	164	191

INSTRUMENT RESEARCH DIVISION

	62	63	64
Excepted	3	3	3
GS-15	7	9	11
GS-14	27	30	35
Other GS	234	274	336
Wage Board	126	127	127
Total	397	443	512

THEORETICAL MECHANICS DIVISION

	62	63	64
Excepted	1	1	1
GS-15	8	8	8
GS-14	8	8	9
Other GS	33	37	42
Total	50	54	60

OFFICE OF ASSISTANT DIRECTOR (GROUP 2)

	62	63	64
Excepted	1	1	1
Total	1	1	1

APPLIED MATERIALS AND PHYSICS DIVISION

	62	63	64
Excepted	5	5	5
GS-15	8	10	12
GS-14	20	22	24
Other GS	150	172	209
Wage Board	5	5	5
Total	188	214	255

DYNAMIC LOADS DIVISION

	62	63	64
Excepted	2	2	2
GS-15	9	9	10
GS-14	10	10	11
Other GS	101	108	115
Total	122	129	138

STRUCTURES RESEARCH DIVISION

	62	63	64
Excepted	3	3	3
GS-15	14	16	18
GS-14	10	12	13
Other GS	110	135	162
Total	137	166	196

OFFICE OF ASSISTANT DIRECTOR (GROUP 3)

	62	63	64
Excepted	1	1	1
Total	1	1	1

AERO-PHYSICS DIVISION

	62	63	64
Excepted	3	3	3
GS-15	13	15	17
GS-14	13	15	17
Other GS	147	173	215
Total	176	206	252

AERO-SPACE MECHANICS DIVISION

	62	63	64
Excepted	3	3	3
GS-15	14	14	14
GS-14	15	16	16
Other GS	107	115	120
Wage Board	34	34	34
Total	173	182	187

FULL-SCALE RESEARCH DIVISION

	62	63	64
Excepted	3	3	3
GS-15	12	13	14
GS-14	18	20	22
Other GS	146	157	178
Total	179	193	217

OFFICE OF CHIEF COUNSEL

	62	63	64
GS-15	1	1	1
Other GS	3	3	3
Total	4	4	4

OFFICE OF PATENT COUNSEL

	62	63	64
GS-14	1	1	1
Other GS	3	3	3
Total	4	4	4

SECURITY OFFICE

	62	63	64
GS-13	1	1	1
Other GS	8	8	8
Total	9	9	9

OFFICE OF PUBLIC AFFAIRS

	62	63	64
GS-14	1	1	1
Other GS	2	2	2
Total	3	3	3

OFFICE OF ASSISTANT DIRECTOR FOR ADMINISTRATION

	62	63	64
Excepted	1	1	1
Other GS	1	1	1
Total	2	2	2

FISCAL DIVISION

	62	63	64
GS-14	1	1	1
Other GS	84	97	107
Total	85	98	108

OFFICE SERVICES DIVISION

	62	63	64
GS-13	1	1	1
Other GS	74	74	74
Wage Board	12	14	14
Total	87	89	89

PERSONNEL DIVISION

	62	63	64
GS-15	1	1	1
GS-14	3	3	3
Other GS	48	55	56
Total	52	59	60

PHOTOGRAPHIC DIVISION

	62	63	64
GS-13	1	1	1
Other GS	38	38	38
Wage Board	45	45	45
Total	84	84	84

PROCUREMENT DIVISION

	62	63	64
GS-15	1	1	1
GS-14	2	2	2
Other GS	95	105	111
Wage Board	30	31	32
Total	128	139	146

SAFETY OFFICE

	62	63	64
GS-13	1	1	1
Other GS	2	2	2
Total	3	3	3

COST ENGINEERING STAFF

	62	63	64
GS-14	1	1	1
Other GS	6	6	6
Total	7	7	7

PROGRAM SCHEDULES AND ANALYSIS UNIT

	62	63	64
GS-13	1	1	1
Other GS	7	10	10
Total	8	11	11

PLANNING CONTROL OFFICE

	62	63	64
GS-13	1	1	1
Other GS	13	8	8
Total	14	9	9

TECHNICAL SERVICE CONTRACT SUPPORT UNIT

	62	63	64
GS-15	xx	1	1
Other GS	xx	7	7
Wage Board	xx	3	3
Total	xx	11	11

OFFICE OF CHIEF OF TECHNICAL SERVICES

	62	63	64
Excepted	2	2	2
GS-15	1	1	1
GS-14	1	1	1
Other GS	8	4	4
Total	12	8	8

ELECTRICAL SERVICE DIVISION

	62	63	64
GS-15	3	3	3
GS-14	6	6	6
Other GS	34	33	33
Wage Board	199	209	209
Total	242	251	251

FLIGHT VEHICLES AND SYSTEMS DIVISION

	62	63	64
GS-15	5	5	5
GS-14	12	12	12
Other GS	102	102	102
Total	119	119	119

MECHANICAL SERVICE DIVISION

	62	63	64
GS-15	2	2	2
GS-14	4	4	4
Other GS	16	17	18
Wage Board	844	856	846
Total	868	879	870

PLANT MAINTENANCE DIVISION

	62	63	64
GS-14	1	1	1
Other GS	7	7	7
Wage Board	204	209	209
Total	212	217	217

RESEARCH MODELS AND FACILITIES DIVISION

	62	63	64
GS-15	3	3	3
GS-14	9	9	9
Other GS	124	124	124
Total	136	136	136

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RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
MANNED SPACECRAFT SYSTEMS				
Supporting research and technology	Direct	9	2	3
	Support	4	1	1
	Total	13	3	4

Langley effort is comprised chiefly of quick-response support to Manned Spacecraft Center on specific problems where Langley researchers, specialized skills, and unique facilities may be utilized.

Mercury	Direct	8	-	-
	Support	3	-	-
	Total	11	-	-

During the period that the Space Task Group was at Langley, ending in fiscal year 1962, some direct Mercury support was provided by the Langley Research Center.

METEOROLOGICAL SATELLITES				
Supporting research and technology	Direct	-	11	13
	Support	-	4	6
	Total	-	15	19

The Aeros project, presently in the study stage, proposes the launching of meteorological satellites into 24-hour stationary equatorial orbits. Langley will perform several advanced mission studies of problems related to Aeros systems.

Meteorological sounding rocket systems	Direct	1	10	10
	Support	1	4	4
	Total	2	14	14

This program consists of systematic meteorological soundings using ARCAS rockets launched from Wallops Station. Approximately two soundings are made each week.

COMMUNICATIONS SATELLITES				
Echo	Direct	17	17	14
	Support	6	7	5
	Total	23	24	19

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		Number of Personnel		
		1962	1963	1964

The Echo program is designed to develop long-lived inflatable structures capable for use as reflecting-surface passive communications satellites. Langley's part in the Echo program is payload development and procurement.

INDUSTRIAL APPLICATIONS	Direct	-	3	3
	Support	-	1	1
	Total	-	4	4

The program at Langley involves the continuous monitoring of Langley work for industrial applications, and the documentation and dissemination of information on innovations with potential industrial applications to NASA Headquarters in the form of written, photographic, or exhibit material.

GEOPHYSICS AND ASTRONOMY

International satellites	Direct	-	25	25
	Support	-	10	10
	Total	-	35	35

This project is a joint Italian-U. S. effort to place an Italian spacecraft into orbit to perform measurements of atmospheric and ionospheric characteristics in an equatorial location using a Scout vehicle. The objectives are to provide: Shot Put sounding rockets and training effort, including vehicle and range operation, for the prototype testing of the spacecraft; Scout launch crew and range operation training, including Wallops Island equipment; and the Scout vehicles, supporting services, technical consultation and overall supervision for range validation and actual launchings from the overseas location. Langley has project responsibility for all satellite, vehicle, and range coordination activities.

LAUNCH VEHICLE DEVELOPMENT

Operational support	Direct	50	58	85
	Support	20	23	34
	Total	70	81	119

This program will provide operational support for all programs using the Scout launch vehicle. This support will include services such as product improvement and failure analysis, maintenance of field test equipment, analysis and studies of recommended uses, peculiar items, and range liaison support. In addition, Langley has responsibility for procuring all Scout vehicles used by the Department of Defense, the Atomic Energy Commission, and NASA.

		Number of Personnel		
		1962	1963	1964
Scout development	Direct	50	12	-
	Support	20	5	-
	Total	70	17	-

Langley's part of this program will be completed in fiscal year 1963.

SPACE VEHICLE SYSTEMS

Supporting research and technology	Direct	782	817	863
	Support	567	587	628
	Total	1,349	1,404	1,491

Space vehicle systems research and technology comprises a major effort at Langley. Effort extends from the study of advanced space vehicle concepts through aerothermodynamics, and loads and structures to the definition of space vehicle design criteria.

Advanced concepts studies are devoted to four major areas: manned orbiting space laboratories, advanced earth or orbit transportation systems using recoverable vehicles, and manned and unmanned planetary missions. Aerothermodynamics research and technology for both spacecraft and launch vehicles covers speed regimes from the low subsonic to 45,000 feet per second and greater. Loads and structures effort is devoted to the study of space vehicle requirements and responses to extreme environmental conditions, such as high-energy radiation, meteoroid impact, hard vacuum, and zero-gravity. Space vehicle design criteria work includes the compilation, correlation, and assessment of state-of-the-art research and technology and the preparation, documentation and updating of general design criteria, standards, and basic guidelines.

This research and technology is carried out both analytically and experimentally to define problems and to find and evaluate promising solutions. Unique facilities, both in operation and under construction, will be used to accomplish work at Langley. Work is carried on predominantly in-house and is supplemented by selected out-of-house contacts with Universities, nonprofit groups and industry.

Scout reentry heating	Direct	50	50	52
	Support	36	36	38
	Total	86	86	90

The objective of this project, for which Langley has responsibility, is to obtain data on reentry heating, dynamics and communications problems during actual flight tests at speed and altitude regimes where there will be significant real-gas effects on the various phenomena investigated.

		Number of Personnel		
		1962	1963	1964
FIRE	Direct	60	90	84
	Support	43	65	61
	Total	103	155	145

This project will investigate the reentry environment at lunar reentry speed. Emphasis will be placed on the determination of total heat transfer, hot air radiance, materials response, and radio blackout effects.

Advanced FIRE	Direct	-	-	19
	Support	-	-	13
	Total	-	-	32

This project is intended to determine the aerodynamic heating environment associated with a planetary reentry velocity, and to study related communications blackout and materials behavior problems. The significant benefits to be derived from this flight research apply directly to all manned and unmanned vehicles required to survive at super-escape reentry velocities. The data will be correlated with data produced in ground facilities and with advanced analytical prediction methods. This project is an extension of Project FIRE.

Scout-launched meteoroid satellites	Direct	16	19	7
	Support	12	14	5
	Total	28	33	12

The objective of these satellites is to supply statistically significant design information on the micrometeoroid hazard to spacecraft, to obtain an experimental comparison of the relative resistance to penetration of aluminum and steel when used as spacecraft materials, to determine meteoroid mass as a function of impact rate by the use of impact detectors, and to provide a flight test of a Langley developed mylar capacitor detector which shows great promise as a micrometeoroid sensor.

Saturn-launched meteoroid experiments	Direct	-	11	11
	Support	-	7	7
	Total	-	18	18

Langley will work with Marshall Space Flight Center, which has general project responsibility, in the area of sensor development for these advanced meteoroid flights.

Space vehicle recovery	Direct	-	-	10
	Support	-	-	7
	Total	-	-	17

		Number of Personnel		
		1962	1963	1964

This project is designed to investigate potential aerodynamic shapes for booster recovery, or for spacecraft configurations which will lead to better control within the atmosphere at low speeds.

Secondary environmental experiments	Direct	-	-	30
	Support	-	-	20
	Total	-	-	50

Langley will have responsibility for the design, development and integration of experiments on materials, structures, and components to be flown as secondary, noninterferring experiments on other NASA flight projects or as primary experiments on small launch vehicles.

Small space vehicle flight experiments	Direct	55	61	54
	Support	39	45	41
	Total	94	106	95

This category encompasses several projects. Project Trailblazer is designed to obtain measurements from the ground of the optical radiation and radar backscatter characteristics of bodies reentering the atmosphere at ballistic missile speeds.

The meteoroid penetration probe is designed to investigate such factors as the origin, distribution, mass, velocity, and density of meteoroids. The paraglider test vehicle will be boosted to 700,000 feet and will record the depth of meteoroid penetration in fixed steps as well as the number of impacts.

The meteoroid simulation experiment will use rocket-powered, artificial meteor reentries in order to calibrate the accumulated optical and radar data collected on natural meteors, and to qualify existing theories or formulate new theory for high-speed reentries.

The wind-shear measurements project is to provide knowledge on the wind-shear characteristics experienced by vertically rising vehicles. The knowledge gained is aimed primarily at measurements of the wind profile characteristics for use in connection with booster response problems. Measurements are presently being taken at the Atlantic Missile Range and will begin at the Pacific Missile Range and Wallops Station in fiscal years 1963 and 1964.

ELECTRONIC SYSTEMS

Supporting research and technology	Direct	290	309	377
	Support	214	223	274
	Total	504	532	651

		Number of Personnel		
		1962	1963	1964

Technological advances will be sought in the areas of guidance systems, control systems, communications, tracking, data acquisition, data handling and processing, and instrumentation. Research will be conducted to obtain information on: the capabilities of control systems, pictorial electronic displays and display techniques for optimal presentation, development and utilization of automatic control systems, advanced control theory, and control components technology; communication techniques and components, and advanced electronic devices; tracking and data acquisition techniques, components and advanced electronic devices; improvements in current analog and digital techniques and equipment, as well as the development of computing and programming techniques for the solution of analytical and experimental data processing problems; and astrophysical instrumentation techniques and design, flight engineering techniques and instrumentation required to measure and indicate a spacecraft's electronic system integrity and performance, as well as behavior of materials and models in simulator facilities.

Small flight projects	Direct	136	114	43
	Support	99	82	31
	Total	235	196	74

This category includes three projects. Project RAM is to provide flight verification of theoretical predictions for flow field ionization and associated electromagnetic signal loss, to study effects of ionization on antenna performance, to measure flow field parameters, and to develop practical methods of eliminating the blackout problem.

Project Scanner is to make detailed measurements, from high altitudes, of the natural radiation gradients which define the horizon in several regions of the spectrum and to relate these gradients to the solid earth horizon. A secondary objective is to develop flight-proven hardware for extended statistical tests.

Project SOCS is to determine the capabilities of the NASA-developed solar orientation control system when used for pointing the axis of a rigid body toward the sun; to determine the capabilities of the NASA-developed planetary orientation control system when used for pointing the axis of a rigid body toward the earth, and the attitude-sensing capabilities of the horizon scanner used in this orientation control system; and to determine the capabilities of the solar orientation control system when used for pointing an elastic body (erectable flexible solar energy collector) toward the sun.

HUMAN FACTOR SYSTEMS

Supporting research and technology	Direct	30	32	35
	Support	21	23	26
	Total	51	55	61

		Number of Personnel		
		1962	1963	1964

Research in human performance and behavior, and development of life support systems, are needed to determine the human factors problems in long space missions and to determine practical solutions. Langley is conducting research in the areas of perception, reaction, and systems studies. These investigations include studies of certain physiological characteristics of the sensory organs of the human as well as the effects of confinement of a multiple crew for long durations. In addition, research is proposed for subsequent development of advanced life-support components and systems, such as pressure suits and back packs, oxygen regenerators, carbon dioxide absorbers, water reclamation systems, and other environmental control systems.

CHEMICAL PROPULSION

Supporting research and technology	Direct	70	79	80
	Support	48	47	55
	Total	118	126	135

The objective of the chemical propulsion program is to develop rocket engines of improved performance and reliability to support launch vehicle development necessary for take-off, rendezvous techniques, lunar orbiting and landing operations. Research and development will be continued in aero-thermo-chemistry and heat transfer. Research is under way to aid in the development of flight-qualified solid-propellant rocket motors. New promising configurations will be evaluated through building and testing of hardware in ground facilities. Research will be continued to develop materials for rocket motor components and to more adequately define those fundamental reaction kinetics influencing the combustion characteristics of solid propellants.

Project Vector is included in this category. The objectives of this project are to advance the art of rocket vehicle control system technology, and specifically to investigate the characteristics of an advanced system under flight conditions. System characteristics which will be studied include the general system response to error signals of various amplitudes and the effects on response of nonlinearities caused by the sine relation between control force and control rocket deflection, rate limitation of the control rocket deflection, and backlash in the actuation system.

SPACE POWER

Supporting research and technology	Direct	28	29	33
	Support	20	21	24
	Total	48	50	57

		Number of Personnel		
		1962	1963	1964

Solar cells and batteries have been a useful means of providing electrical power to operate instruments, communications, and other equipment in space. To meet the requirements of advanced space vehicles, such as higher reliability, lighter weight, longer life, and improved radiation resistance, improved energy sources are needed. This center is continuing in the development of the technology by the evaluation of components as well as by utilizing in-house capability to provide design guidance.

AERONAUTICS

Supporting research and technology	Direct	421	445	483
	Support	309	323	350
	Total	730	768	833

Langley has a continuing program of research for providing flow characteristics in the hypersonic, supersonic, subsonic, and transonic regimes and on the effects of the flow on complete aircraft configurations as well as their components. Investigations are being pursued on aircraft loads and structures to define experimentally environmental conditions which impose loads on airframes, theoretical determinations of structural dynamic characteristics, and basic theory and experimental data for design of efficient structures. Further, basic research is continuing in air-breathing propulsion to increase the performance characteristics in subsonic as well as supersonic and transonic propulsion systems. Major objectives are the development of design guidance for advanced civilian and military aircraft.

Supersonic transport	Direct	59	62	64
	Support	42	45	47
	Total	101	107	111

The Federal Aviation Agency, Department of Defense, and NASA are participating in a joint research program on an economically competitive supersonic commercial air transport. Langley has a continuing responsibility in the aerodynamic and structural research aspects of the project.

V/STOL aircraft	Direct	72	77	81
	Support	53	55	58
	Total	125	132	139

This project consists of the planning, direction, execution, and evaluation of vertical and short take-off and landing (V/STOL) aircraft research and flight studies to better define and understand V/STOL concepts and characteristics, and to provide the technology for the design and development of practical commerical and military V/STOL vehicles. Major effort is directed toward understanding the aerodynamic, structures, and operating problems of such aircraft.

		Number of Personnel		
		1962	1963	1964
TRACKING AND DATA ACQUISITION				
Supporting research and technology	Direct	6	31	33
	Support	3	9	10
	Total	9	40	43

This effort is to develop preliminary design information and technical specifications for independently steerable antennas, to establish a continuing radar signature research and development effort, and to obtain an operational general purpose read-out system for data recorded on magnetic tape in pulse code modulation form.

Network operation and equipment and components	Direct	-	15	18
	Support	-	9	10
	Total	-	24	28

This project provides in-house optical tracking and data acquisition support and for the purchase of necessary equipment and components for Langley reentry flight projects. Philco Corporation provides contractor effort on tracking and data acquisition.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the Index to that volume for the location of detailed project justification.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

LAUNCH OPERATIONS CENTER

MISSION:

The former Launch Operations Directorate of Marshall Space Flight Center was formally established as the Launch Operations Center on July 1, 1962, with the following responsibilities:

1. To conduct overall planning and supervision of the integration, test, checkout and launch of NASA space vehicle systems at the Atlantic Missile Range (AMR) and Merritt Island, except for the Mercury and Gemini projects.

2. To provide a central point of contact with the Atlantic Missile Range for NASA.

3. To provide support in general, technical, administrative, and facilities areas, such as:

a. 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.

b. Programming, integrating and meeting user requirements for such general purpose facilities as office, warehouse, and maintenance buildings; utilities; and roads.

c. Design and construction of all NASA facilities at AMR and Merritt Island to meet users' functional requirements.

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

e. Officially representing NASA in coordinating with the 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 AMR.

LOCATION:

Launch Operations Center Headquarters, industrial, and launch facilities are presently located within and adjacent to the Cape Canaveral Missile Test Annex in Florida, which is situated approximately 50 miles east of Orlando and south of Daytona Beach in northeast Brevard County. A portion

of the administrative functions are located within leased space in the town of Cocoa Beach, approximately 5 miles south.

LAND:

The Atlantic Missile Range at Cape Canaveral (excluding Patrick Air Force Base installations) consists of approximately 15,800 acres, of which the Launch Operations Center occupies 350 acres under permit from the Air Force. The remainder of the Range is occupied by the armed services in support of various weapons systems.

At the present time an additional 87,400 acres is being procured by NASA in the Merritt Island area to provide the space necessary for the manned lunar landing program.

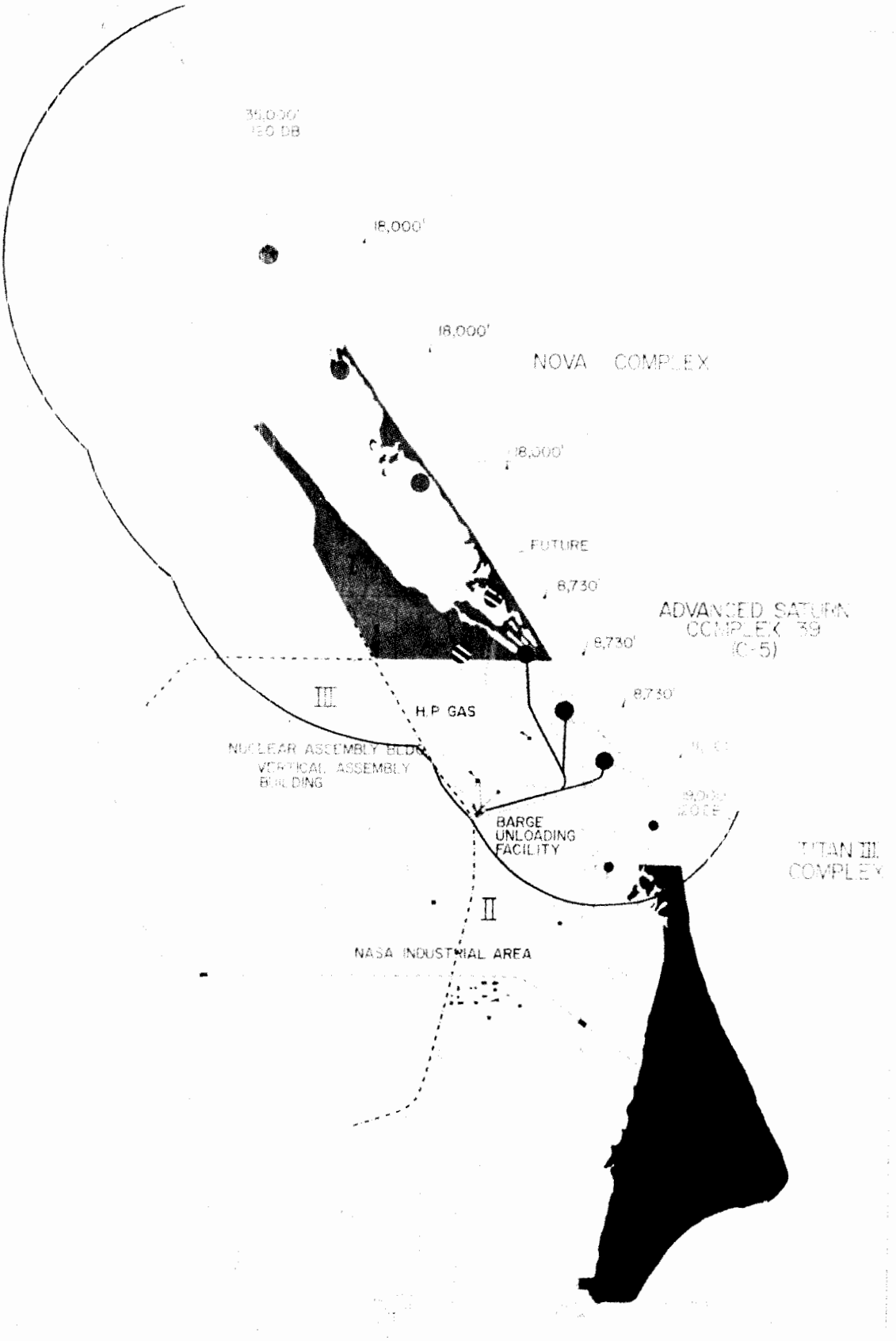
PLANT VALUE:

A large part of the launch and industrial facilities utilized by NASA are retained as a part of the real property of the Air Force Missile Test Center. The plant value of property to which NASA does have title is $69,206,000, and includes capital equipment, work in progress, and land for which payment was made through June 30, 1962.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	333	800	1,200
Personnel costs.....	$2,998,965	$5,533,000	$11,088,000
Operation of installation.....	3,403,973	10,300,000	26,100,000
Subtotal.....	$6,402,938	$15,833,000	$37,188,000
Construction program.....	116,291,400	326,974,400	312,855,000
Total installation costs.	$122,694,338	$342,807,400	$350,043,000

NASA
MERRITT ISLAND LAUNCH AREA
CAPE CANAVERAL MISSILE TEST ANNEX



LOC 3

LAUNCH OPERATIONS CENTER

FISCAL YEAR 1964 ESTIMATES

LOCATION PLAN

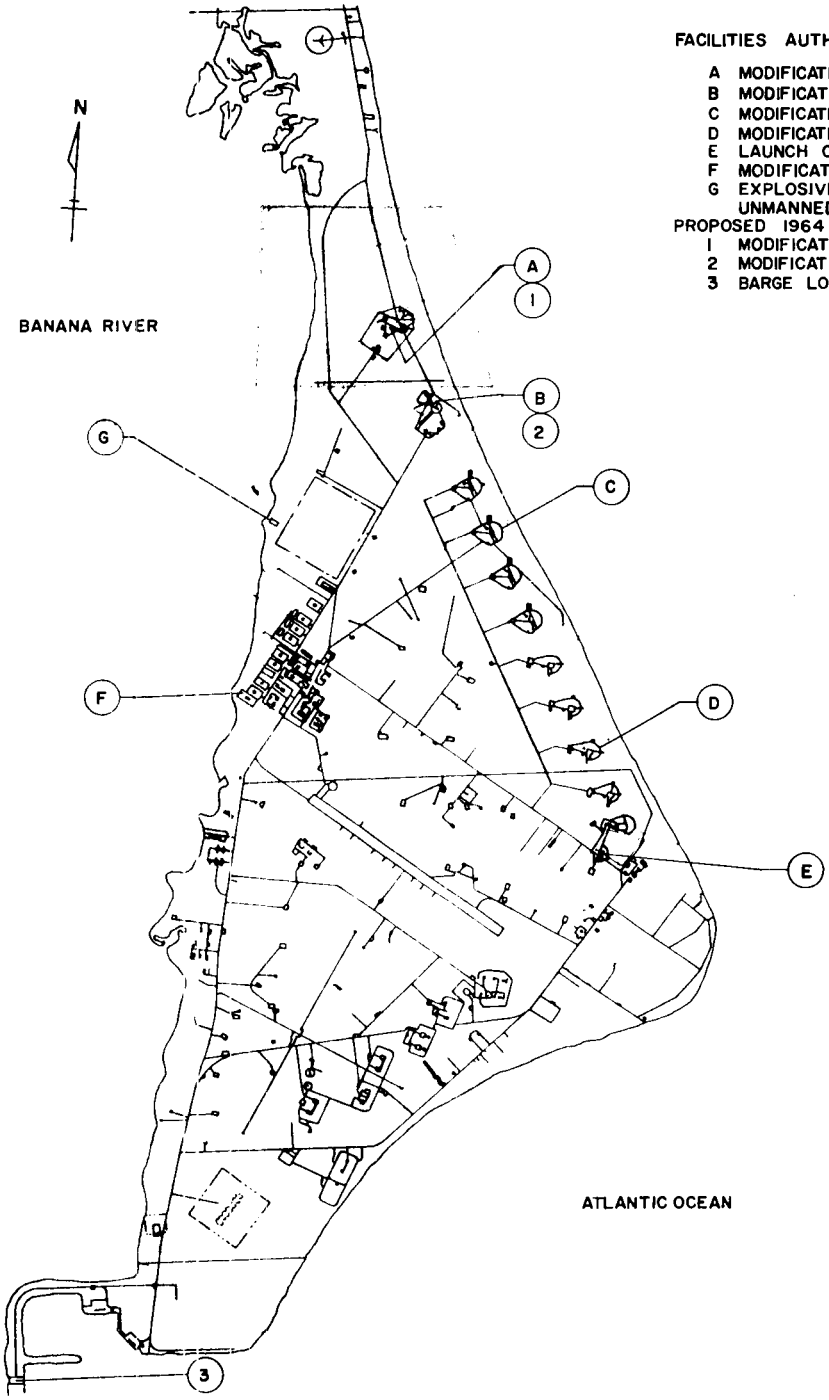
CAPE CANAVERAL MISSILE TEST ANNEX

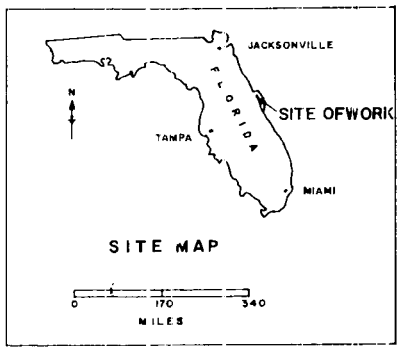
FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

- A MODIFICATIONS TO LAUNCH COMPLEX 37
- B MODIFICATIONS TO LAUNCH COMPLEX 34
- C MODIFICATIONS TO LAUNCH COMPLEX 19
- D MODIFICATIONS TO LAUNCH COMPLEX 12
- E LAUNCH COMPLEX 36B
- F MODIFICATIONS TO MAB "AF"
- G EXPLOSIVE SAFE ASSEMBLY FACILITY FOR UNMANNED SPACECRAFT

PROPOSED 1964 PROJECTS

- 1 MODIFICATIONS AND ADDITIONS TO L.C 37
- 2 MODIFICATIONS AND ADDITIONS TO L.C 34
- 3 BARGE LOCK AND CHANNEL





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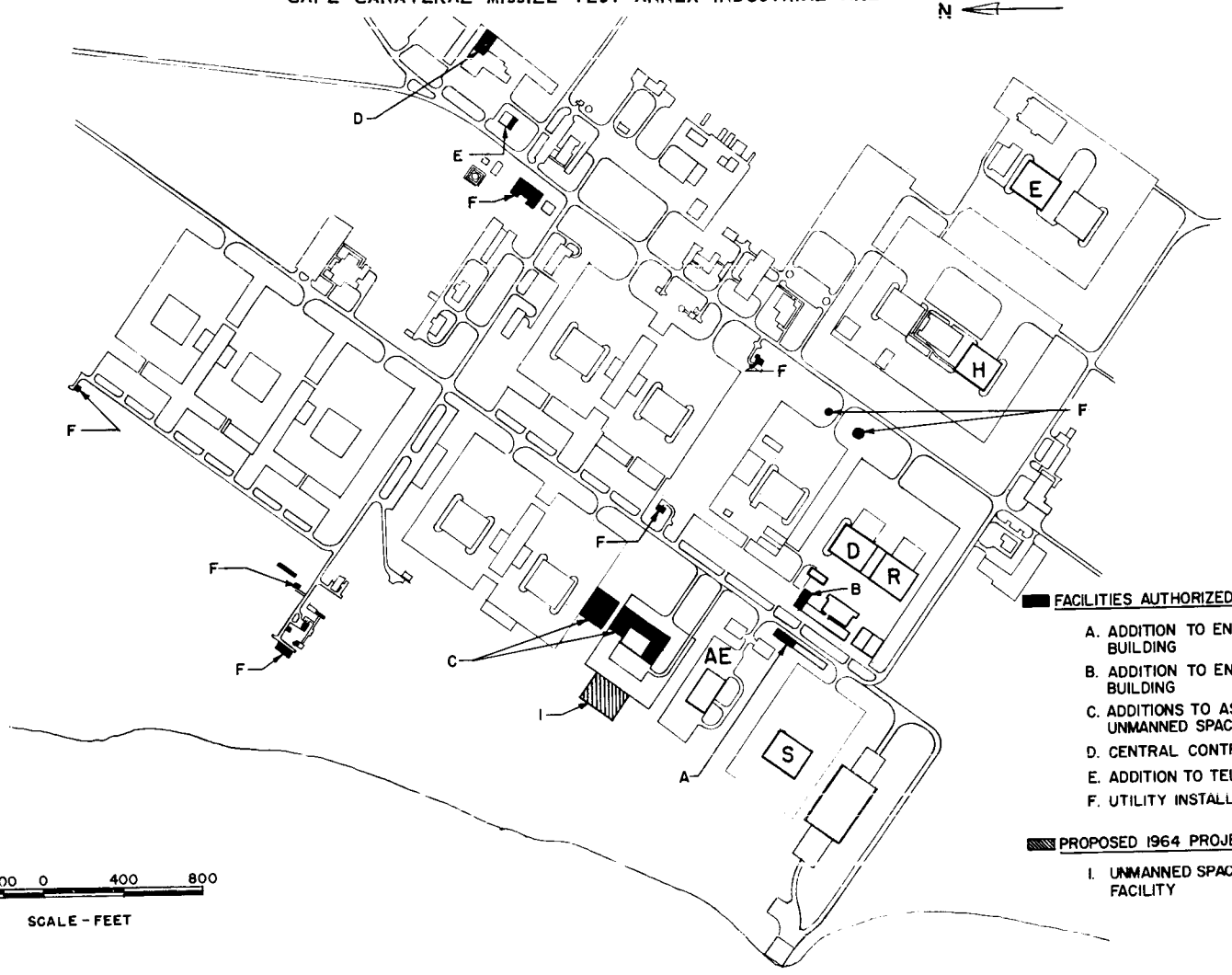
LAUNCH OPERATIONS CENTER

FISCAL YEAR 1964 ESTIMATES

CAPE CANAVERAL MISSILE TEST ANNEX INDUSTRIAL AREA



FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

A. ADDITION TO ENGINEERING & OPERATIONS BUILDING

B. ADDITION TO ENGINEERING & LABORATORY BUILDING

C. ADDITIONS TO ASSEMBLY FACILITY FOR UNMANNED SPACECRAFT

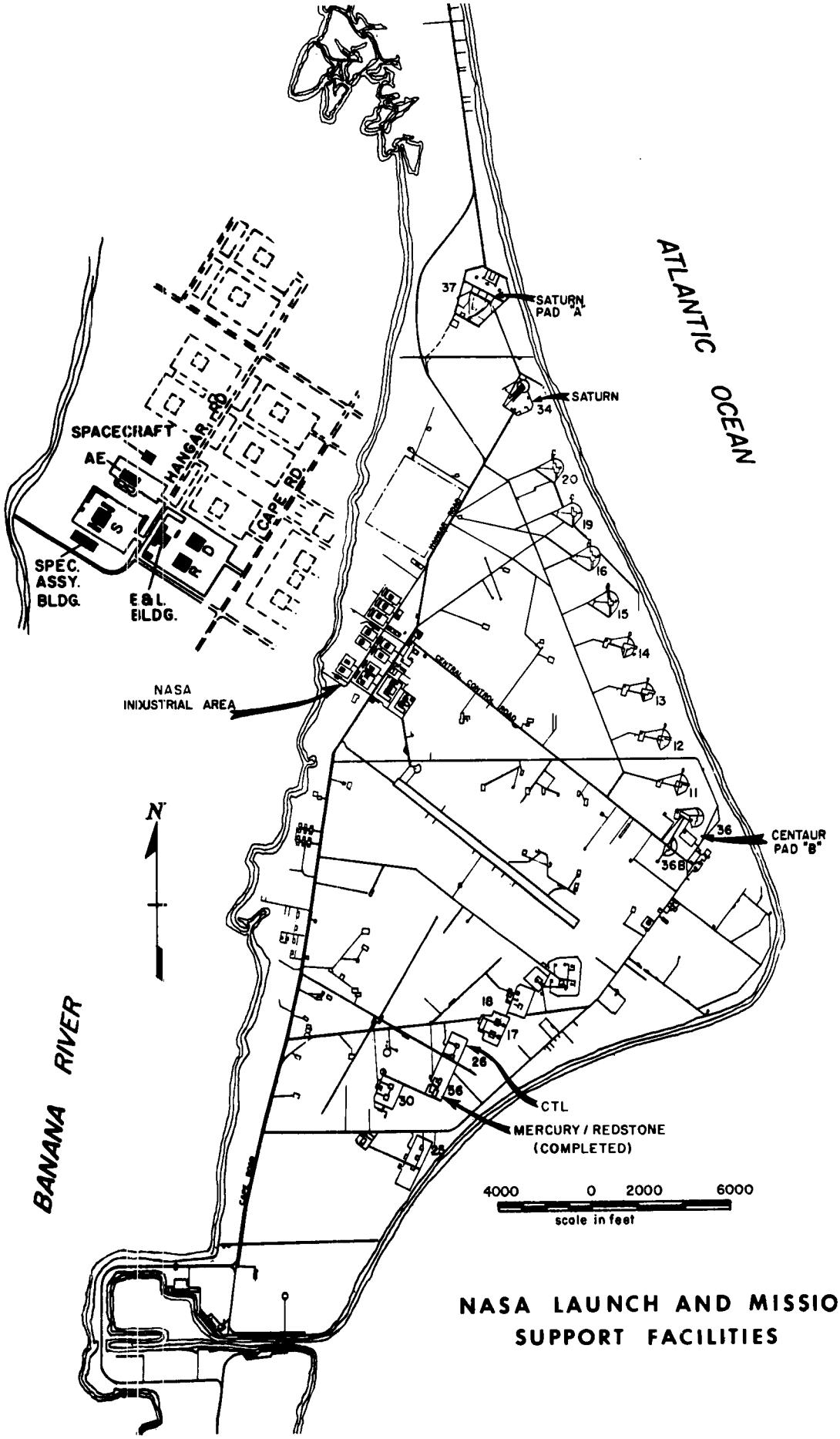
D. CENTRAL CONTROL FACILITY

E. ADDITION TO TELEPHONE EXCHANGE (CCMTA)

F. UTILITY INSTALLATION-EXISTING AREA

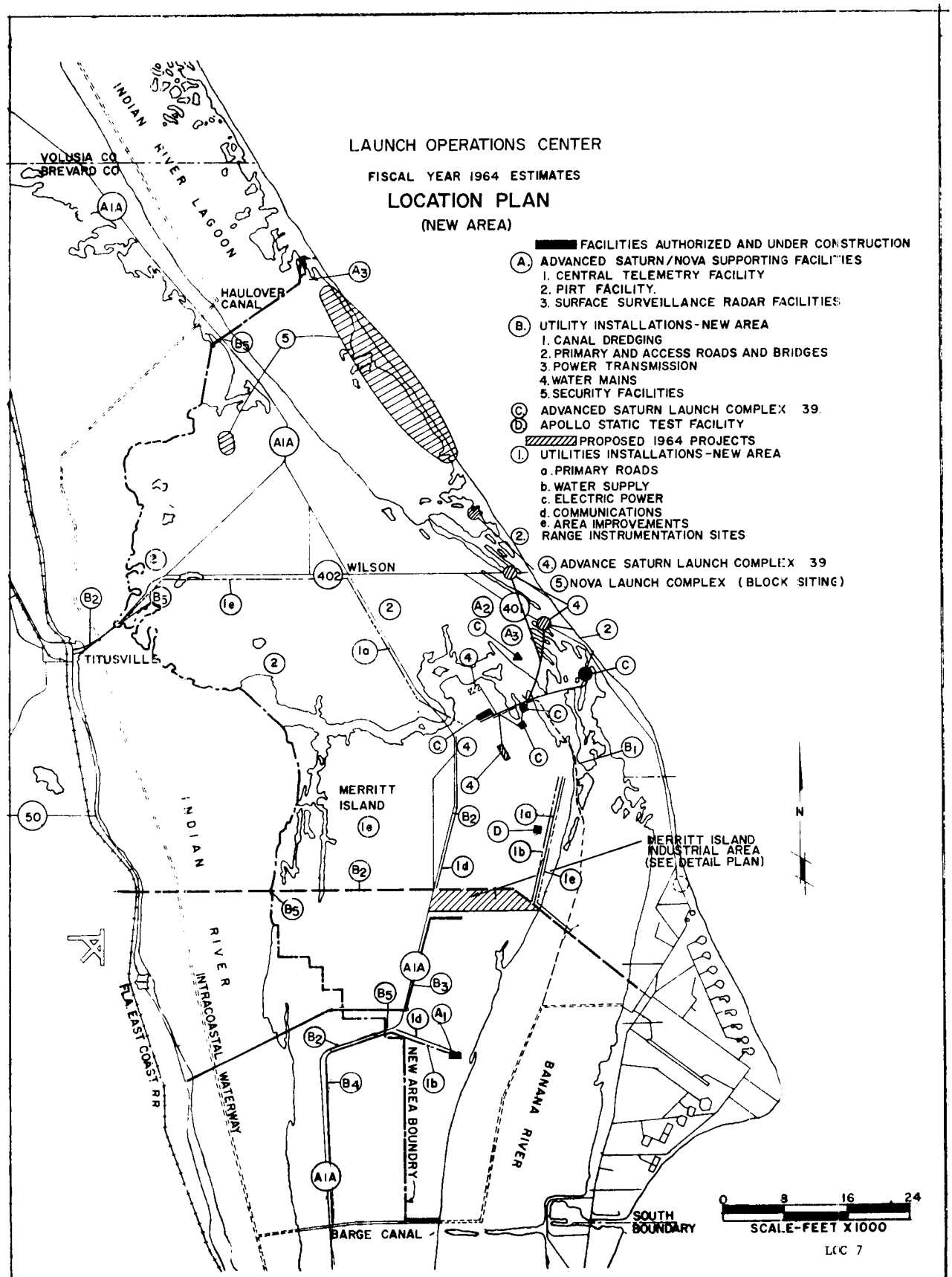
PROPOSED 1964 PROJECTS

I. UNMANNED SPACECRAFT OPERATIONS FACILITY



NASA LAUNCH AND MISSION SUPPORT FACILITIES

LOC 6


LAUNCH OPERATIONS CENTER
FISCAL YEAR 1964 ESTIMATES
LOCATION PLAN
(NEW AREA)
FACILITIES AUTHORIZED AND UNDER CONSTRUCTION
A. ADVANCED SATURN/NOVA SUPPORTING FACILITIES
1. CENTRAL TELEMETRY FACILITY
2. PIRT FACILITY.
3. SURFACE SURVEILLANCE RADAR FACILITIES
B. UTILITY INSTALLATIONS-NEW AREA
1. CANAL DREDGING
2. PRIMARY AND ACCESS ROADS AND BRIDGES
3. POWER TRANSMISSION
4. WATER MAINS
5. SECURITY FACILITIES
C. ADVANCED SATURN LAUNCH COMPLEX 39.
D. APOLLO STATIC TEST FACILITY
PROPOSED 1964 PROJECTS
I. UTILITIES INSTALLATIONS-NEW AREA
a. PRIMARY ROADS
b. WATER SUPPLY
c. ELECTRIC POWER
d. COMMUNICATIONS
e. AREA IMPROVEMENTS
2. RANGE INSTRUMENTATION SITES
4. ADVANCE SATURN LAUNCH COMPLEX 39
5. NOVA LAUNCH COMPLEX (BLOCK SITING)
VOLUSIA CO
BREVARD CO
INDIAN RIVER LAGOON
HAULOVER CANAL
WILSON
TITUSVILLE
MERRITT ISLAND
INDIAN RIVER
INTRACOASTAL WATERWAY
FLA EAST COAST RR
NEW AREA BOUNDRY
BANANA RIVER
BARGE CANAL
SOUTH BOUNDARY
MERRITT ISLAND INDUSTRIAL AREA (SEE DETAIL PLAN)
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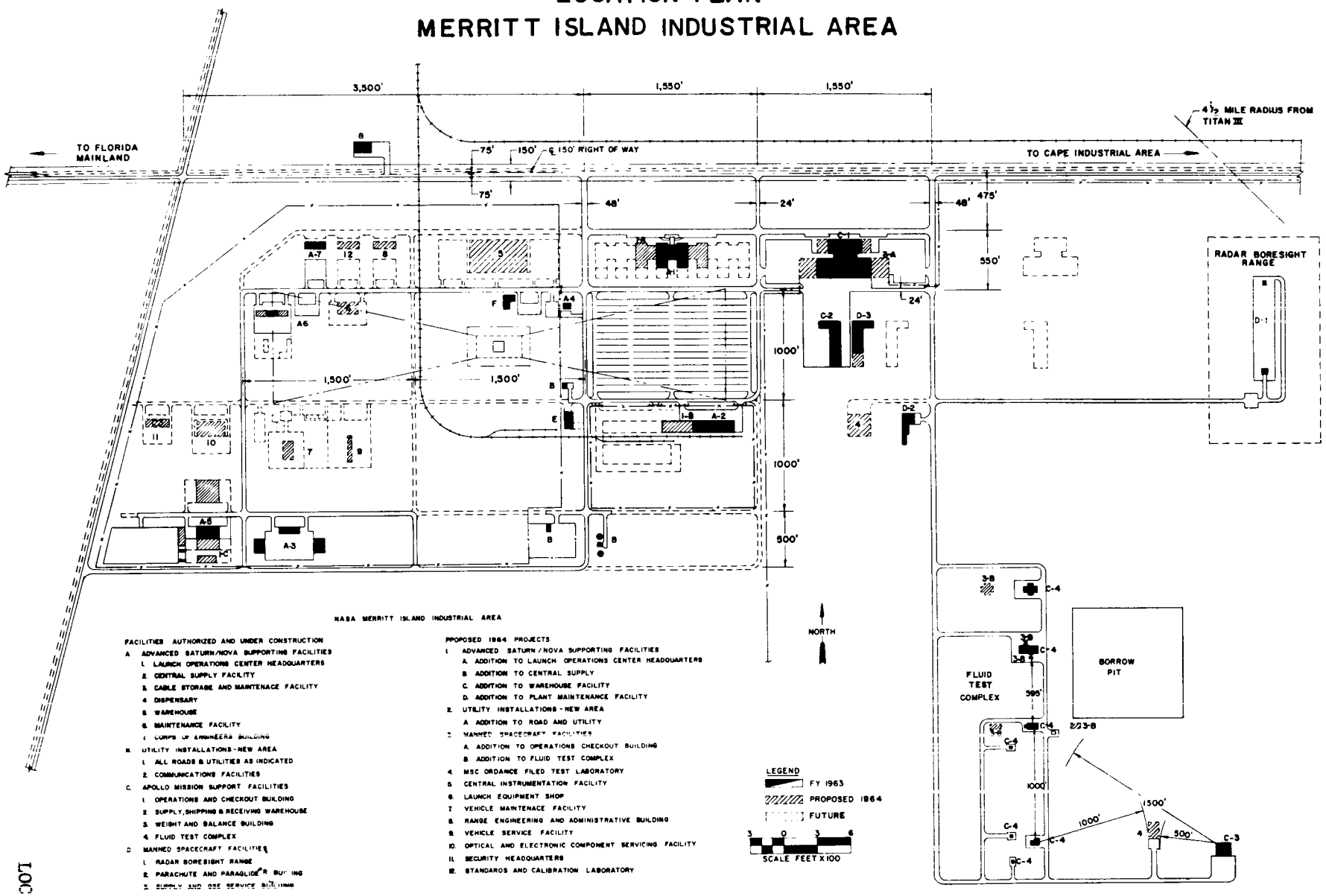
LOC 7

LAUNCH OPERATIONS CENTER

FISCAL YEAR 1964 ESTIMATES

LOCATION PLAN
MERRITT ISLAND INDUSTRIAL AREA



NASA MERRITT ISLAND INDUSTRIAL AREA

FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

A. ADVANCED SATURN/NOVA SUPPORTING FACILITIES
1. LAUNCH OPERATIONS CENTER HEADQUARTERS
2. CENTRAL SUPPLY FACILITY
3. CABLE STORAGE AND MAINTENACE FACILITY
4. DISPENSARY
5. WAREHOUSE
6. MAINTENANCE FACILITY
7. CORPS OF ENGINEERS BUILDING

B. UTILITY INSTALLATIONS - NEW AREA
1. ALL ROADS & UTILITIES AS INDICATED
2. COMMUNICATIONS FACILITIES

C. APOLLO MISSION SUPPORT FACILITIES
1. OPERATIONS AND CHECKOUT BUILDING
2. SUPPLY, SHIPPING & RECEIVING WAREHOUSE
3. WEIGHT AND BALANCE BUILDING
4. FLUID TEST COMPLEX

D. MANNED SPACECRAFT FACILITIES
1. RADAR BORESIGHT RANGE
2. PARACHUTE AND PARAGLIDER BUILDING
3. SUPPLY AND GSE SERVICE BUILDING

E. FIRE STATION

F. MAIN CAFETERIA

PROPOSED 1964 PROJECTS

1. ADVANCED SATURN / NOVA SUPPORTING FACILITIES
A. ADDITION TO LAUNCH OPERATIONS CENTER HEADQUARTERS
B. ADDITION TO CENTRAL SUPPLY
C. ADDITION TO WAREHOUSE FACILITY
D. ADDITION TO PLANT MAINTENANCE FACILITY

2. UTILITY INSTALLATIONS - NEW AREA
A. ADDITION TO ROAD AND UTILITY

3. MANNED SPACECRAFT FACILITIES
A. ADDITION TO OPERATIONS CHECKOUT BUILDING
B. ADDITION TO FLUID TEST COMPLEX

4. MSC ORDANCE FILED TEST LABORATORY
5. CENTRAL INSTRUMENTATION FACILITY
6. LAUNCH EQUIPMENT SHOP
7. VEHICLE MAINTENACE FACILITY
8. RANGE ENGINEERING AND ADMINISTRATIVE BUILDING
9. VEHICLE SERVICE FACILITY
10. OPTICAL AND ELECTRONIC COMPONENT SERVICING FACILITY
11. SECURITY HEADQUARTERS
12. STANDARDS AND CALIBRATION LABORATORY

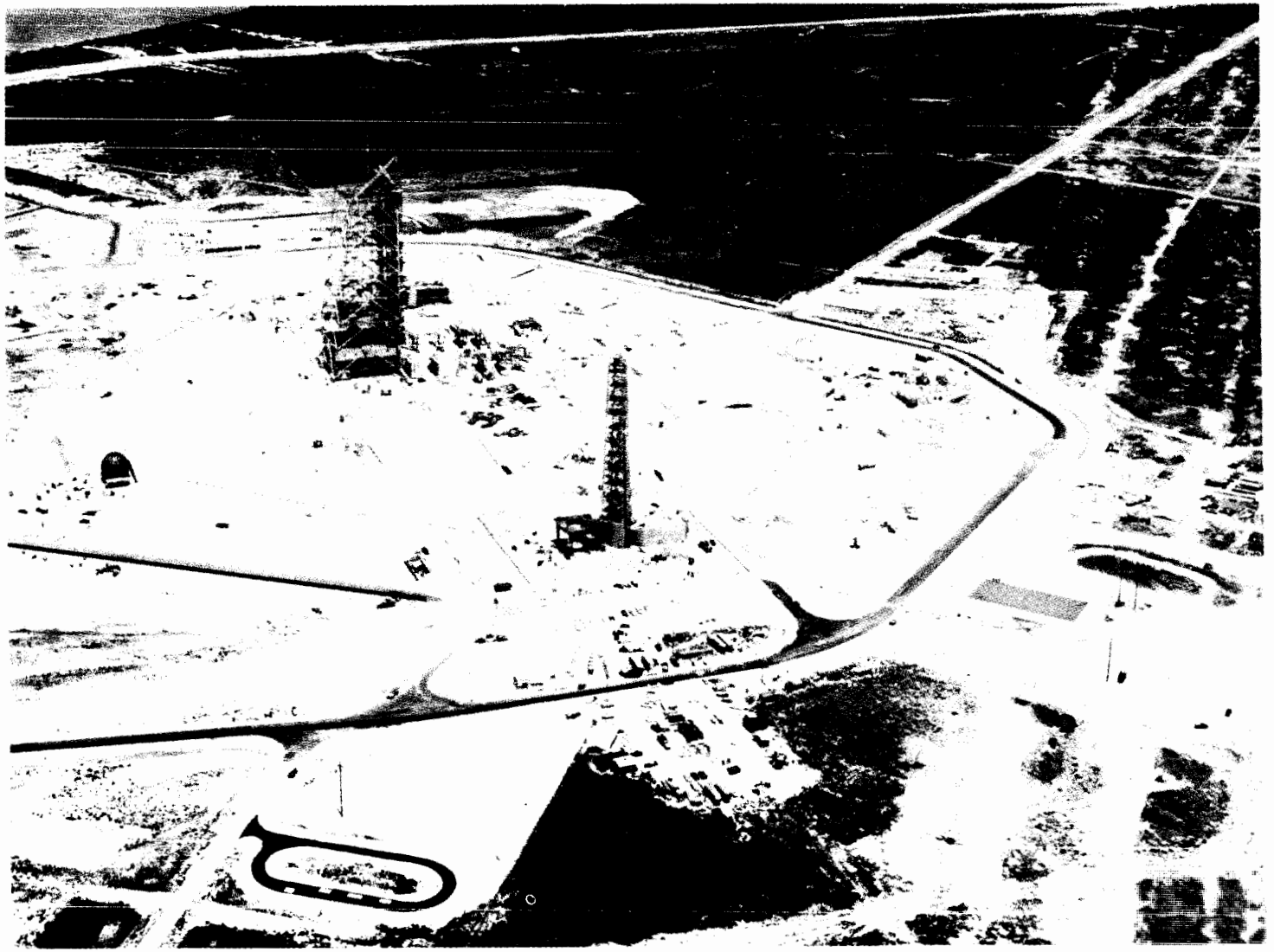
LAUNCH OPERATIONS CENTER
Cocoa Beach, Florida

AERIAL VIEW - Overall View of Industrial Area

LAUNCH OPERATIONS CENTER
Cocoa Beach, Florida

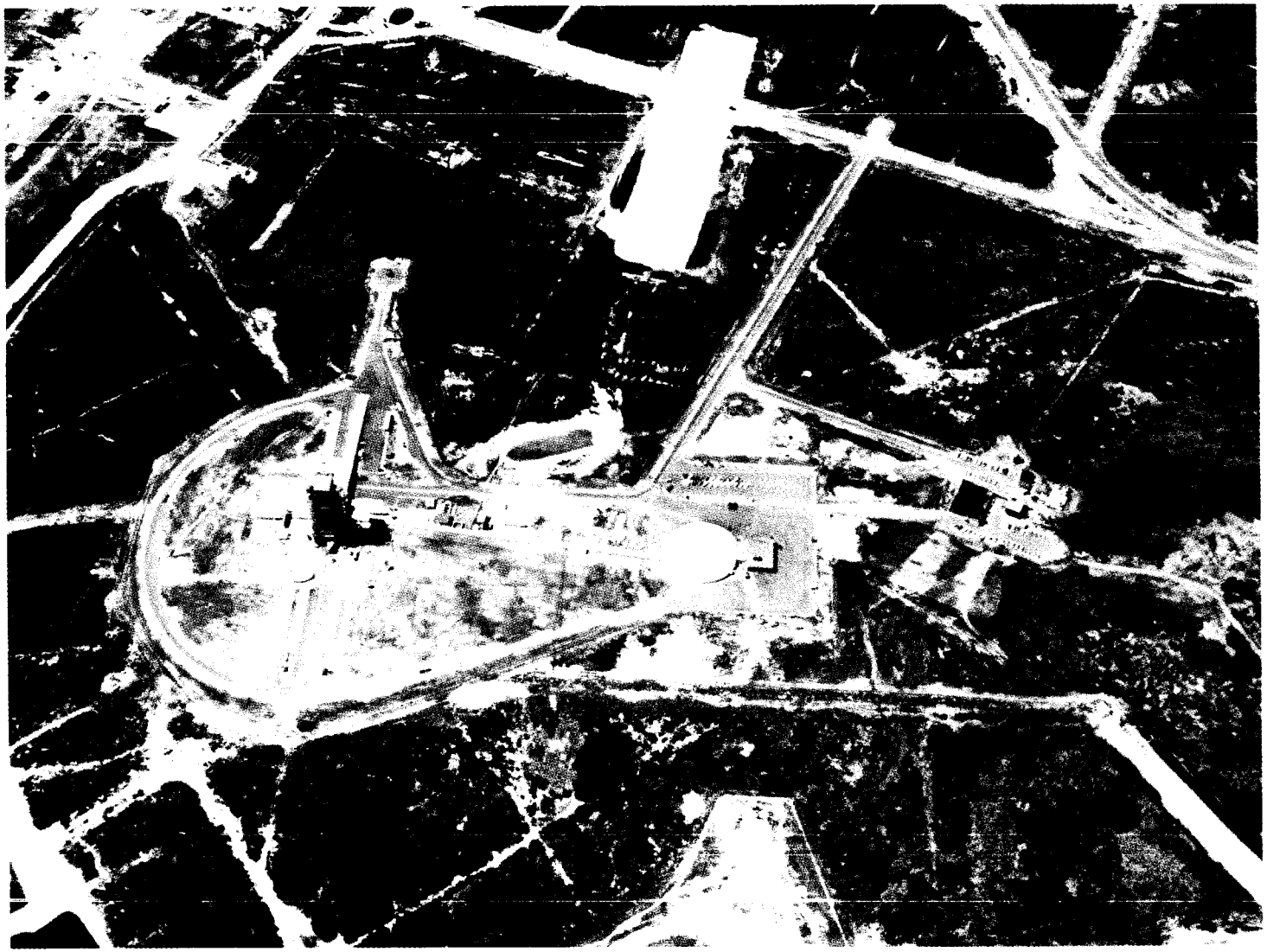
AERIAL VIEW - West Half of Industrial Area

LAUNCH OPERATIONS CENTER
Cocoa Beach, Florida



AERIAL VIEW - Launch Complex No. 37

LAUNCH OPERATIONS CENTER
Cocoa Beach, Florida



AERIAL VIEW - Launch Complex No. 36

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART:
LAUNCH OPERATIONS CENTER

STAFF SUMMARY

	FY 62	FY 63	FY 64
EXCEPTED	2	5	5
GS 15	16	50	68
GS 14	34	50	60
OTHER GS	270	640	1082
WB	11	46	40
TOTAL LOC ORGZ. STAFFING	333	800	1200

OFFICE of DIRECTOR

	FY62	FY63	FY64
EXCEPTED	1	2	2
GS 15	1	1	1
GS 14	1	1	1
OTHER GS	4	4	6
TOTAL	7	8	10

ASSOC. DIRECTOR FOR ADM. AND SERVICES

	FY62	FY63	FY64
EXCEPTED	0	1	1
GS 15	1	2	2
GS 14	0	0	0
OTHER GS	0	2	3
TOTAL	1	5	6

TECHNICAL AND SCIENTIFIC STAFF

	FY 62	FY 63	FY 64
GS 15	1	1	2
GS 14	0	2	2
OTHER GS	2	1	1
TOTAL	3	4	5

RELIABILITY

	FY 62	FY 63	FY 64
GS 15	1	1	2
GS 14	0	1	2
OTHER GS	3	2	4
TOTAL	4	4	8

COMMUNITY DEVELOPMENT

	FY 62	FY 63	FY 64
GS 15	0	1	1
GS 14	1	0	0
OTHER GS	1	3	4
TOTAL	2	4	5

INDUSTRIAL RELATIONS

	FY 62	FY 63	FY 64
GS 15	0	0	1
GS 14	0	1	1
OTHER GS	2	1	1
TOTAL	2	2	3

SAFETY

	FY 62	FY 63	FY 64
GS 15	0	1	1
GS 14	1	0	0
OTHER GS	0	5	7
TOTAL	1	6	8

INSTRUMENTATION PLANNING OFFICE

	FY 62	FY 63	FY 64
EXCEPTED	0	1	1
GS 15	0	11	11
GS 14	0	11	8
OTHER GS	0	7	165
TOTAL	0	30	185

PUBLIC RELATIONS OFFICE

	FY 62	FY 63	FY 64
GS 15	0	1	1
GS 14	1	4	4
OTHER GS	6	7	13
TOTAL	7	12	18

LIGHT / MEDIUM SPACE VEHICLE SYSTEMS OFFICE

	FY 62	FY 63	FY 64
GS 15	1	2	3
GS 14	2	3	5
OTHER GS	3	9	12
TOTAL	6	14	20

HEAVY SPACE VEHICLE SYSTEMS OFFICE

	FY 62	FY 63	FY 64
GS 15	1	2	3
GS 14	1	8	10
OTHER GS	7	16	27
TOTAL	9	26	40

NASA TEST SUPPORT OFFICE

	FY 62	FY 63	FY 64
GS 15	1	1	2
GS 14	2	1	1
OTHER GS	8	9	9
TOTAL	11	11	12

LEGAL OFFICE

	FY 62	FY 63	FY 64
GS 15	1	1	1
OTHER GS	2	4	7
TOTAL	3	5	8

SUPPORT SERVICES OFFICE

	FY 62	FY 63	FY 64
GS 15	0	1	2
GS 14	1	3	3
OTHER GS	33	71	104
WB	7	13	13
TOTAL	41	88	122

SECURITY OFFICE

	FY 62	FY 63	FY 64
GS 14	0	1	1
OTHER GS	10	15	19
TOTAL	10	16	20

FINANCIAL MANAGEMENT OFFICE

	FY 62	FY 63	FY 64
GS 15	1	1	3
GS 14	0	2	2
OTHER GS	33	51	73
TOTAL	34	54	78

PROCUREMENT & CONTRACTS OFFICE

	FY 62	FY 63	FY 64
GS 15	1	1	3
GS 14	2	2	1
OTHER GS	44	78	119
TOTAL	47	81	123

PROGRAM COORD. & MANAGEMENT OFFICE

	FY 62	FY 63	FY 64
GS 15	1	3	4
GS 14	2	1	3
OTHER GS	14	59	95
TOTAL	17	63	102

TECHNICAL INFORMATION OFFICE

	FY 62	FY 63	FY 64
GS 15	0	1	1
GS 14	1	1	3
OTHER GS	22	37	48
WB	4	4	4
TOTAL	27	43	56

PERSONNEL OFFICE

	FY 62	FY 63	FY 64
GS 15	0	1	1
GS 14	0	0	1
OTHER GS	4	31	43
TOTAL	4	32	45

FACILITIES OFFICE

	FY 62	FY 63	FY 64
GS 15	2	4	5
GS 14	6	7	9
OTHER GS	39	126	131
WB	0	28	28
TOTAL	47	165	173

TEST CONTROL OFFICE

	FY 62	FY 63	FY 64
GS 15	0	0	4
GS 14	0	0	2
OTHER GS	0	0	14
TOTAL	0	0	20

LAUNCH SUPPORT EQUIPMENT OFFICE

	FY 62	FY 63	FY 64
EXCEPTED	1	1	1
GS 15	3	13	14
GS 14	13	10	10
OTHER GS	33	102	107
WB	0	1	1
TOTAL	50	127	133

RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
MANNED SPACECRAFT SYSTEMS				
Apollo	Direct	2	13	19
	Support	3	16	21
	Total	5	29	40

The Center's Apollo effort encompasses the development and operations of launch facilities, support equipment and instrumentation to meet planned Apollo schedules.

LAUNCH VEHICLE AND PROPULSION SYSTEMS				
Launch operations supporting technology	Direct	5	9	14
	Support	8	15	18
	Total	13	24	32

This project includes the study, definition and solution of problems in the areas of launch techniques, assembly and checkout systems, acoustics, data reduction, telemetry, tracking and communication which are a responsibility of NASA Launch Operations crews.

Saturn	Direct	89	223	343
	Support	142	269	385
	Total	231	492	728

Work includes the development and operations of launch facilities, support equipment and instrumentation to meet current Saturn launch schedules centered at launch complexes 34 and 37.

Advanced Saturn	Direct	14	48	69
	Support	22	52	90
	Total	36	100	159

Effort includes the development and operations of launch facilities, support equipment and instrumentation to meet current Advanced Saturn launch schedules centered at launch complex 39 and the new Merritt Island support area.

Range instrumentation	Direct	-	-	30
	Support	-	-	6
	Total	-	-	36

Range instrumentation design, development, modification and procurement are covered here.

		Number of Personnel		
		1962	1963	1964
Range support	Direct	2	3	5
	Support	4	10	20
	Total	6	13	25

This project provides support of NASA range operations at both the Merritt Island and Cape Canaveral.

SYSTEMS ENGINEERING	Direct	-	6	7
	Support	-	7	8
	Total	-	13	15

Effort will be made to plan and coordinate site locations, facilities, equipment and operations for Nova-type launch vehicles to provide for maximum utilization of existing and planned facilities and equipment associated with other launch vehicles, in a manner having minimum effect on other vehicle launch operations, should a Nova development program be approved in the future.

LAUNCH VEHICLE DEVELOPMENT

Operational support	Direct	15	49	64
	Support	17	44	54
	Total	32	93	118

This project provides for the development, modification and operation of launch facilities, launch support equipment and instrumentation to meet a variety of projects using the Atlas-Agena and Centaur launch vehicles.

NUCLEAR ROCKETS

RIFT	Direct	4	16	22
	Support	6	20	25
	Total	10	36	47

This project includes intensive analytical studies of the facilities, launch support equipment and instrumentation needed for the RIFT nuclear stage project, especially the development of maximum reliability checkout and test methods for both the launch vehicle and nuclear stage.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the index to that volume for the location of detailed project justifications.

671994 O-63—12

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

LEWIS RESEARCH CENTER

MISSION:

The primary mission of the Lewis Research Center is research and development in the areas of advanced propulsion and space power generation. This includes work on the high-energy chemical, nuclear, and electric rocket engines and on space power systems for converting chemical, nuclear, and solar energy into electricity. In support of these areas, basic and applied research is conducted in-house on materials and metallurgy; cryogenic and liquid-metal heat-transfer fluids; pumps and turbines; combustion processes, propellants, tankage, injectors, chambers, and nozzles; system control dynamics; plasmas and magnetohydrodynamics; space meteoroid damage and zero-gravity effects; and on turboelectric, thermoelectrical, and thermionic energy-conversion systems.

The in-house research provides technical input and direction to related contractual development efforts for which Lewis has managerial responsibility. For example, Lewis maintains technical management of NASA contracts on electric propulsion, nuclear and solar turboelectric space power systems, and liquid-hydrogen rocket technology. Lewis also has project management responsibility for the M-1 engine, the Centaur launch vehicle, and Agena procurement.

Major research tools and facilities at Lewis (including the Plum Brook Station) are designed to simulate various flight conditions, and range from atmospheric wind tunnels to large space environment facilities (or vacuum tanks). A large 60-megawatt thermal reactor is now available for studying nuclear radiation effects on materials and components. The reactor simulates various flux levels associated with spacecraft applications of nuclear energy. Other specialized experimental facilities include vacuum electron-beam furnaces for refinement of tungsten, liquid-metal power loops for component evaluations, a zero-gravity drop tower, chemical-rocket static thrust stands, a full-scale nonnuclear NERVA stand for the study of engine control dynamics, and various cryogenic component rigs.

LOCATION:

Cleveland, Ohio, and Plum Brook, Ohio. The Cleveland portion is located at the western edge of Cleveland-Hopkins Airport, about 15 miles southwest of the center of Cleveland. The Plum Brook Station is located about five miles south of the city of Sandusky, on land formerly occupied by the Army's Plum Brook Ordnance Works. The Plum Brook Station is about 45 miles west of the Cleveland site, a one-hour drive over the Ohio Turnpike.

LAND:

Cleveland - Total area occupied is 364 acres, of which 349 acres are owned by the NASA and 15 acres are leased from the City of Cleveland for auto parking purposes at the Development Engineering Building.

Plum Brook Station - Total area occupied is 6,031 acres, of which 5,981 are owned by the NASA and 50 acres are leased from individual owners.

PLANT VALUE:

The plant value as of June 30, 1962, was $189,555,000, of which approximately $29,000,000 represents facilities at Plum Brook.

SUMMARY OF RESOURCES REQUESTED:

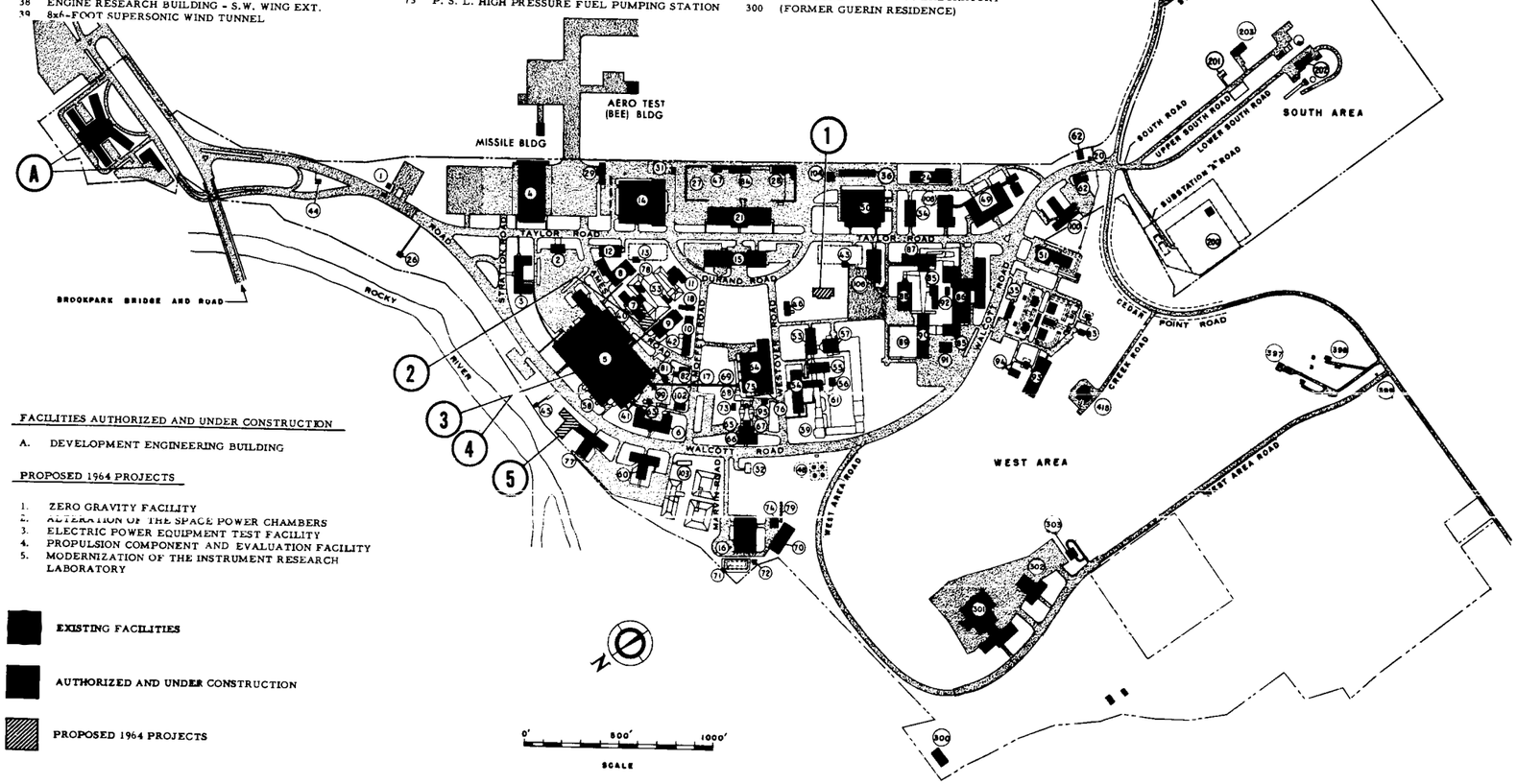
	1962	1963	1964
Number of permanent employees (end of year).....	3,678	4,658	5,128
Personnel costs.....	$27,583,000	$39,645,000	$48,707,000
Operation of installation....	17,725,000	14,000,000	17,050,000
Subtotal.....	$45,308,000	$53,645,000	$65,757,000
Construction program.....	1,835,000	43,485,000	25,835,000
Total installation costs.	$47,143,000	$97,130,000	$91,592,000

LEWIS RESEARCH CENTER
FISCAL YEAR 1964 ESTIMATES

LOCATION PLAN

LEGEND

1 GATEHOUSE (MAIN)
2 PERSONNEL BUILDING
3 ADMINISTRATION BUILDING
4 FLIGHT RESEARCH BUILDING
5 ENGINE RESEARCH BUILDING
6 CHEMISTRY LABORATORY
7 SPACE POWER CHAMBERS
8 EXHAUSTER BUILDING
9 REFRIGERATION BUILDING
10 COOLING TOWER NO. 1
11 ICING RESEARCH TUNNEL
12 STEAM GENERATING PLANT
13 SUBSTATION "B"
14 TECHNICAL SERVICE BUILDING
15 UTILITIES BUILDING
16 ELECTRIC PROPULSION RESEARCH BUILDING
17 UNDERGROUND FUEL STORAGE
18 AIR DRYER NO. 1
20 SOUTH GATEHOUSE
21 PROCUREMENT & SUPPLY BUILDING
23 ENGINE RESEARCH BUILDING - WEST WING
24 SPECIAL PROJECTS LABORATORY
26 SEWAGE PUMPING STATION
27 COAL STORAGE
28 BARREL STORAGE BUILDING
29 PLANT PROTECTION BUILDING
31 RESERVOIR AND FIRE PROTECTION WATER SUPPLY
32 SUBSTATION "C"
33 18"x18", 18"x18" AND 2x2 FOOT SUPERSONIC WIND TUNNELS
34 LIQUID METALS CORROSION LABORATORY
35 ROCKET LABORATORY
36 TEMPO "A"
37 ENGINE RESEARCH BUILDING - N.W. WING
38 ENGINE RESEARCH BUILDING - S.W. WING EXT.
39 8x6-FOOT SUPERSONIC WIND TUNNEL
40 SUBSTATION "D"
41 SUBSTATION "F"
42 SUBSTATION "E"
43 SUBSTATION "G"
44 GAS METER HOUSE
45 DROP TOWER
46 COOLING TOWER NO. 2
47 STORAGE BUILDING NO. 47
48 FUEL STORAGE TANKS
49 MATERIALS AND STRESSES LABORATORY
50 FABRICATION SHOP
51 HIGH ENERGY FUELS LABORATORY
53 8x6-FOOT SWT DRIVE EQUIPMENT BLDG.
54 8x6-FOOT SWT RESEARCH AND CONTROL BUILDING (OFFICE)
55 8x6-FOOT SWT MODELS PREPARATION BLDG.
56 8x6-FOOT SWT EXHAUSTER BUILDING
57 8x6-FOOT SWT AIR DRYER BUILDING
58 SUBSTATION "H"
60 PROPULSION SYSTEMS LABORATORY OPERATIONS BUILDING
61 8x6-FOOT SWT FUEL BUILDING
62 PLANT SERVICES BUILDING
63 HIGH TEMPERATURE VAPOR SYSTEM
64 P. S. L. EQUIPMENT BUILDING
65 P. S. L. ALTITUDE CHAMBERS (2)
66 P. S. L. ACCESS BUILDING
67 P. S. L. PRIMARY COOLERS (2)
68 P. S. L. SECONDARY COOLERS
69 P. S. L. TIE LINE
70 P. S. L. COOLING TOWER NO. 3
71 P. S. L. FUEL STORAGE
72 P. S. L. LOW PRESSURE FUEL PUMPING STATION
73 P. S. L. HIGH PRESSURE FUEL PUMPING STATION
74 P. S. L. CIRCULATING WATER PUMPING STATION
75 P. S. L. SUBSTATION "J"
76 P. S. L. COMBUSTION AIR HEATER
77 INSTRUMENT RESEARCH LABORATORY
78 A. W. T. PUMP HOUSE
79 P. S. L. COOLING WATER DEAERATORS
81 E. R. B. SPRAY COOLER BUILDING
82 COOLING TOWER NO. 4
83 CRYOGENICS SERVICES BUILDING
84 STORAGE BUILDING NO. 84
85 10'x10' SUPERSONIC WIND TUNNEL
86 10'x10' - SWT RESEARCH AND CONTROL BUILDING
87 10'x10' - SWT SECONDARY COMPRESSOR AND DRIVE BLDG.
88 10'x10' - SWT AIR DRYER BUILDING
89 10'x10' - SWT SUBSTATION "K"
90 10'x10' - SWT MAIN COMPRESSOR AND DRIVE BUILDING
91 10'x10' - SWT LOW PRESSURE FUEL PUMPING STATION
92 10'x10' - SWT HIGH PRESSURE FUEL PUMPING STATION
93 10'x10' - SWT COOLING TOWER NO. 5
94 10'x10' - SWT COOLING TOWER WATER PUMPING BUILDING
95 P.S. L. DESICCANT AIR DRYER
99 E. R. B. COMBUSTION AIR HEATER
100 ROCKET OPERATIONS BUILDING
102 LIQUID METALS POWER LABORATORY
103 INDUSTRIAL WASTE TREATMENT BASINS
104 GARAGE
105 MATERIALS PROCESSING LABORATORY
106 BASIC MATERIALS LABORATORY
200 SUBSTATION "A"
201 SUBSTATION "L"
202 ROCKET ENGINE FACILITY
203 FRACTURE MECHANICS LABORATORY
300 (FORMER GUERIN RESIDENCE)
301 ELECTRIC PROPULSION LABORATORY
302 ENERGY CONVERSION LABORATORY
303 SUBSTATION "M"
397 (FORMER MITCHELL GARAGE)
398 (FORMER MITCHELL RESIDENCE)
399 GATEHOUSE - WEST AREA
415 ROCKET COMBUSTION LABORATORY



FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

A. DEVELOPMENT ENGINEERING BUILDING

PROPOSED 1964 PROJECTS

1. ZERO GRAVITY FACILITY
2. ALTERATION OF THE SPACE POWER CHAMBERS
3. ELECTRIC POWER EQUIPMENT TEST FACILITY
4. PROPULSION COMPONENT AND EVALUATION FACILITY
5. MODERNIZATION OF THE INSTRUMENT RESEARCH LABORATORY

EXISTING FACILITIES

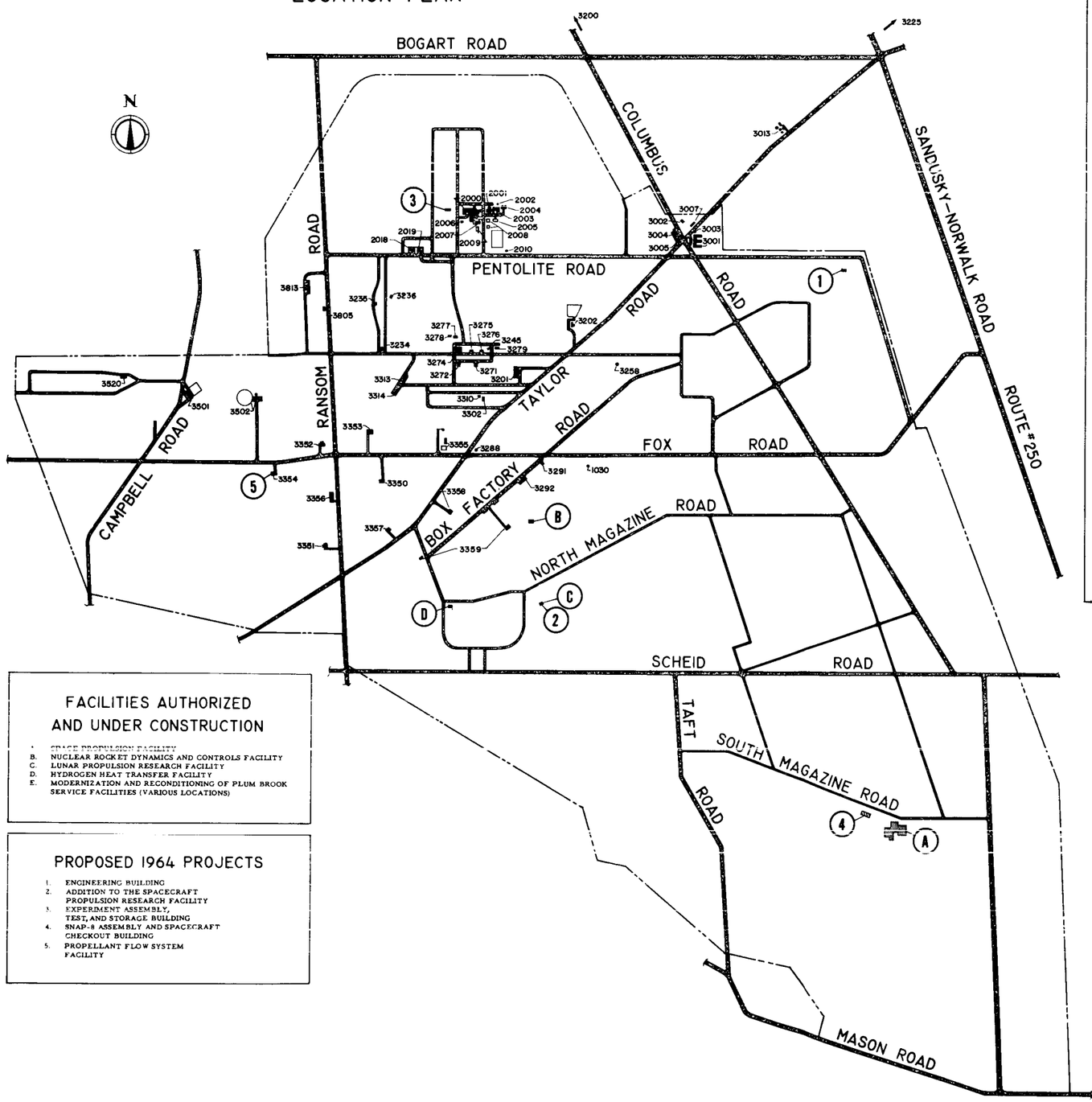
AUTHORIZED AND UNDER CONSTRUCTION

PROPOSED 1964 PROJECTS

671994 O - 63 (Face p. 182) No. 1

PLUM BROOK STATION
FISCAL YEAR 1964 ESTIMATES

LOCATION PLAN



LEGEND

1030	FIRE WATER TOWER
2000	REACTOR BUILDING (OFFICE ETC.)
2001	REACTOR SERVICES BUILDING
2002	REACTOR WATER TOWER
2003	REACTOR COOLING TOWER
2004	REACTOR SLUDGE BASINS
2005	REACTOR SUBSTATION A
2006	REACTOR SECURITY BUILDING
2007	REACTOR FAN HOUSE
2008	REACTOR COLD RETENTION BASINS
2009	REACTOR HOT RETENTION BASINS
2010	REACTOR EFFLUENT METERING STATION
2018	WAREHOUSE
2019	WAREHOUSE
3001	ADMINISTRATION BUILDING
3002	HEATING PLANT AND ELECTRICAL SHOP
3003	GATE HOUSE
3004	PLANT PROTECTION BUILDING
3005	MEDICAL SERVICES BUILDING
3007	PERSONNEL BUILDING (INACTIVE)
3013	SEWAGE PLANT
3200	BIG ISLAND PUMPING STATION
3201	SUBSTATION B (AND POWER PLANT)
3202	RESERVOIR AND PUMP STATION #1
3225	RYE BEACH PUMPING STATION
3234	RAILROAD SCALES
3235	FUEL OIL TANK AND PUMP
3236	GAS HANDLING FACILITY
3245	FUEL OIL TANK AND PUMP
3258	WATER TOWER (INACTIVE)
3271	WAREHOUSE
3272	WAREHOUSE
3274	MAINTENANCE SHOP
3275	WAREHOUSE
3276	WAREHOUSE
3277	GARAGE
3278	GARAGE
3279	WAREHOUSE
3288	DOMESTIC WATER TOWER
3291	WAREHOUSE
3292	WAREHOUSE
3302	AIR COMPRESSOR BUILDING
3310	PUMP HOUSE (INACTIVE)
3313	WAREHOUSE
3314	WAREHOUSE
3350	ROCKET PUMP LABORATORY
3351	ROCKET TURBO-PUMP LABORATORY
3352	ROCKET TURBINE LABORATORY
3353	ROCKET SYSTEMS DYNAMICS LAB.
3354	ROCKET SYSTEMS HYDRAULICS LAB.
3355	ROCKET TURBINE AND PUMP PILOT LAB.
3356	CENTRAL CONTROL AND DATA BUILDING
3357	FLUORINE PUMP LABORATORY
3358	ROCKET SYSTEMS LAB. --(PORTABLE RIGS)
3359	ALTITUDE ROCKET TEST FACILITY
3501	SUBSTATION C (AND POWER PLANT)
3502	RESERVOIR AND PUMPING STATION NO. 2
3520	WAREHOUSE
3805	TRUCK SCALE
3813	WAREHOUSE

FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

A. SPACE PROPULSION FACILITY
B. NUCLEAR ROCKET DYNAMICS AND CONTROLS FACILITY
C. LUNAR PROPULSION RESEARCH FACILITY
D. HYDROGEN HEAT TRANSFER FACILITY
E. MODERNIZATION AND RECONDITIONING OF PLUM BROOK SERVICE FACILITIES (VARIOUS LOCATIONS)

PROPOSED 1964 PROJECTS

1. ENGINEERING BUILDING
2. ADDITION TO THE SPACECRAFT PROPULSION RESEARCH FACILITY
3. EXPERIMENT ASSEMBLY, TEST, AND STORAGE BUILDING
4. SNAP-8 ASSEMBLY AND SPACECRAFT CHECKOUT BUILDING
5. PROPELLANT FLOW SYSTEM FACILITY

EXISTING FACILITIES

AUTHORIZED AND UNDER CONSTRUCTION

PROPOSED 1964 PROJECTS

0 1000' 2000' 3000' 4000'
SCALE

LeRC 4

671994 O - 63 (Face p. 182) No. 2

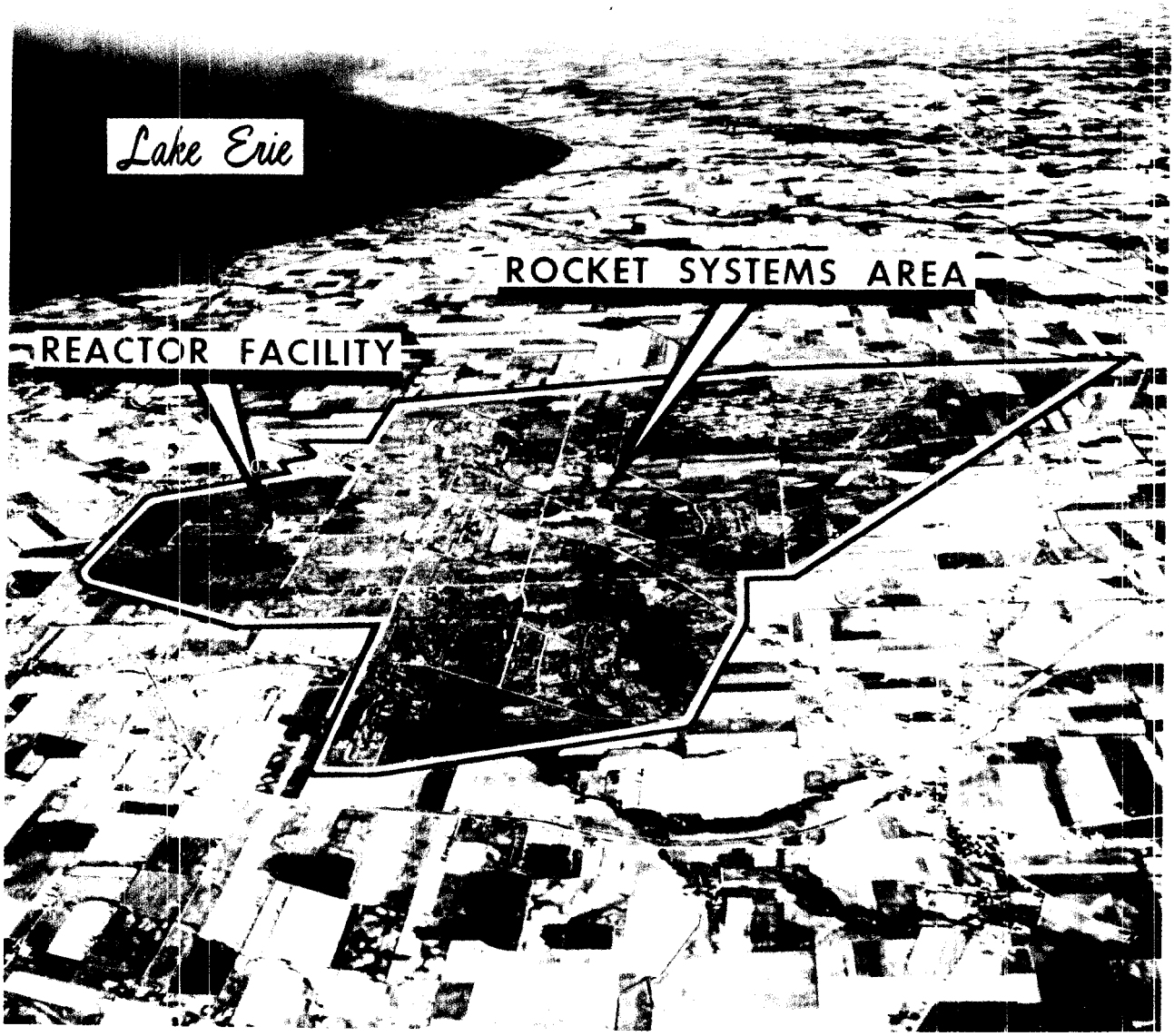
LEWIS RESEARCH CENTER
Cleveland, Ohio

1. PERSONNEL BUILDING
2. ADMINISTRATION BUILDING
3. FLIGHT RESEARCH BUILDING
4. ENGINE RESEARCH BUILDING
5. CHEMISTRY LABORATORY
6. SPACE POWER CHAMBERS
7. TECHNICAL SERVICE BUILDING
8. UTILITIES BUILDING
9. ELECTRIC PROPULSION RESEARCH BUILDING
10. PROCUREMENT AND SUPPLY BUILDING
11. SPECIAL PROJECTS LABORATORY
12. LIQUID METALS CORROSION LABORATORY
13. ROCKET LABORATORY
14. 8×6-FOOT SUPERSONIC WIND TUNNEL
15. MATERIALS AND STRESSES BUILDING
16. FABRICATION SHOP
17. HIGH ENERGY FUELS LABORATORY
18. PROPULSION SYSTEMS LABORATORY
19. PROPULSION SYSTEMS LABORATORY OPERATIONS BUILDING
20. PROPULSION SYSTEMS LABORATORY TIE LINE
21. INSTRUMENT RESEARCH LABORATORY
22. 10×10-FOOT SUPERSONIC WIND TUNNEL
23. ROCKET OPERATIONS BUILDING
24. LIQUID METALS POWER LABORATORY
25. INDUSTRIAL WASTE TREATMENT BASINS
26. MATERIALS PROCESSING LABORATORY
27. BASIC MATERIALS LABORATORY
28. ELECTRIC PROPULSION LABORATORY
29. ENERGY CONVERSION LABORATORY
30. ROCKET COMBUSTION LABORATORY

AERIAL VIEW - Cleveland Facilities

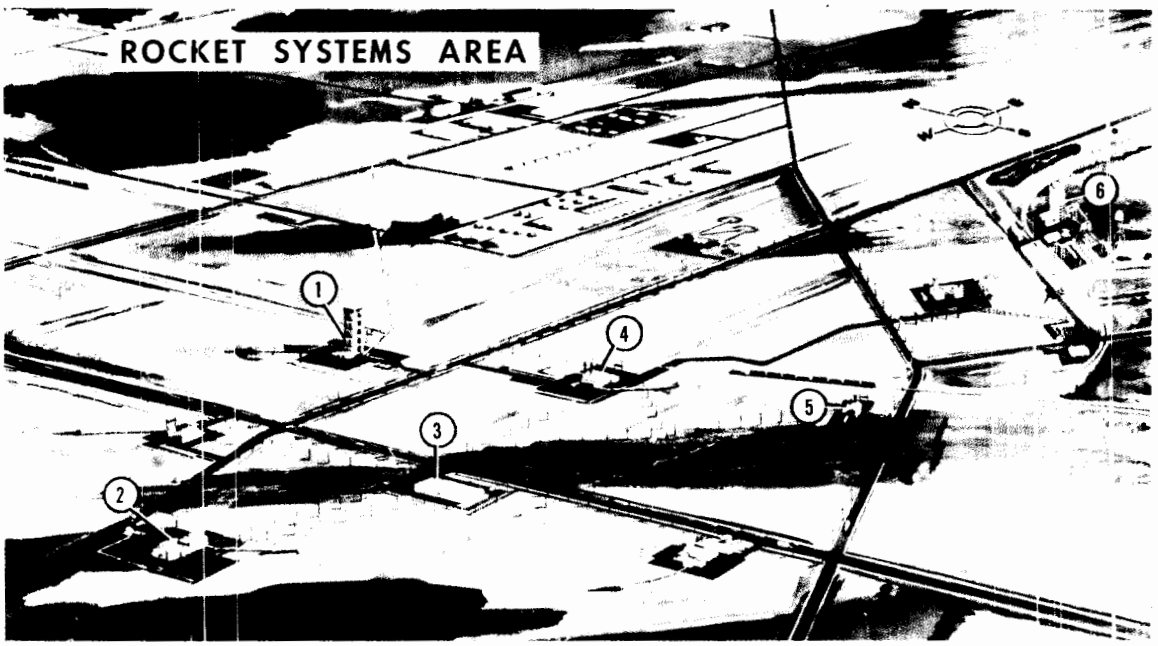
LeRC 5

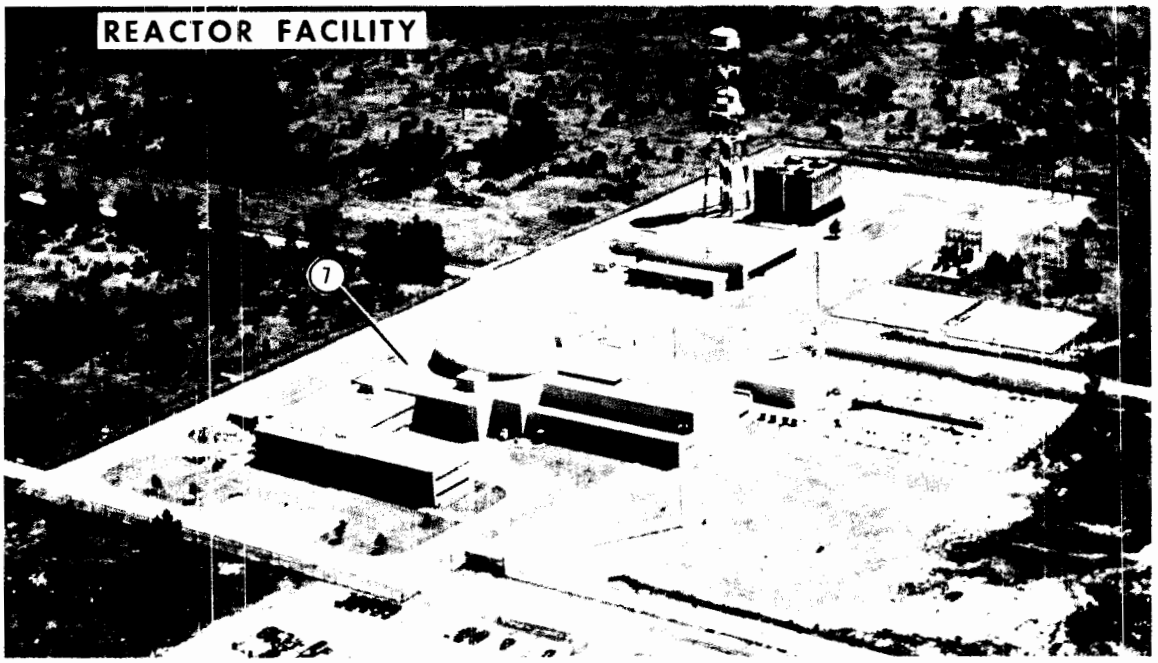
LEWIS RESEARCH CENTER
Sandusky, Ohio



AERIAL VIEW - NASA Plum Brook Station

LEWIS RESEARCH CENTER
Sandusky, Ohio





1. DYNAMICS STAND 2. HYDRAULICS LABORATORY
3. CENTRAL CONTROL 4. HYDROGEN PUMP 5. FLUORINE PUMP
6. ALTITUDE ROCKET TEST FACILITY 7. REACTOR FACILITY

AERIAL VIEW - NASA Plum Brook Station

LeRC 7

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART:
LEWIS RESEARCH CENTER

STAFFING SUMMARY

	62	63	64
Excepted	32	37	37
GS-15	118	190	208
GS-14	180	269	300
Other GS	1845	2427	2708
WB	1503	1735	1875
Total	3678	4658	5128

RESOURCES PLANNING OFFICE

	62	63	64
Excepted	1	1	1
GS-14	2	2	2
Other GS	2	7	7
Total	5	10	10

DIRECTOR

	62	63	64
Excepted	2	4	4
GS-15	1	1	1
Other GS	4	4	5
Total	7	9	10

OFFICE OF ASSOCIATE DIRECTOR FOR RESEARCH

	62	63	64
Excepted	1	1	1
Other GS	1	1	1
Total	2	2	2

OFFICE OF RESEARCH PLANS AND PROGRAMS

	62	63	64
Excepted	1	1	1
GS-15	4	5	6
GS-14	1	2	4
Other GS	20	22	23
Total	26	30	34

CHEMISTRY AND ENERGY CONVERSION DIVISION

	62	63	64
Excepted	1	1	1
GS-15	13	20	22
GS-14	13	17	17
Other GS	88	97	107
WB	1	1	1
Total	116	136	148

ELECTROMAGNETIC PROPULSION DIVISION

	62	63	64
Excepted	1	2	2
GS-15	8	13	15
GS-14	12	15	17
Other GS	83	85	86
Total	104	115	120

MATERIAL AND STRUCTURES DIVISION

	62	63	64
Excepted	2	2	2
GS-15	11	15	17
GS-14	17	23	24
Other GS	112	112	122
Total	142	152	165

INSTRUMENT AND COMPUTING DIVISION

	62	63	64
Excepted	2	2	2
GS-15	9	18	21
GS-14	12	17	18
Other GS	167	177	183
WB	80	81	87
Total	270	295	311

FLUID SYSTEMS COMPONENTS DIVISION

	62	63	64
Excepted	3	4	4
GS-15	12	18	19
GS-14	19	24	26
Other GS	90	96	99
Total	124	142	148

NUCLEAR REACTOR DIVISION

	62	63	64
Excepted	1	1	1
GS-15	11	19	20
GS-14	11	16	17
Other GS	70	79	84
Total	93	115	122

OFFICE OF ASSOCIATE DIRECTOR FOR DEVELOPMENT

	62	63	64
Excepted	1	1	1
Other GS	2	3	4
Total	3	4	5

OFFICE OF DEVELOPMENT PLANS AND PROGRAMS

	62	63	64
Excepted	1	1	1
GS-15	1	1	2
GS-14	3	4	7
Other GS	4	9	20
Total	9	15	30

OFFICE OF RELIABILITY AND QUALITY ASSURANCE

	62	63	64
Excepted	1	1	1
GS-15	1	4	4
GS-14	5	8	7
Other GS	8	38	58
Total	15	51	70

SYSTEMS ENGINEERING AND REQUIREMENTS DIVISION

	62	63	64
Excepted	1	1	1
GS-15	4	8	10
GS-14	9	17	22
Other GS	48	61	77
Total	62	87	110

OFFICE OF PROJECT MANAGEMENT

	62	63	64
Excepted	4	5	5
GS-15	10	25	24
GS-14	19	51	58
Other GS	97	382	413
Total	130	463	500

ADVANCED DEVELOPMENT AND EVALUATION DIVISION

	62	63	64
Excepted	4	4	4
GS-15	17	25	27
GS-14	21	36	43
Other GS	185	219	247
Total	227	284	321

PLUM BROOK STATION

	62	63	64
Excepted	1	1	1
GS-15	1	1	1
Other GS	2	4	4
Total	4	6	6

ROCKET SYSTEMS DIVISION

	62	63	64
GS-15	--	--	--
GS-14	2	2	2
Other GS	32	43	51
Total	34	45	53

REACTOR DIVISION

	62	63	64
GS-15	1	2	2
GS-14	4	4	4
Other GS	84	118	129
Total	89	124	135

ENGINEERING DIVISION

	62	63	64
GS-15	1	1	1
GS-14	3	3	3
Other GS	17	27	31
WB	1	1	1
Total	22	32	36

ADMINISTRATION DIVISION

	62	63	64
GS-15	--	--	--
GS-14	--	--	--
Other GS	14	22	35
WB	4	6	8
Total	18	28	43

FACILITIES SERVICE DIVISION

	62	63	64
GS-15	--	--	--
GS-14	--	--	--
Other GS	19	25	30
WB	236	295	317
Total	255	320	347

STAFF ASSISTANTS

	62	63	64
Excepted	--	--	--
GS-15	--	--	--
GS-14	3	3	3
Other GS	26	30	32
WB	--	--	--
Total	29	33	35

OFFICE OF ASSISTANT DIRECTOR FOR ADMINISTRATION

	62	63	64
Excepted	1	1	1
Other GS	2	3	3
Total	3	4	4

PERSONNEL DIVISION

	62	63	64
GS-15	1	1	1
GS-14	--	--	--
Other GS	59	64	73
Total	60	65	74

ACCOUNTING AND AUDIT DIVISION

	62	63	64
GS-15	--	--	--
GS-14	1	1	1
Other GS	58	73	94
Total	59	74	95

ADMINISTRATIVE SERVICES DIVISION

	62	63	64
GS-15	--	--	--
GS-14	--	--	--
Other GS	19	23	25
WB	6	12	12
Total	25	35	37

PROCUREMENT AND SUPPLY DIVISION

	62	63	64
GS-15	--	--	--
GS-14	2	2	2
Other GS	105	153	169
WB	25	29	29
Total	132	184	200

TECHNICAL INFORMATION DIVISION

	62	63	64
GS-15	--	--	--
GS-14	1	1	1
Other GS	73	78	92
WB	26	27	27
Total	100	106	120

STAFF ASSISTANTS

	62	63	64
GS-15	--	1	1
GS-14	3	3	3
Other GS	29	38	42
WB	10	10	10
Total	42	52	56

OFFICE OF CHIEF OF TECHNICAL SERVICES

	62	63	64
Excepted	2	2	2
GS-15	1	1	1
GS-14	1	1	1
Other GS	4	4	4
Total	8	8	8

PLANT SERVICES DIVISION

	62	63	64
GS-15	--	--	--
GS-14	1	1	1
Other GS	36	36	36
WB	112	133	134
Total	149	170	171

TEST INSTALLATIONS DIVISION

	62	63	64
GS-14	--	1	1
Other GS	3	3	3
WB	353	392	445
Total	356	396	449

FACILITIES OPERATIONS DIVISION

	62	63	64
GS-15	1	1	1
GS-14	1	1	1
Other GS	30	32	35
WB	445	513	539
Total	477	547	576

FABRICATION DIVISION

	62	63	64
GS-15	1	1	1
GS-14	1	1	1
Other GS	25	25	26
WB	204	235	265
Total	231	262	293

ENGINEERING DESIGN DIVISION

	62	63	64
GS-15	5	5	6
GS-14	5	5	5
Other GS	153	154	167
Total	163	164	178

FACILITIES ENGINEERING DIVISION

	62	63	64
Excepted	1	1	1
GS-15	4	4	5
GS-14	8	8	9
Other GS	74	80	91
Total	87	93	106

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RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
LAUNCH VEHICLE AND PROPULSION SYSTEMS				
M-1 engine	Direct	-	57	96
	Support	-	66	99
	Total	-	123	195

The project management responsibility for M-1 engine development was transferred to Lewis from Marshall Space Flight Center on October 15, 1962. Work is proceding on the design of the gas generator, thrust chamber, including wedge chamber testing, and other components. Single-stage centrifugal pump designs for the fuel and oxidizer pump are 80 percent completed. When the current engine requirements and limited growth capability of the centrifugal pump was considered, it was decided that an axial pump was needed for the M-1. Designs are in progress for the axial LH_2 pump, oxidizer turbine, propellant utilization systems and engine configurations.

A technical review of the entire program resulted in design concept changes such as axial flow fuel pump, consideration of side-gas injection for thrust vector control, and increased nominal engine rating. Some lengthening of the original program is anticipated, and the Aerojet-General Corporation is presently redesigning the engine where needed. In-house study reports by various Lewis action groups have guided the program. These studies will continue in some areas through the early part of the program.

INDUSTRIAL APPLICATIONS	Direct	2	2	3
	Support	6	5	5
	Total	8	7	8

The Lewis activities in this area are concerned with innovation identification and dissemination, including recognition of improvements in products, processes, techniques, or devices, arising from the NASA program.

GEOPHYSICS AND ASTRONOMY				
Sounding rockets	Direct	-	2	2
	Support	-	5	5
	Total	-	7	7

Lewis effort in this area is part of the NASA aeronomy program. Lewis supports bench-scale studies, payload development and procurement, and data reduction and reporting. During the past year ozone was successfully released at 70 KM at night by Lewis scientists using a NIKE-Cajun launched from Wallops Island. This cloud was observed by phototubes in the rocket. The results of this experiment have provided the first conclusive evidence that atomic hydrogen is present at that altitude. (Normally hydrogen occurs as a

		Number of Personnel		
		1962	1963	1964

molecule of two atoms. When single atoms occur not bound together in a molecule, that hydrogen is referred to as atomic hydrogen.) These flights will continue.

LAUNCH VEHICLE DEVELOPMENT

Centaur development	Direct	-	160	166
	Support	-	149	189
	Total	-	309	355

The Centaur project management responsibility was transferred from Marshall Space Flight Center to Lewis on October 15, 1962. The transfer was affected to allow Marshall to concentrate its efforts on large man-rated launch vehicles and to bring the Lewis research and development experience with high-energy systems to bear on the Centaur problem, since Centaur is the first launch vehicle to use liquid hydrogen in its upper stage. Since that time Lewis has conducted an extensive review of the problems and requirements of the project. Lewis is working with the prime contractor, General Dynamics/Astronautics, to assure successful development of the vehicle.

Operational support	Direct	-	108	176
	Support	-	54	87
	Total	-	162	263

This program will provide operational support for all programs using operational Centaur and Atlas-Agena launch vehicles. This support will include services such as product improvement and failure analysis, analysis and studies of recommended uses, and range liaison support. This program also includes the technical monitoring of the procurement of operational vehicles. In this regard, technical personnel supervise required design modification and perform necessary liaison to insure launch vehicle compatibility with the many scheduled satellite and space probe missions.

SPACE VEHICLE SYSTEMS

Supporting research and technology	Direct	80	93	101
	Support	220	233	252
	Total	300	326	353

Lewis conducts space vehicle research in the areas of advanced concepts, aerothermodynamics, loads and structures, environmental factors and design criteria. Both in-house and contract research will be conducted to investigate, analytically and experimentally, problems and their solution in these areas. Major effort in fiscal year 1964 will be devoted to study of space vehicle environmental factors such as meteoroid hazards, fluid behavior in zero-gravity fields, vacuum and radiation effects, temperature control,

		Number of Personnel		
		1962	1963	1964

and to study the launch vehicle loads and structures.

Small space vehicle flight experiments	Direct	12	18	20
	Support	33	30	35
	Total	45	48	55

Lewis is conducting a study of the problems encountered in handling cryogenic propellants, especially liquid hydrogen, in space vehicles in a zero-gravity environment. The experiments will consist of scale models of space vehicle systems (such as propellant tanks) which are subjected to simulated operating environment and conditions (such as radiant heat source, venting operations, and fuel transfer operations) while in a zero-gravity state, obtained by firing the experiment into a ballistic trajectory by a rocket booster. Supporting studies are conducted in the Lewis drop tower and airplane zero-gravity facilities and the behavior of the systems at normal gravity is observed for comparison. Several rocket vehicles are being used such as the Aerobee, a pod on Atlas, and the WASP, a solid propellant vehicle being developed by Lewis.

The results of the experiments to date have provided verification of the interface configurations obtained in drop tower studies and have provided considerable insight into the effect of zero-gravity on the heat transfer characteristics to liquid hydrogen over a range of relatively high flux rates. Information on the effect of low flux rates, of tank filling and of tank size on the heat transfer characteristics is needed to complete this part of the study. Experiments studying these effects are being conducted and others are planned which should complete this part of the study. The experiments with interface control geometries indicated successful performance of these devices and more experiments are contemplated in connection with venting, fuel transfer, and fluid and vehicle dynamics studies.

ELECTRONIC SYSTEMS

Supporting research and technology	Direct	36	38	40
	Support	99	94	100
	Total	135	132	140

Lewis is conducting research on guidance systems, control systems, communications, data handling and processing, and instrumentation.

Lewis, in its role as the NASA technical manager of several space vehicle projects (SERT, SNAP-8, SNAP-8 flight evaluation and Centaur), which require unique and precise guidance systems, will pursue advanced research to develop and to acquire the needed components and system testing equipment and analysis techniques. Newly developed and/or novel guidance system components and subsystems will be procured and evaluated in fiscal year 1964 to determine the feasibility and desirability of modifying existing systems or sub-

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	Number of Personnel		
	1962	1963	1964

stituting new systems.

In fiscal year 1964 a capability for testing and evaluating existing control components and systems, and for exploring new developments in control theory, control concepts and advanced components will be established at Lewis.

The technical goals of the Lewis research program in communications are to extract concepts and theories applicable to research data transmission, to devise the necessary hardware components to demonstrate the feasibility of a particular approach, and to apply these to the in-house propulsion and power generation research programs. Current major effort is being devoted to establishing a high-stability radio frequency link to investigate the synchronization problem in pulse-code modulated, high-serial-rate data.

Lewis is investigating means for reducing space probe and satellite power consumption. In addition, techniques of encoding and condensing the information prior to transmission are being developed to make the most efficient use of transmitter power. The design and construction of a prototype low-power, low-voltage input multiplexer began in fiscal year 1963. In fiscal year 1964 contracts will be issued in support of in-house research in this area and for construction of a digital computer with very low power requirements for probe and satellite applications.

The instrumentation work at Lewis includes the measurement of physical variables under high and low pressures and temperatures in a wide range of applications. System and environmental pressures of advanced propulsion systems range from the ultra-low vacuum of space to several thousand pounds per square inch. Temperatures in advanced propulsion and power systems vary from near absolute zero to 10,000°C. System fluids that indicate the wide range of problems include liquid hydrogen, chemical rocket fuels and oxidizers, plasmas in electric propulsion and power, and liquid and vapor alkali metals for space power generating systems. A large portion of fiscal year 1964 work will be research in instruments for use in programs involving high-vacuum technology. Other investigations will include devices to measure low forces such as those which prevail in electric propulsion systems and precise measurement of the temperatures of cryogenic fluids.

NUCLEAR-ELECTRIC SYSTEMS

Supporting research and technology	Direct	272	304	318
	Support	686	675	707
	Total	958	979	1,025

Lewis effort in this area includes work in the electrostatic, electrothermal, electromagnetic and small engine technology areas. The specific

		Number of Personnel		
		1962	1963	1964

technical goals of the effort are to develop advanced nuclear-electric space power systems (electrical powers in the range of tenths to tens of megawatts) capable of reliable operation for long periods of time (months to years). In order to accomplish these goals, extensive analytical and experimental programs both in-house and under contract are being conducted.

Specifically, considerable effort is underway in the areas of boiling and condensing heat-rejection systems, turbomachinery, bearings, and seals, materials alloy development, material properties, material corrosion and thermionic emitter research.

SNAP-8 development	Direct	63	60	64
	Support	150	120	124
	Total	213	180	188

Lewis has been delegated project management responsibilities for the SNAP-8 electrical generating system. In addition, various divisions of the Center are providing technical support to the SNAP-8 project in the areas of fluid dynamic characteristics in a zero-gravity environment, power-conversion system component performance dynamics, radiation damage of SNAP-8 electrical components, and reliability and quality assurance.

SNAP-8 flight evaluation	Direct	2	9	14
	Support	6	12	17
	Total	8	21	31

A flight evaluation program is planned to support the development of the SNAP-8 nuclear-electric power generating system. It will be tested in an orbital space environment for an extended period of time (10,000 hours), acquiring the necessary operational data to perform an evaluation of the system. Other support programs, such as ballistic shots, nuclear aspects, hazards studies, and long-range R&D may be required as part of the overall flight evaluation program.

Present planning is for contract award of task area studies, preliminary testcraft design, and development of a flight test program in the first quarter of 1963. Hardware development, integration, flight test and evaluation will be initiated upon the completion of the first contracts.

MECCA	Direct	-	3	3
	Support	-	7	7
	Total	-	10	10

The development of reliable and efficient nuclear-turbogenerator power conversion systems depends on obtaining design criteria on the heat transfer, pressure drop, and dynamic behavior characteristics of variable quality two-phase flows of working fluids in a heat exchanger under zero-gravity and space

		Number of Personnel		
		1962	1963	1964

environmental conditions. Lewis will experimentally define such characteristics, with particular emphasis on application to the SNAP-8 system.

Specially designed experimental equipment and instrumentation will be combined into payloads suitable for adapting to small solid rocket WASP boosters. These payloads will include single and multitube configurations. The payload will be launched from Wallops Island on a ballistic trajectory and selected portions of the recording equipment used in the experiment will be recovered at the end of the flight. Selected zero-g experiments will also be conducted with the AJ-2 airplane stationed at the Lewis Research Center.

Electric-engine development projects	Direct	8	14	14
	Support	10	14	14
	Total	18	28	28

The electric engine development project is comprised of three separate projects as follows: (1) development of large ion engines, (2) development of large arc jet engines, and (3) development of small arc and ion jets.

The objective of the Lewis effort in this program is to develop electric thruster systems which are efficient, reliable and mission-ready on a time schedule compatible with the development of electric power generating systems. At the present time, the main goal is to evolve the design concepts necessary to obtain high efficiency for these systems. In this phase of the work, the advanced techniques and new concepts being evolved under the research program and research and technology contracts are being used to improve the performance of the thruster systems. An important part of this project is to provide flight systems for the SERT project.

Space electric rocket test (SERT)	Direct	31	32	32
	Support	56	50	50
	Total	87	82	82

The SERT project was initiated to advance the electric propulsion state-of-the-art by conducting electric propulsion experimental investigations in the environment of space. At present, all electric propulsion experimental investigations have taken place in vacuum chambers. The SERT flight program is subdivided into three phases: electric engine feasibility, specific electric engine development, and electric engine application. Lewis personnel will work on all phases of this project.

NUCLEAR ROCKETS

Supporting research and technology	Direct	167	246	267
	Support	463	584	614
	Total	630	830	881

		Number of Personnel		
		1962	1963	1964

Lewis is supporting the development of feasible, reliable, and high-power nuclear rocket vehicles in the areas of nuclear rocket reactor research and nuclear rocket engine systems design and development.

In the area of nuclear rocket reactor research, design studies of advanced concepts are being conducted to determine new problem areas and performance estimates. Specific research in this area, devoted to work on materials, shielding, and neutronics design and development has been carried on in-house at Lewis in fiscal years 1962 and 1963. In fiscal year 1964 effort will continue in these areas, and in addition, work will be carried on toward the experimental verification of such advanced concepts as the maximum power density capable from metallic fueled reactors, the feasibility of heterogeneous reactors, and the minimum feasibility of gaseous core reactors.

Research effort at Lewis in the area of nuclear rocket engine systems design has been and will continue to be devoted to turbopump, bearing, seal, nozzle, and reactor start-up problems, and to hydrogen tank design.

NERVA	Direct	20	27	27
	Support	55	67	67
	Total	75	94	94

Lewis is conducting various experiments and analyses in direct support of NERVA. A simulated nuclear rocket, including nozzle, reactor core, turbopump, and bottom of propellant tank is being assembled for tests of start-up and control. A calibration of the pump performance with cavitation will be made. In another experiment, the dynamic performance of the actuators, to be used for control, will be determined while the actuator is in the Plum Brook reactor experiencing radiation similar to that expected on the NERVA engine.

The violent fluctuation in the flow of hydrogen into the reflector during start-up must be suppressed or at least minimized. Experimental work at Lewis will establish stability boundaries, degree of fluctuation expected when unstable, and possible dangerous nuclear transients induced in the reactor.

RIFT	Direct	15	30	32
	Support	41	73	75
	Total	56	103	107

Lewis is and will continue to assist Marshall Space Flight Center with supporting research and technology effort. Studies of radiation heating of the propellant, insulation of RIFT propellant tanks, and the effects of radiation, vacuum and space temperatures on bearings, seals and lubricants will be conducted in ground facilities. Experiments on small tanks heated

		Number of Personnel		
		1962	1963	1964

by infra-red radiation display circulation and stratification patterns that differ from the circulation model generally assumed to exist, and hence the effect of nuclear radiation on tank pressure and weight may be in error. Larger scale experiments with infra-red or other safe radiation will be conducted at Lewis. Experiments on tank heating by reactor radiation will be made in fiscal year 1964 in continuation of a contracted program started in fiscal year 1963.

CHEMICAL PROPULSION

Supporting research and technology	Direct	172	185	202
	Support	473	441	473
	Total	645	626	675

Lewis effort in this program extends from in-house studies of advanced concepts to basic and applied research on both liquid and solid propulsion systems and components. Even though significant in-house effort is devoted to solid propulsion research, major effort is devoted to liquid propulsion systems. In-house research has been and will continue to be devoted to the study of such problems as pumps, seals, bearings, nozzles, fuel combinations, and fuel tank fabrication problems.

SPACE POWER

Supporting research and technology	Direct	95	137	148
	Support	254	293	311
	Total	349	430	459

Lewis work in this area extends from advanced conceptual studies through research on and development of advanced solar power and chemical power generation systems.

Theoretical studies carried on in-house at Lewis are designed to investigate, both analytically and experimentally, such novel concepts for power generation as magnetohydrodynamics using two-phase flow, radio-isotope generation of high voltages through beta-ray capture and fused salt thermo-electricity.

Effort at Lewis has been and will continue to be devoted to research on and development of devices such as solar cells, solar thermionic devices and dynamic solar power generation systems to convert solar energy into usable electric power for spacecraft use. Lewis is working closely with industrial contractors who are developing advanced chemical power generation systems. Examples of these developments are the hydrogen-oxygen combustion engine being developed by Vickers, a solid electrolyte fuel cell being developed by Astropower Inc., a thermally regenerative system being developed by the Allison Division of General Motors, and others. Lewis effort in fiscal year

		Number of Personnel		
		1962	1963	1964

1964 will be devoted to an evaluation of these and other systems and in-house research efforts to complement industrial work.

AERONAUTICS

Supporting research and technology	Direct	27	28	29
	Support	75	70	73
	Total	102	98	102

The Lewis effort in this area consists of work on aircraft aerodynamics, air-breathing propulsion, and aircraft operating problems. Aircraft aerodynamics effort is devoted to the operation of wind tunnels for outside groups, such as the armed services.

The Lewis air-breathing propulsion effort is planned to improve the state of fundamental knowledge in the hypersonic region to permit evaluation and possible development of high-speed air-breathing systems. Both analytical and small-scale experimental work will be carried out in-house in fiscal year 1964.

Supersonic transport	Direct	13	18	20
	Support	36	45	50
	Total	49	63	70

Lewis will be conducting in-house studies to provide technical support in the areas of engine performance analyses, bearings and lubricants, and alloy evaluation and selection criteria.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the Index to that volume for the location of detailed project justifications.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

MANNED SPACECRAFT CENTER

MISSION:

The Manned Spacecraft Center has as its primary mission the development of spacecraft for manned space flight programs and the conduct of manned flight operations. The Center was established during 1962, having previously been located at the Langley Research Center as the Space Task Group. The Center is now carrying out four major space research and exploration projects:

Mercury - The nation's first manned space flight program involving suborbital and orbital flights culminating in the successful accomplishment of the six orbit flight of October, 1962. This project is being completed in fiscal year 1963.

One-day mission - A series of flight missions using a modified Mercury capsule with increased capability of eighteen orbits, to demonstrate manned orbital flights of one-day duration. Except for a small effort in fiscal year 1964, this project will be completed this year.

Gemini - A series of flight missions using a two-man capsule of improved design to demonstrate rendezvous and docking techniques in orbit, and a greater degree of maneuverability both in space and in landing.

Apollo - A series of flight missions using an entirely new three-man spacecraft of modular concept capable of space flight in earth and lunar orbits to culminate in a manned lunar landing, using a lunar excursion module, and return.

The Center's mission further embraces an engineering, development and operations capability to support these projects and to generate the knowledge required to advance the technology of space and manned spacecraft development. Engineering and development efforts focus on the conception and implementation of a program of applied research and development in the areas of space research, space physics, life systems, and test and evaluation. Specific responsibilities include:

The conduct of study, analysis and systems evaluation of present and advanced projects, identifying required systems capabilities, performance, load, and environmental aspects of the mission.

The conduct of advanced research in the biological, biomedical and aeromedical aspects of manned space flight with emphasis on life support systems and crew equipment required in support of manned flight missions.

Maintenance of a comprehensive technical knowledge of the concepts, designs and performance of spacecraft systems through the conduct of necessary development, test and evaluation programs.

Conduct of a program of applied research into the problems of the lunar and space environments, acquiring basic physical data and knowledge that bear upon the safe performance of manned space flight missions.

The supporting operations activities include responsibility for:

The preparation of spacecraft for flight, the integration of spacecraft and booster during flight preparations, the spacecraft during launch, and spacecraft handling after recovery.

The planning and supervision of flight operations, including calculation of mission trajectories, development and operation of flight control centers, and development of equipment and techniques for recovery operations.

The selection of astronauts and training of astronaut crews.

A program covering medical aspects of flight operations.

The staff includes experts from all fields of the aeronautical and space sciences as well as numerous technicians and specialists engaged in the supporting roles of procurement, personnel, facilities management and other administrative services.

LOCATION:

Manned Spacecraft Center is located on Road 528, two miles east of the town of Webster. The site is approximately 20 miles southeast of downtown Houston, 25 miles northwest of Galveston and 20 miles southwest of Baytown. Primary access to the site is by the Gulf Freeway (U.S. 75) and Road 528. Two other secondary highways, State 3 and 146, also provide access from the north and the south via Road 528. A portion of the site lies on the shores of Clear Lake which provides access by water to Galveston Bay and thence to the Intracoastal Canal and the Gulf of Mexico. Two railroads service the general areas in which the site is located. The Galveston, Houston and

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Henderson Railroad passes through Webster on the west and the Southern Pacific, Texas and New Orleans Railroad through Seabrook to the east. Galveston and Houston both offer excellent deep water ports and service to all ports of the world. Airline service is available with most major airline companies or connecting lines. Ellington Air Force Base, seven miles to the northwest, provides adequate military landing facilities.

LAND:

Total area occupied is 1600 acres. This land was acquired by two conveyances, one of 600 acres and the other of 1020 acres less 20 acres within the area reserved for mineral rights by the Humble Oil Company. The total area will be owned by NASA. The property is subject to easements to the Houston Natural Gas Company, Harris County and the State of Texas.

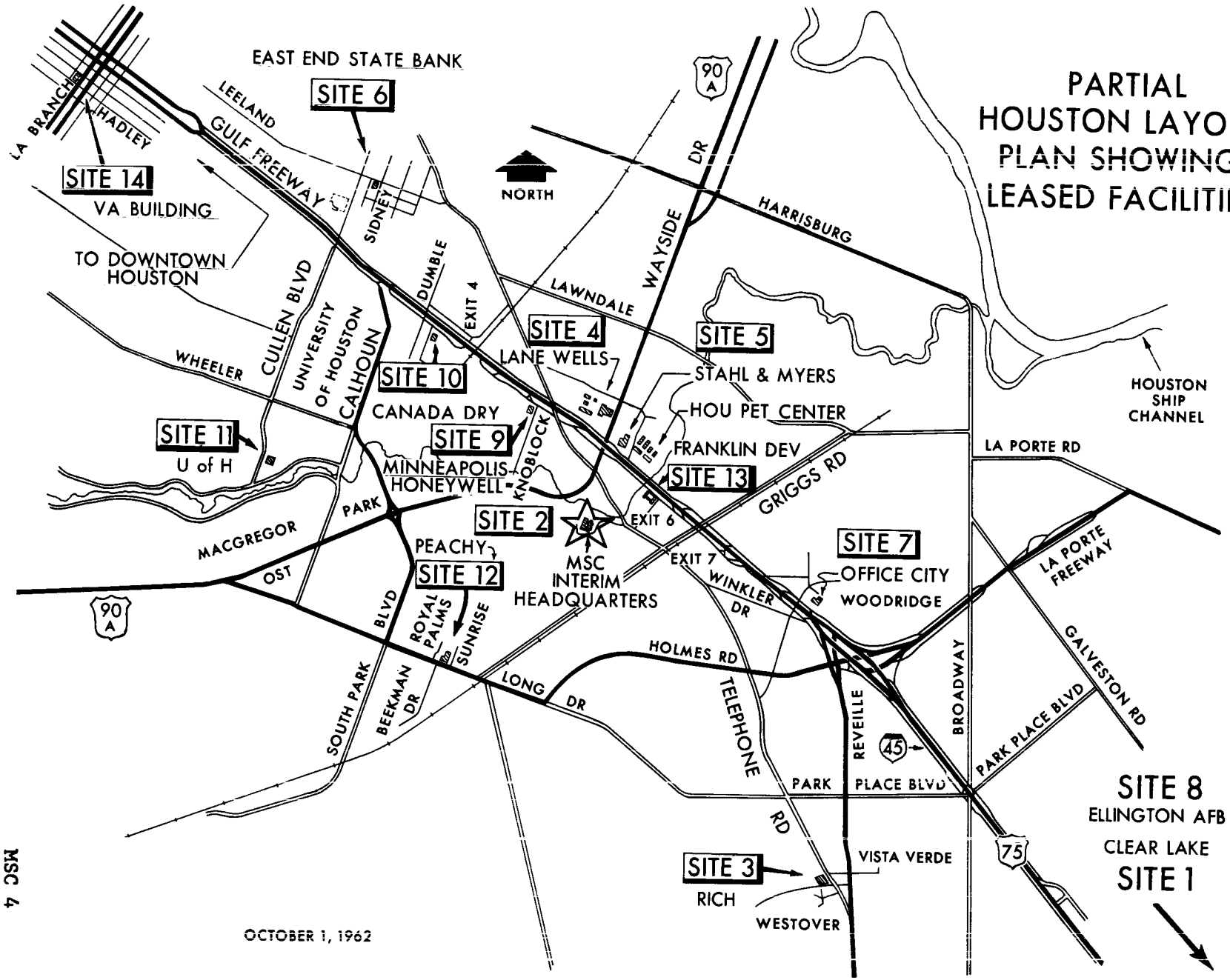
PLANT VALUE:

The plant value of the Manned Spacecraft Center as of June 30, 1962, was $16,131,000.

SUMMARY OF RESOURCES REQUESTED:

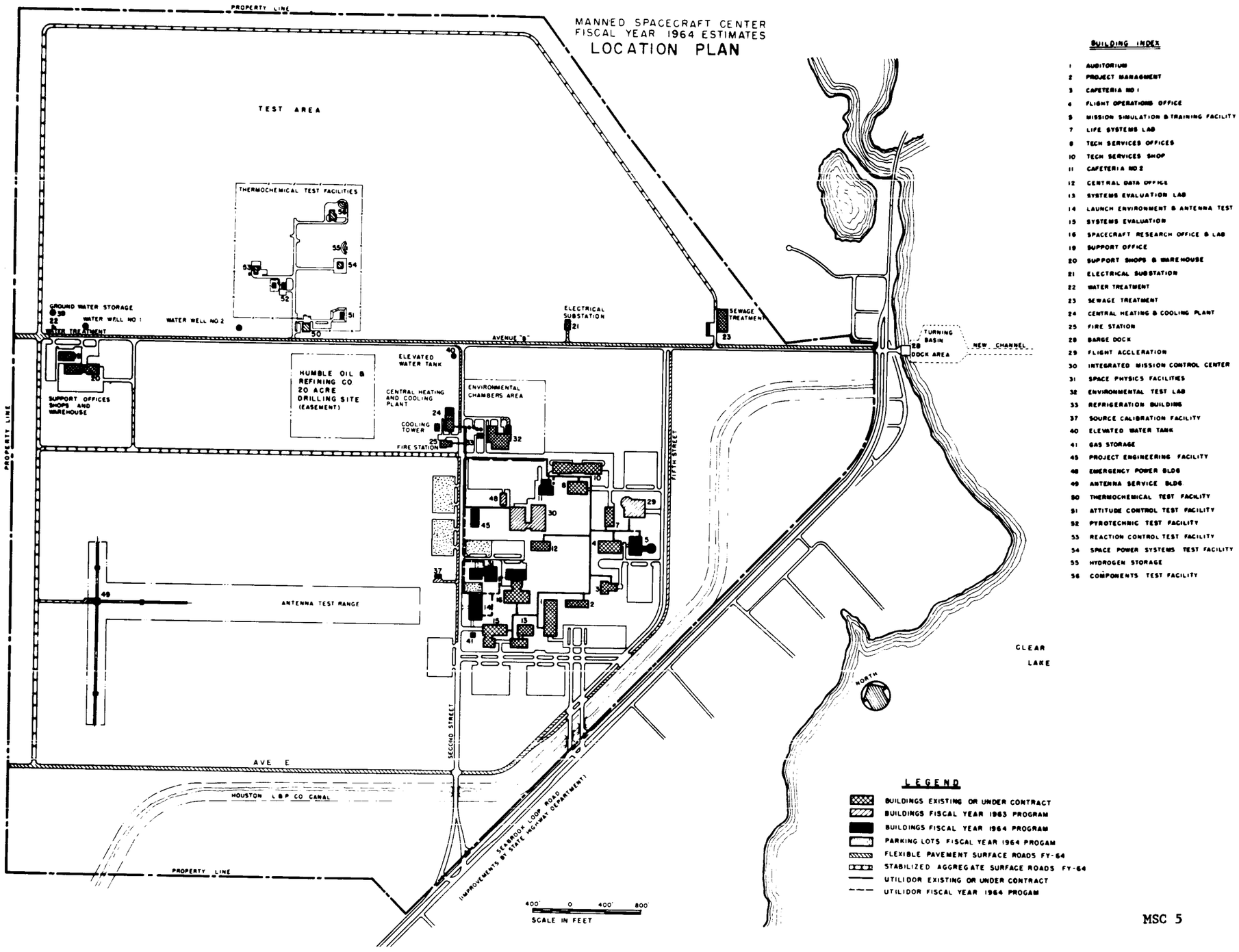
	1962	1963	1964
Number of permanent employees (end of year).....	1,620	3,196	3,980
Personnel costs.....	$11,565,840	$26,454,000	$38,361,000
Operation of installation....	12,271,160	23,700,000	32,900,000
Subtotal.....	$23,837,000	$50,154,000	$71,261,000
Construction program.....	66,688,600	45,282,700	37,736,000
Total installation costs.	$90,525,600	$95,436,700	$108,997,000

PARTIAL HOUSTON LAYOUT PLAN SHOWING LEASED FACILITIES



OCTOBER 1, 1962

MSC 4



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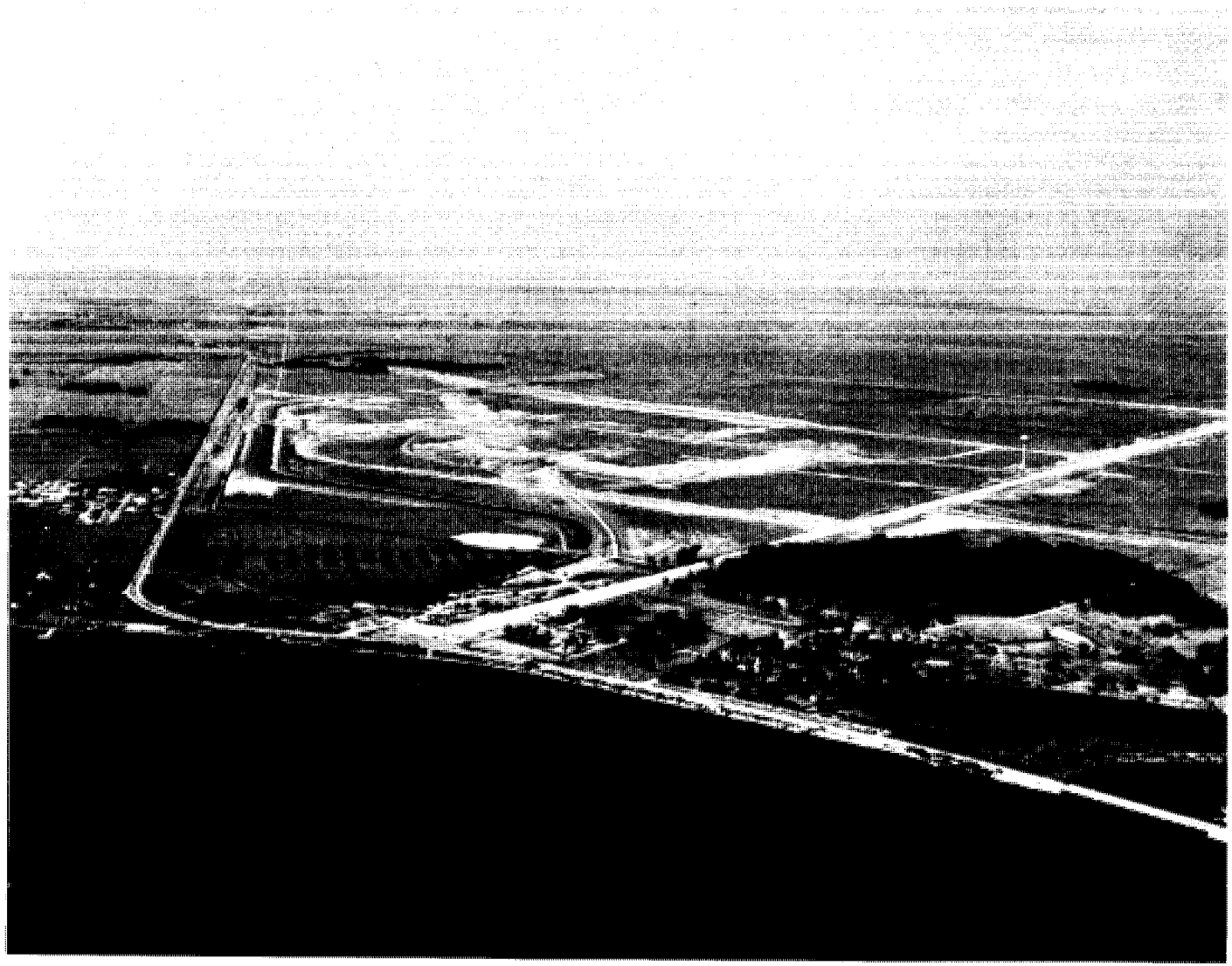
MANNED SPACECRAFT CENTER
Houston, Texas



AERIAL VIEW

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ORGANIZATION AND STAFFING CHART: MANNED SPACECRAFT CENTER

STAFFING SUMMARY

	62	63	64
EXCEPTED	28	37	37
GS-15	93	165	212
GS-14	125	305	362
OTHER GS	1,188	2,414	2,983
WB	186	275	386
TOTAL	1,620	3,196	3,980

DIRECTOR

	62	63	64
EXCEPTED	3	3	3
GS-15	1	1	7
GS-14	0	2	1
OTHER GS	4	6	7
TOTAL	8	12	18

AUDIT OFFICE

	62	63	64
EXCEPTED	0	0	0
GS-15	0	1	1
GS-14	1	1	2
OTHER GS	3	7	12
TOTAL	4	9	15

PUBLIC AFFAIRS OFFICE

	62	63	64
EXCEPTED	0	0	0
GS-15	0	1	1
GS-14	1	1	3
OTHER GS	30	38	41
TOTAL	31	40	45

LEGAL OFFICE

	62	63	64
EXCEPTED	0	0	0
GS-15	1	1	1
GS-14	1	1	2
OTHER GS	5	12	14
TOTAL	7	14	17

ASTRONAUT ACTIVITIES OFFICE

	62	63	64
EXCEPTED	0	1	1
GS-15	0	1	1
GS-14	0	0	1
OTHER GS	0	7	7
TOTAL	0	9	10

RELIABILITY & FLIGHT SAFETY OFFICE

	62	63	64
EXCEPTED	1	1	1
GS-15	3	3	5
GS-14	5	5	7
OTHER GS	4	9	12
TOTAL	13	18	25

PROGRAM ANALYSIS & EVALUATION OFFICE

	62	63	64
EXCEPTED	1	1	1
GS-15	0	0	1
GS-14	1	4	4
OTHER GS	9	21	26
TOTAL	11	26	32

MANAGEMENT ANALYSIS DIVISION

	62	63	64
EXCEPTED	0	0	0
GS-15	0	1	1
GS-14	3	4	5
OTHER GS	9	13	17
TOTAL	12	18	23

ASSISTANT DIRECTOR FOR ADMINISTRATION

	62	63	64
EXCEPTED	2	2	2
GS-15	1	1	2
GS-14	0	3	5
OTHER GS	1	24	26
TOTAL	4	30	35

MERCURY PROJECT OFFICE

	62	63	64
EXCEPTED	1	1	1
GS-15	3	3	3
GS-14	9	9	0
OTHER GS	33	44	6
TOTAL	46	57	10

ADVANCE PROJECTS OFFICE

	62	63	64
EXCEPTED	0	0	0
GS-15	0	0	5
GS-14	0	0	11
OTHER GS	0	0	44
TOTAL	0	0	60

GEMINI PROJECT OFFICE

	62	63	64
EXCEPTED	3	3	3
GS-15	14	20	22
GS-14	12	22	24
OTHER GS	53	106	106
WB	4	4	5
TOTAL	86	155	160

APOLLO SPACECRAFT PROJECT OFFICE

	62	63	64
EXCEPTED	6	7	7
GS-15	17	37	43
GS-14	11	62	68
OTHER GS	56	133	197
TOTAL	90	239	315

PERSONNEL DIVISION

	62	63	64
EXCEPTED	0	0	0
GS-15	1	1	1
GS-14	1	2	3
OTHER GS	48	69	89
TOTAL	50	72	93

PROCUREMENT & CONTRACTS DIVISION

	62	63	64
EXCEPTED	1	1	1
GS-15	3	4	6
GS-14	9	10	10
OTHER GS	82	179	192
WB	1	1	1
TOTAL	96	195	210

SECURITY DIVISION

	62	63	64
EXCEPTED	0	0	0
GS-15	0	0	0
GS-14	0	0	0
OTHER GS	14	18	20
TOTAL	14	18	20

FINANCIAL MANAGEMENT DIVISION

	62	63	64
EXCEPTED	0	1	1
GS-15	3	5	5
GS-14	3	13	13
OTHER GS	58	79	106
TOTAL	64	98	125

OFFICE OF CENTER SERVICES

	62	63	64
EXCEPTED	1	1	1
GS-15	2	7	8
GS-14	8	15	16
OTHER GS	160	336	366
WB	115	171	248
TOTAL	286	530	639

ASSISTANT DIRECTOR FOR ENGINEERING & DEVELOPMENT

	62	63	64
EXCEPTED	1	1	1
GS-15	1	2	2
GS-14	0	2	2
OTHER GS	4	3	4
TOTAL	6	8	9

SPACECRAFT TECHNOLOGY DIVISION

	62	63	64
EXCEPTED	2	3	3
GS-15	10	16	20
GS-14	17	25	30
OTHER GS	131	263	267
TOTAL	160	307	320

CREW SYSTEMS DIVISION

	62	63	64
EXCEPTED	0	0	0
GS-15	2	4	5
GS-14	9	12	13
OTHER GS	76	112	152
WB	0	14	20
TOTAL	87	142	190

SYSTEMS EVALUATION & DEVELOPMENT DIVISION

	62	63	64
EXCEPTED	1	1	1
GS-15	10	13	16
GS-14	7	21	25
OTHER GS	102	150	166
WB	3	10	22
TOTAL	123	195	230

SPACE ENVIRONMENT DIVISION

	62	63	64
EXCEPTED	0	0	0
GS-15	0	1	1
GS-14	1	4	8
OTHER GS	10	25	41
TOTAL	11	30	50

ASSISTANT DIRECTOR FOR OPERATIONS

	62	63	64
EXCEPTED	0	0	0
GS-15	0	0	1
GS-14	0	0	0
OTHER GS	0	0	2
TOTAL	0	0	3

MANAGER CAPE OPERATIONS

	62	63	64
EXCEPTED	0	0	0
GS-15	0	1	1
GS-14	0	2	2
OTHER GS	18	23	32
TOTAL	18	26	35

AEROSPACE MEDICAL OPERATIONS OFFICE

	62	63	64
EXCEPTED	0	0	0
GS-15	0	1	1
GS-14	0	1	2
OTHER GS	0	11	19
TOTAL	0	13	22

PREFLIGHT OPERATIONS DIVISION

	62	63	64
EXCEPTED	1	1	1
GS-15	7	7	10
GS-14	11	25	31
OTHER GS	74	164	261
WB	63	75	90
TOTAL	156	272	393

FLIGHT OPERATIONS DIVISION

	62	63	64
EXCEPTED	1	2	2
GS-15	9	11	12
GS-14	9	24	28
OTHER GS	129	249	327
TOTAL	148	286	369

FLIGHT CREW OPERATIONS DIVISION

	62	63	64
EXCEPTED	2	4	4
GS-15	5	6	9
GS-14	6	12	15
OTHER GS	37	80	124
TOTAL	50	102	152

ASSISTANT DIRECTOR FOR INFORMATION & CONTROL SYSTEMS

	62	63	64
EXCEPTED	0	1	1
GS-15	0	1	1
GS-14	0	1	1
OTHER GS	0	2	2
TOTAL	0	5	5

GOSS PROJECT OFFICE

	62	63	64
EXCEPTED	0	1	1
GS-15	0	4	4
GS-14	0	8	8
OTHER GS	0	57	72
TOTAL	0	70	85

INSTRUMENTATION & DATA SYSTEMS DIVISION

	62	63	64
EXCEPTED	0	0	0
GS-15	0	6	9
GS-14	0	7	12
OTHER GS	0	95	119
TOTAL	0	108	140

COMPUTATION & DATA REDUCTION DIVISION

	62	63	64
EXCEPTED	1	1	1
GS-15	0	5	7
GS-14	0	7	10
OTHER GS	38	79	107
TOTAL	39	92	125

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RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
MANNED SPACECRAFT SYSTEMS				
Supporting research and technology	Direct	80	147	187
	Support	47	81	94
	Total	127	228	281

Work will be conducted on research, engineering, and technological development related to advanced manned spacecraft systems and components, manned spacecraft structures and materials, special scientific equipment for manned spacecraft, and to flight operations methods and systems. These personnel are responsible for the conduct of in-house effort and the monitoring of study and component contracts for future manned spacecraft missions, and provide the Center with knowledge of science and technology necessary for the development of new manned spacecraft components and subsystems.

Gemini	Direct	150	474	909
	Support	89	259	466
	Total	239	733	1,375

Continuing development and initial operation of the Gemini two-man spacecraft system requires a significant personnel increase in 1964. In addition to the majority working at the Center in planning, monitoring contract effort, and testing spacecraft components, the Center maintains people at the McDonnell plant and at NASA's Launch Operations Center. Gemini personnel also coordinate with the Air Force and Marshall Space Flight Center on the development and modification of the Titan II launch vehicle, and with Lewis Research Center on the Agena stage.

Apollo	Direct	301	835	1,363
	Support	217	461	701
	Total	518	1,296	2,064

A significant increase in Center personnel working on the Apollo three-man spacecraft will occur during 1964 as prototype modules are launched with Little Joe II boosters and boilerplate spacecraft are flown on Saturn developmental launch vehicles. Most Apollo personnel will be located at the Center, involved in mission planning, contract monitoring, testing, and coordination. A number of Apollo personnel will be located at the North American Aviation plant at Downey, California, for direct monitoring and coordination on the Apollo spacecraft and the command and service module. Other Apollo personnel will perform a similar function at the Grumman Aircraft Corporation plant at Bethpage, Long Island for the lunar excursion module. The Center will also have a number of personnel located at the White Sands Missile Range,

		Number of Personnel		
		1962	1963	1964

New Mexico, to support flights of prototype modules on Little Joe II and tests of Apollo propulsion units. Additional personnel will be located at the Launch Operations Center to support the Apollo missions, while others will monitor the Saturn launch vehicle development carried on at Marshall Space Flight Center to insure system compatibility. Lastly, coordination will be performed with the Office of Tracking and Data Acquisition to provide tracking, telemetry, and recovery support for Apollo flights.

Mercury	Direct	373	16	-
	Support	221	9	-
	Total	594	25	-

Effort on the successful Mercury manned spacecraft development and flights will be completed in 1963 with the final data reduction and documentation coming to an end.

One-day mission	Direct	47	468	6
	Support	28	256	4
	Total	75	724	10

Effort on the One-day mission project will be completed during 1964.

AEROSPACE MEDICINE	Direct	41	83	110
	Support	24	45	55
	Total	65	128	165

This project provides medical support for the Gemini and Apollo missions and for the development of aerospace medicine techniques and technology necessary for future manned missions. These personnel will also conduct research on life-support and protection systems and will monitor research under contract. Finally, they will evaluate and monitor the medical aspects of the Gemini and Apollo flights prior to the flights, and from the Launch Operations Center and from the tracking and data acquisition sites during the missions.

SYSTEMS ENGINEERING	Direct	-	37	37
	Support	-	3	3
	Total	-	40	40

Studies and analyses of a manned orbital space station will be conducted with these personnel.

INDUSTRIAL APPLICATIONS	Direct	2	3	3

This effort covers the Center's participation in NASA's program to identify and disseminate to the industrial community information on new systems, methods, or developments which arise from the civil space program.

		Number of Personnel		
		1962	1963	1964
SPACE VEHICLE SYSTEMS				
Supporting research and technology	Direct	-	1	7
	Support	-	-	3
	Total	-	1	10

Manned Spacecraft Center effort in this program is to monitor research and technology contracts in the areas of advanced concepts, spacecraft aerothermodynamics, spacecraft loads and structures, space vehicle environmental factors, and space vehicle design criteria.

ELECTRONIC SYSTEMS				
Supporting research and technology	Direct	-	4	7
	Support	-	2	4
	Total	-	6	11

Manned Spacecraft Center monitors research and technology contracts in the areas of guidance systems, control systems, communications, data handling and processing, and instrumentation.

HUMAN FACTOR SYSTEMS				
Supporting research and technology	Direct	-	8	8
	Support	-	4	4
	Total	-	12	12

Effort in this area will be devoted chiefly to life support and protective systems, and human research. The effort will be largely by contract and will be supplemented by selected in-house work.

TRACKING AND DATA ACQUISITION				
Supporting research and technology	Direct	-	-	6
	Support	-	-	3
	Total	-	-	9

Center personnel will carry out in-house studies and monitor engineering study contracts relating to proposed modifications, improvements, and additions to the manned flight network. Center personnel insure that manned spacecraft mission tracking and data acquisition requirements are coordinated with the major efforts of the Office of Tracking and Data Acquisition.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the Index to that volume for the location of detailed project justifications.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

MARSHALL SPACE FLIGHT CENTER

MISSION:

The primary mission of the Marshall Space Flight Center (MSFC) is to develop and provide launch vehicle and space transportation systems to meet the space program requirements. This responsibility begins with the conception and extends through all phases of design, fabrication, testing, and production, to the integration and coordination of launching the vehicle, and subsequent space operations and analysis. Marshall also performs advanced studies and research in the general fields of astronautics. Other activities include basic research, product improvement, and the advancement of launch vehicle technology, particularly in the areas of multi-engine and stage vehicles, and nuclear and electrical propulsion.

Major functions currently assigned to Marshall include:

a. Project management for the development of the Saturn family of large launch vehicles:

   (1) The Saturn to support the manned earth orbital Apollo missions.

   (2) The Saturn B to continue manned earth orbital development flights.

   (3) The Advanced Saturn to perform manned lunar landing and return mission and deep space explorations.

b. The project management for the development of the propulsion systems for the Saturn family and other launch vehicles. These include:

   (1) F-1 Engine, 1,500,000 pounds thrust.

   (2) J-2 Engine, 200,000 pounds thrust.

   (3) H-1 Engine, 188,000 pounds thrust.

   (4) RL-10 Engine, 15,000 pounds thrust.

c. Development and test of the nuclear rocket stage (RIFT) as a forerunner for application on future large space vehicles.

d. Performance of studies and evaluations of system parameters and concepts for future launch vehicle development and operations, such as Nova, a lunar logistic vehicle, lunar base build-up, manned space stations, and manned planetary explorations.

e. Development of techniques for controlling flight operations of multi-stage vehicles.

f. Development of orbital rendezvous techniques and in-flight hardware.

g. Development of orbital checkout and repair techniques and hardware.

h. Development of lunar logistic payload requirement and equipment. Development of in-orbit launch support facilities and equipment.

To support its operations and its development-management role, Marshall has an integrated complex of engineering, laboratory, fabrication, and test facilities. These in-house facilities and activities are essential to provide the Center with the capability for successful management and evaluation of contractors' activities. Marshall maintains close technical supervision and an active liaison program with contractor technical personnel. Marshall's management operations include the plants at Huntsville, Alabama; the Mississippi Test Facility, the Michoud Plant, and at several contractor facilities.

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

The mission of the Michoud Plant is the manufacture of stages for the Saturn family of launch vehicles. Plant operation is conducted by various companies under contract to NASA.

LOCATION:

The Marshall Space Flight Center is located near Huntsville, Alabama, on Army property at Redstone Arsenal, Alabama. The Mississippi Test Facility is located in southwest Mississippi, approximately 50 miles east of New Orleans, Louisiana. The Michoud Plant is located at Michoud, Louisiana, approximately 15 miles east of New Orleans.

LAND:

Total area occupied in Huntsville is 1,617 acres under permit from the Army. Certain facilities such as the Redstone Arsenal Army Air Field and some utilities are used jointly by NASA and the Army. The total area to be occupied at the Mississippi Test Facility is 141,950 acres, of which 13,550

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acres are being purchased and 128,400 acres held under easement as a buffer area. The Michoud Plant comprises 844 acres owned by NASA.

PLANT VALUE:

The plant value at Huntsville as of June 1962 was $105,388,000; at the Michoud Plant it was $37,128,000; while the Mississippi Test Facility was under development.

SUMMARY OF RESOURCES REQUESTED:

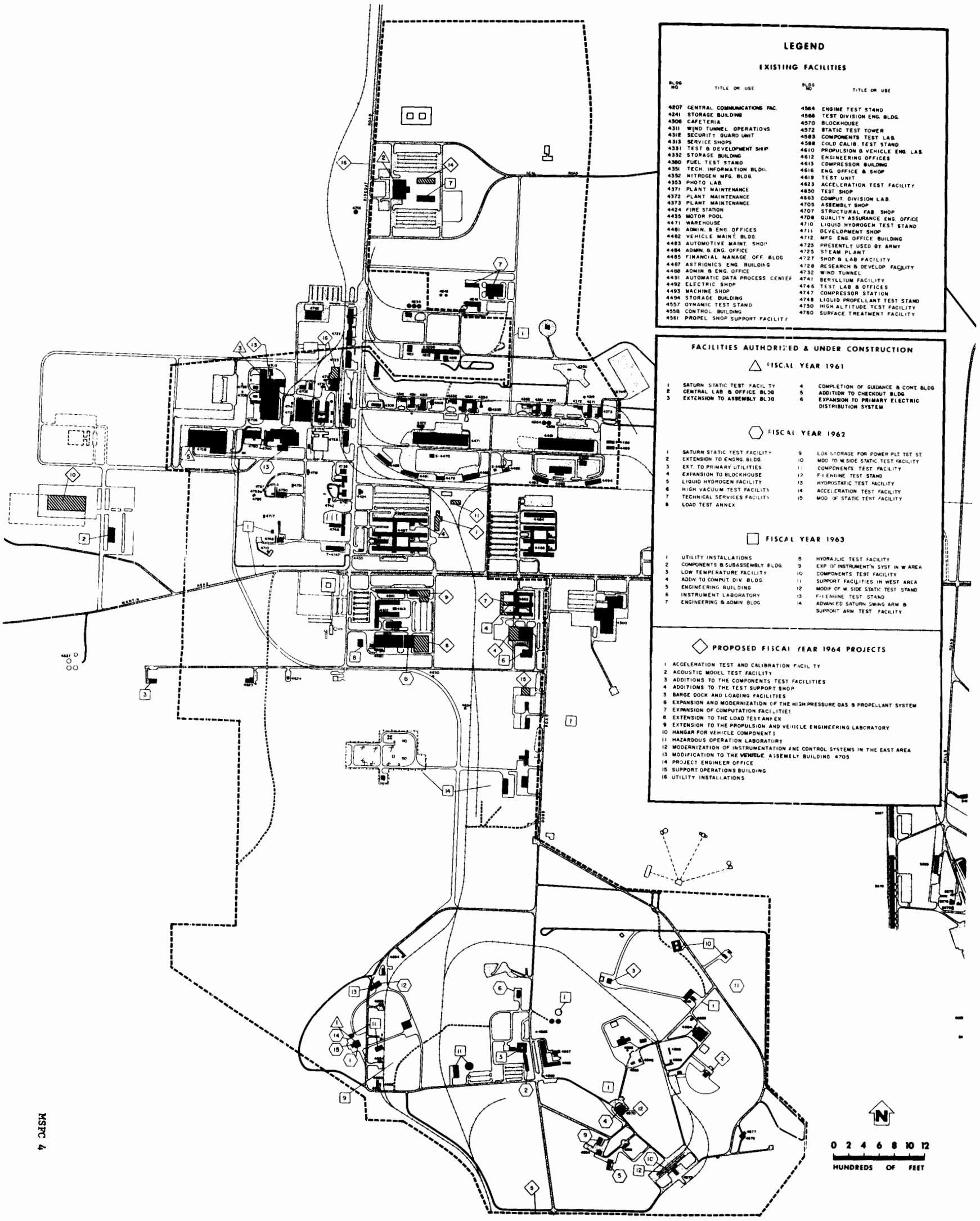
	1962	1963	1964
Number of permanent employees (end of year).....	6,194 1/	7,062 1/	7,492 1/
Personnel costs.....	$54,051,836	$73,599,000	$81,739,000
Operation of installations...	34,576,858	39,500,000	50,590,000
Subtotal	$88,628,694	$113,099,000	$132,329,000
Construction program:			
Huntsville.....	30,318,000	43,559,500	38,496,000
Mississippi Test Facility..	18,990,000	73,200,000	111,690,000
Michoud Plant.....	10,723,000	18,294,000	10,003,000
Total installation costs.	$148,659,694	$248,152,500	$292,518,000

1/ Of these totals, 59, 8, and 6 in fiscal years 1962, 1963, and 1964 are reimbursable.

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1964 ESTIMATES

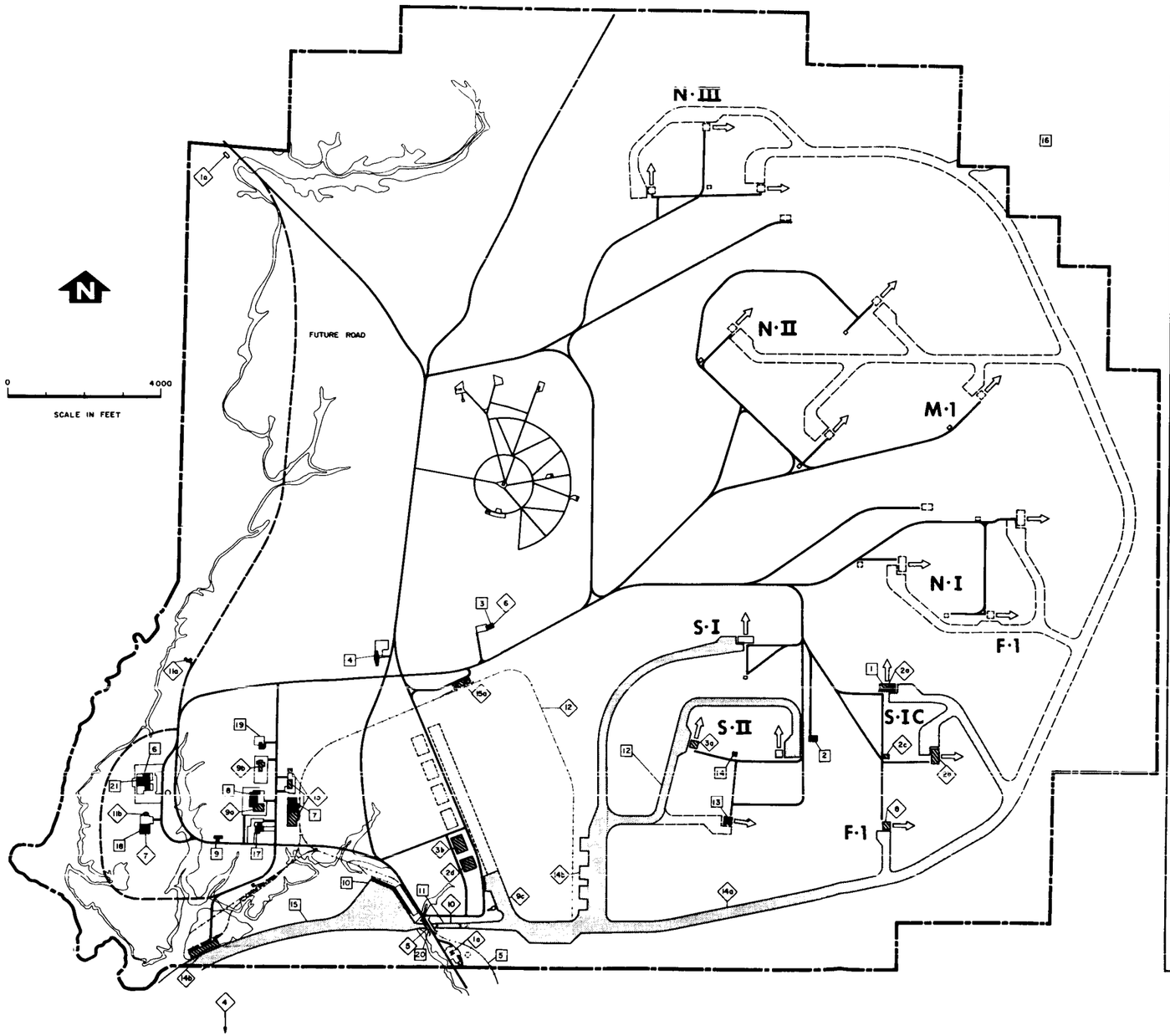
LOCATION PLAN



MISSISSIPPI TEST FACILITY

FISCAL YEAR 1964 ESTIMATES

LOCATION PLAN



LEGEND

☐ FACILITIES AUTHORIZED & UNDER CONSTRUCTION

PROJECT NO 3571 ADVANCED SATURN STAGE TEST FACILITIES
1 EXCAVATION & PILES (FOR TEST STAND)
2 DATA ACQUISITION CENTER
3 DATA HANDLING CENTER
4 TEST AREA CONTROL CENTER

PROJECT NO 3573 UTILITY INSTALLATIONS & SUPPORT FACILITIES
5 RAILROADS
6 OFFICE & ADMINISTRATION BUILDING
7 WAREHOUSE
8 MAINTENANCE BUILDING
9 STEAM PLANT
10 DOCKS, RIVER
11 LOCK (EXCAVATION & FOUNDATION)

NOTE: UTILITY SYSTEMS, ROADS, RIVER DREDGING & SEVERAL MINOR ITEMS ARE EITHER NOT SHOWN OR FY-63 PORTION NOT DEFINED TO PRESERVE CLARITY OF PRESENTATION

PROJECT NO ADVANCE SATURN SECOND STAGE (S-II) TEST FACILITY
12 WATERWAY EXTENSION
13 TEST STAND
14 TEST CONTROL CENTER

PROJECT NO. ADDITIONAL UTILITIES INSTALLATIONS
15 DREDGING HARBOR
16 DAM & RESORVOIR
17 EMERGENCY SERVICE BUILDING
18 ELECTRONIC & INSTRUMENTATION LABORATORY
19 COMMUNICATIONS & TELEPHONE BUILDING
20 BRIDGE, CANAL (EXCAVATION & FOUNDATION)
21 CAFETERIA

◇ PROPOSED FISCAL YEAR 1964 PROJECTS

1. ADMINISTRATIVE FACILITIES
A. SECURITY CONTROL CENTER

2. ADVANCED SATURN FIRST STAGE (S-IC) STATIC TEST FACILITIES
A. TEST STAND
B. TEST STAND FOUNDATIONS
C. TEST CONTROL CENTER
D. STAGE STORAGE BUILDING

3. ADVANCED SATURN SECOND STAGE (S-II) STATIC TEST FACILITIES
A. TEST STAND
B. STAGE SERVICE & STORAGE BUILDING

4. BRIDGE FOR U S INTERSTATE HIGHWAY NO 10 (OFF-SITE NOT SHOWN)

5. CANAL BRIDGE

6. CONTROL AND DATA HANDLING FACILITIES (EQUIP ONLY)

7. ELECTRONICS, INSTRUMENTATION AND MATERIALS LABORATORY (EQUIP)

8. F-1 ENGINE SYSTEMS TEST STAND

9. MAINTENANCE FACILITIES
A. TEST MAINTENANCE SHOP
B. AUTO MAINTENANCE SHOP
C. BARGE TERMINAL AND REPAIR FACILITY

10. NAVIGATION LOCK

11. SONIC MEASURING FACILITIES
A. ACOUSTIC LAB
B. METEOROLOGICAL LAB

12. TRANSPORTATION AND PARKING FACILITIES
A. RAILROADS

13. WAREHOUSE ADDITION AND STORAGE FACILITIES

14. WATERWAYS AND DOCKING FACILITIES
A. CANALS
B. DOCKS

15. UTILITIES
A. RP-1 STORAGE

MSFC 5

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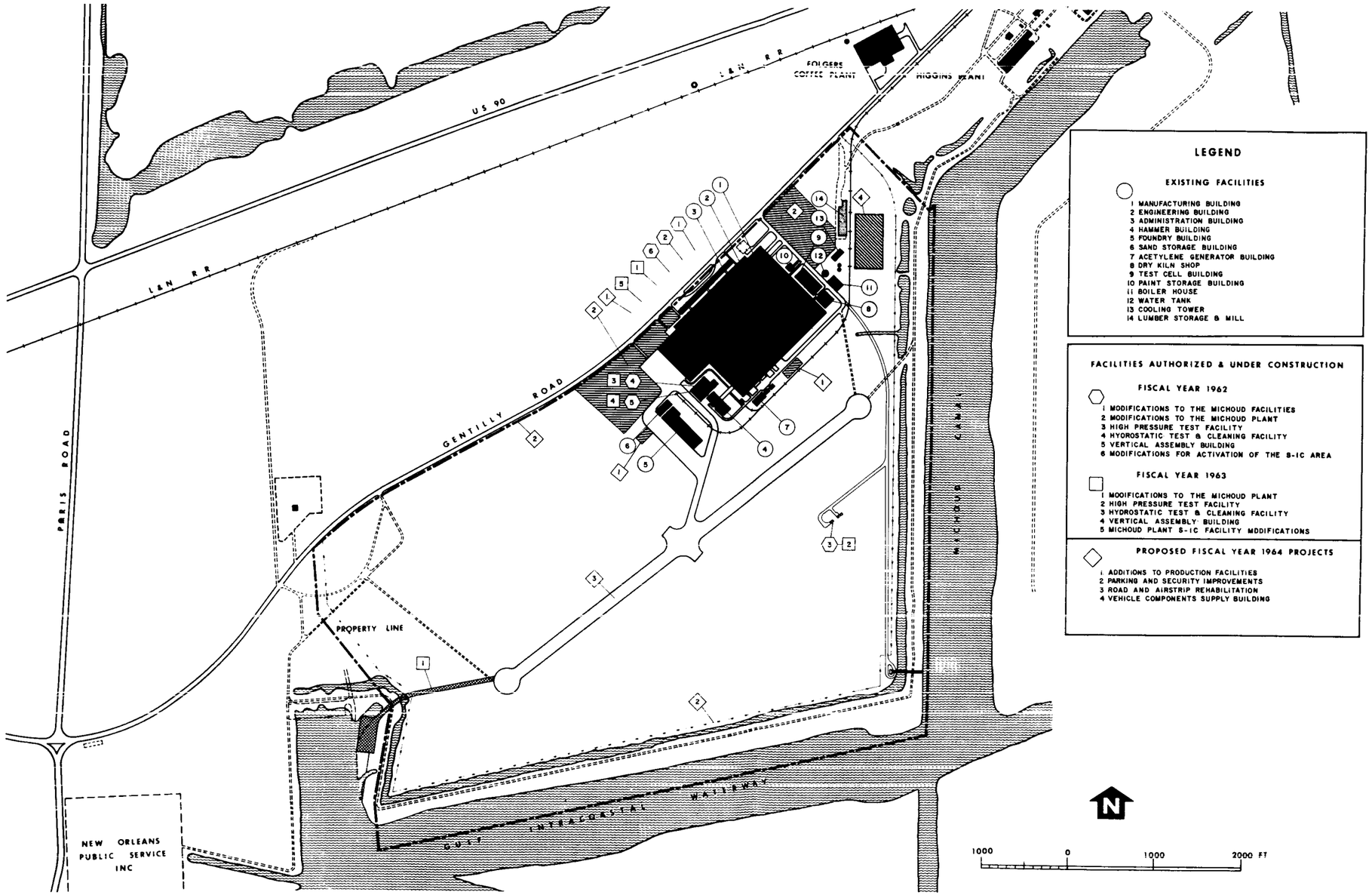
MICHOUD OPERATIONS

FISCAL YEAR 1964 ESTIMATES

LOCATION PLAN



MSFC 6

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GEORGE C. MARSHALL SPACE FLIGHT CENTER
Huntsville, Alabama

AERIAL VIEW

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART:
MARSHALL SPACE FLIGHT CENTER

STAFFING SUMMARY

	62	63	64
Excepted	53	56	56
GS-18	1	0	0
GS-16	4	5	5
GS-15	283	416	501
GS-14	503	661	830
Other GS	3,664	4,258	4,659
WB	1,686	1,666	1,441
Total	6,194	7,062	7,492

DIRECTOR

DEP. DIR. FOR R&D
DEP. DIR. FOR ADM.

	62	63	64
Excepted	6	6	6
GS-15	1	7	7
GS-14	0	2	3
Other GS	11	13	12
Total	18	28	28

SPECIAL ASSIGNMENTS OFFICE

	62	63	64
Excepted	1	1	1
GS-18	1	0	0
GS-15	9	6	11
GS-14	22	5	7
Other GS	58	17	31
Total	91	29	50

PUBLIC INFORMATION OFFICE

	62	63	64
GS-15	1	2	2
GS-14	1	1	2
Other GS	20	25	24
Total	22	28	28

CENTRAL PLANNING OFFICE

	62	63	64
Excepted	1	2	2
GS-15	9	15	15
GS-14	15	24	30
Other GS	58	53	47
Total	83	94	94

AUDITORS

	62	63	64
GS-15	1	1	1
GS-14	1	1	2
Other GS	8	19	19
Total	10	21	22

FINANCIAL MANAGEMENT OFFICE

	62	63	64
GS-15	5	9	9
GS-14	5	10	13
Other GS	141	156	163
Total	151	175	185

FACILITIES ENGINEERING OFFICE

	62	63	64
GS-15	5	9	10
GS-14	16	18	22
Other GS	94	133	148
Total	115	160	180

SATURN SYSTEMS OFFICE

	62	63	64
Excepted	4	4	4
GS-15	7	23	30
GS-14	22	32	40
Other GS	59	87	116
total	92	146	190

RELIABILITY OFFICE

	62	63	64
Excepted	0	1	1
GS-15	4	4	4
GS-14	8	7	9
Other GS	9	23	23
total	21	35	37

GENERAL COUNSEL

	62	63	64
GS-15	2	2	2
GS-14	4	4	5
Other GS	11	17	16
Total	17	23	23

INDUSTRIAL RELATIONS OFFICE

	62	63	64
GS-15	1	2	2
GS-14	1	1	2
Other GS	3	3	2
Total	5	6	6

PROCUREMENTS AND CONTRACTS

	62	63	64
Excepted	1	1	1
GS-15	2	4	8
GS-14	8	14	18
Other GS	215	261	283
Total	226	280	310

SUPPORT SERVICES OFFICE

	62	63	64
GS-15	2	2	2
GS-14	5	6	8
Other GS	213	233	231
WB	358	358	358
Total	578	599	599

AEROBALLISTICS DIVISION

	62	63	64
Excepted	4	4	4
GS-16	1	1	1
GS-15	27	35	40
GS-14	23	47	59
Other GS	213	232	253
WB	14	14	10
Total	282	333	367

ASTRIONICS DIVISION

	62	63	64
Excepted	8	8	8
GS-16	1	1	1
GS-15	50	73	78
GS-14	85	100	126
Other GS	475	493	583
WB	254	249	151
Total	873	924	947

FUTURE PROJECTS OFFICE

	62	63	64
Excepted	2	2	2
GS-15	3	4	6
GS-14	4	6	8
Other GS	16	23	34
Total	25	35	50

MANAGEMENT SERVICES OFFICE

	62	63	64
Excepted	0	1	1
GS-15	5	4	6
GS-14	12	12	15
Other GS	234	239	241
W B	42	42	37
Appren.	5	5	5
Total	298	303	305

MANUFACTURING ENGINEERING DIVISION

	62	63	64
Excepted	3	3	3
GS-16	0	1	1
GS-15	12	29	34
GS-14	27	51	64
Other GS	346	368	393
WB	453	448	405
Total	841	900	900

PROPULSION AND VEHICLE ENGINEERING DIVISION

	62	63	64
Excepted	8	8	8
GS-16	1	1	1
GS-15	53	76	85
GS-14	111	123	154
Other GS	505	569	597
WB	125	120	75
Total	803	897	920

MICHOUD OPERATIONS

	62	63	64
Excepted	1	1	1
GS-15	10	16	22
GS-14	11	20	25
Other GS	42	198	222
Total	64	235	270

COMPUTATION DIVISION

	62	63	64
Excepted	3	3	3
GS-15	8	14	17
GS-14	21	23	29
Other GS	125	129	130
Total	157	169	179

TEST DIVISION*

	62	63	64
Excepted	3	3	3
GS-15	20	24	35
GS-14	37	37	46
Other GS	188	302	336
WB	411	406	380
Total	659	772	800

RESEARCH PROJECTS DIVISION

	62	63	64
Excepted	2	2	2
GS-16	1	1	1
GS-15	9	12	15
GS-14	14	22	26
Other GS	40	48	54
Total	66	85	98

LAUNCH VEHICLE OPERATIONS DIVISION

	62	63	64
Excepted	3	3	3
GS-15	18	20	26
GS-14	16	24	30
Other GS	206	197	235
Total	243	244	294

QUALITY ASSURANCE DIVISION**

	62	63	64
Excepted	3	3	3
GS-15	19	23	34
GS-14	34	71	87
Other GS	374	420	466
WB	24	24	20
Total	454	541	610

* Includes Mississippi Test Facility Personnel
** Includes personnel assigned to Michoud Operations

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RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
MANNED SPACECRAFT SYSTEMS				
Apollo	Direct	2	64	330
	Support	-	25	135
	Total	2	89	465

Marshall conducts vehicle procurement of the operational Saturn, Saturn B, and Advanced Saturn launch vehicles for Apollo. The effort at MSFC includes provision for guidance and related ground support equipment for operational vehicles, quality assurance, stage and engine checkout, testing and acceptance, preparation for vehicle launch, technical supervision, and contract management.

LAUNCH VEHICLE AND PROPULSION SYSTEMS				
Launch vehicle and propulsion supporting technology	Direct	59	65	66
	Support	32	36	36
	Total	91	101	102

This project is composed of theoretical and experimental supporting research that will be required for the future development of large space vehicles.

Saturn	Direct	2,537	2,141	1,438
	Support	1,414	1,187	774
	Total	3,951	3,328	2,212

The S-I first stage was designed and developed at Marshall, and has been successfully static fired at MSFC more than 25 times. The initial development boosters are being assembled at Marshall, and operational boosters are to be built at MSFC's Michoud Plant, under a contract with the Chrysler Corporation. The S-IV second stage, powered by six RL-10 engines, is being developed by Douglas Aircraft Company. Other in-house Saturn effort includes design, inspection, component testing, transportation, evaluation, system integration and overall engineering and contract management.

Saturn B	Direct	20	151	256
	Support	11	83	138
	Total	31	234	394

The Saturn B will consist of the first stage of the Saturn (S-I) and the third stage of the Advanced Saturn (S-IVB). The Saturn B will be used in early phases of the Apollo program. MSFC participation in the Saturn B system will be similar to that of the Saturn.

		Number of Personnel		
		1962	1963	1964
Advanced Saturn	Direct	487	1,447	2,070
	Support	265	793	1,118
	Total	752	2,240	3,188

The Advanced Saturn is now in early development. The design of the S-IC first stage is a joint undertaking of Marshall and Boeing, with Boeing to produce 24 flight units at the Michoud Plant in New Orleans. The flight units will be static fired at the Mississippi Test Facility. Earlier, non-flight test boosters will be built and tested at Marshall.

The S-II second stage is under development by the Space and Information Systems Division of North American Aviation, Inc. The third stage for the Advanced Saturn configuration will be identified as the S-IVB stage. Douglas Aircraft Company has been awarded the prime S-IVB development contract, which will contain a J-2 engine. MSFC personnel will perform system management, contract supervision, inspection, design testing, evaluation and system integration functions in connection with the Advanced Saturn.

M-1 engine	Direct	14	-	-
	Support	8	-	-
	Total	22	-	-

The M-1 engine project was transferred to Lewis Research Center, October 1962.

H-1 engine	Direct	25	22	17
	Support	14	12	9
	Total	39	34	26

The H-1 engine is being developed by Rocketdyne Division, North American Aviation, Inc., under the direction of the MSFC, and will produce 188,000 pounds of thrust.

RL-10 engine	Direct	28	35	39
	Support	15	19	22
	Total	43	54	61

The RL-10 A-3 engine is being developed by Pratt and Whitney Aircraft under the direction of MSFC, and produces 15,000 pounds of thrust.

F-1 engine	Direct	33	48	47
	Support	18	26	26
	Total	51	74	73

		Number of Personnel		
		1962	1963	1964

The F-1 engine is the largest space rocket engine under development in the United States. It is contracted to Rocketdyne Division of North American Aviation under the technical direction of MSFC and develops 1,500,000 pounds thrust. Static testing will be conducted at MSFC as well as at the Contractor plant.

J-2 engine	Direct	38	46	51
	Support	21	25	28
	Total	59	71	79

The J-2 engine is being developed by the Rocketdyne Division of North American Aviation under the direction of MSFC, and produces 200,000 pounds of thrust.

SYSTEMS ENGINEERING	Direct	62	100	100
	Support	34	50	50
	Total	96	150	150

Studies and analyses of a lunar logistics system, Nova class launch vehicles, a lunar base, space stations and planetary exploration will be conducted with these personnel.

INDUSTRIAL APPLICATIONS	Direct	4	5	10
	Support	2	3	3
	Total	6	8	13

The purpose of the Industrial Applications Program is to identify items, or ideas, resulting from the research programs of NASA which are of benefit to industry and to disseminate this information. The support of a non-profit contractor to assist in the documentation and dissemination of information pertaining to the program and possible participation of one or two colleges or universities for pilot or experimental effort in support of the program is planned.

LAUNCH VEHICLE DEVELOPMENT

Centaur development	Direct	239	-	-
	Support	130	-	-
	Total	369	-	-

The Centaur development project has been transferred to Lewis Research Center.

Operational support	Direct	183	-	-
	Support	99	-	-
	Total	282	-	-

		Number of Personnel		
		1962	1963	1964

The Agena procurement program has been transferred to Lewis Research Center, with the responsibility for design modifications required to make the Agena stage compatible with satellite and space probe spacecraft to be flown on it.

SPACE VEHICLE SYSTEMS

Supporting research and technology	Direct	90	127	132
	Support	49	70	71
	Total	139	197	203

MSFC will perform tasks related to the development of launch vehicle structures; studies concerning the effects of space environment on launch vehicle structures and components; investigations of aerodynamic loading on launch vehicle structures; the response of structures to dynamic loadings; aerodynamic heat transfer investigations; and studies of advanced vehicle concepts.

Saturn-launched meteoroid experiment	Direct	-	17	17
	Support	-	8	8
	Total	-	25	25

Marshall has been assigned management responsibility for this project. Systems integration will be by contract.

ELECTRONIC SYSTEMS

Supporting research and technology	Direct	60	98	100
	Support	32	54	55
	Total	92	152	155

Marshall is conducting studies in this area concerning the development of guidance and control equipment and instrumentation for launch vehicles.

HUMAN FACTOR SYSTEMS

Supporting research and technology	Direct	-	6	6
	Support	-	3	4
	Total	-	9	10

Man's reaction time as a function of control system design and sensitivity will be investigated. Instrumentation for system operation will be developed for the pilot's decision making process. Integration of multi-stage vehicles where pilots are used to recover each stage will be evaluated in terms of electro-mechanical connections and separation techniques. This will be a detailed investigation in support of recoverable booster studies presently in progress.

NUCLEAR-ELECTRIC SYSTEMS

		Number of Personnel		
		1962	1963	1964
Supporting research and technology	Direct	8	4	10
	Support	4	2	4
	Total	12	6	14

The integration of space missions with their associated carrier vehicles will be given particular attention. A broad spectrum of missions will be considered ranging from the early unmanned probes to large ferry vehicles, for logistic support of advanced lunar bases. By product applications of the electric propulsion development program, such as large electric power supplies for use on the moon will also be considered.

NUCLEAR ROCKETS

Supporting research and technology	Direct	-	7	7
	Support	-	4	4
	Total	-	11	11

Effort will consist of basic research, development and mission analyses.

RIFT	Direct	39	117	134
	Support	21	64	72
	Total	60	181	206

The main objective of the RIFT project is to flight test the Nerva engine to evaluate the operating characteristics and problems of nuclear rocket propulsion in the space flight environment. The design of the RIFT nuclear stage will be optimized for operation on an Advanced Saturn vehicle, but derated where required to emphasize safety, reliability, and data acquisition.

CHEMICAL PROPULSION

Supporting research and technology	Direct	5	8	12
	Support	3	4	5
	Total	8	12	17

This program involves liquid and solid rocket systems and includes studies of combustion, engine components, propellants, and overall engine performance.

SPACE POWER

Supporting research and technology	Direct	12	23	21
	Support	7	13	12
	Total	19	36	33

		Number of Personnel		
		1962	1963	1964

This project is concerned with the generation of power by chemical means such as batteries and fuel cells, and systems for the distribution of power within the launch vehicle. Included in the latter area are tasks concerning the microminiaturization of electronic components, development of rectifiers and power converters, electronic circuitry having high temperature capabilities, and development of advance power supplies.

TRACKING AND DATA ACQUISITION

Supporting research and technology	Direct	7	27	32
	Support	4	15	17
	Total	11	42	49

MSFC is conducting studies to improve existing systems and operations, and to develop new systems and subsystems in the areas of data acquisition, electronic tracking, optical tracking, data processing, data communications and spacecraft command.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the Index to that volume for the location of detailed project justifications.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

NORTH EASTERN OFFICE

MISSION:

The mission of the North Eastern Office, which was established in August 1962, is to provide both overall liaison with industry and the scientific, educational, and civic organizations in the northeastern region, and technical and administrative assistance in support of NASA programs within the region as requested by Headquarters or NASA Centers. The office also has responsibility for a continuing evaluation of the effect of the space program on the region, and the identification of the industrial, scientific, and educational resources which may be utilized in the space program. Through these liaison and survey activities, the office is continuously engaged in ascertaining and developing the most appropriate methods for translating any susceptible technological processes, techniques, materials and other innovations developed under the space program into commercial application in the interest of the general welfare.

The office also monitors, administers and audits NASA contracts and grants within the region and conducts such special pre-award surveys as may be necessary. It provides for the appropriate dissemination within the region of information concerning the activities of the NASA and serves as NASA spokesman in the region, developing and issuing information on NASA and the space program of particular interest to the region. The office also operates a reliable electrical connections school.

LOCATION:

The North Eastern Office is located in Cambridge, Massachusetts.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	-	30	40
Personnel costs.....	-	$220,000	$453,000
Operation of installation....	-	133,000	190,000
Total installation costs.	-	$353,000	$643,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART:
NORTH EASTERN OFFICE

STAFFING SUMMARY

	62	63	64
Excepted	-	2	2
GS-15	-	4	4
GS-14	-	6	10
Other GS	-	18	24
Total	-	30	40

DIRECTOR

	62	63	64
Excepted	-	1	1
Other GS	-	1	1
Total	-	2	2

TECHNICAL PROGRAMS

	62	63	64
Excepted	-	1	1
GS-15	-	2	2
GS-14	-	3	5
Other GS	-	6	7
Total	-	12	15

ADMINISTRATIVE MANAGEMENT

	62	63	64
Other GS	-	4	6
Total	-	4	6

REGIONAL DEVELOPMENT

	62	63	64
GS-15	-	2	2
GS-14	-	3	5
Other GS	-	7	10
Total	-	12	17

RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

	Number of Support Personnel		
	1962	1963	1964
MANNED SPACECRAFT SYSTEMS	-	4	5
LAUNCH VEHICLE AND PROPULSION SYSTEMS	-	4	5
INTEGRATION AND CHECKOUT	-	3	4
SYSTEMS ENGINEERING	-	4	5
COMMUNICATIONS SATELLITES	-	1	1
INDUSTRIAL APPLICATIONS	-	1	2
GEOPHYSICS AND ASTRONOMY	-	3	3
LUNAR AND PLANETARY EXPLORATION	-	3	3
BIOSCIENCE	-	-	2
SPACE VEHICLE SYSTEMS	-	2	3
ELECTRONIC SYSTEMS	-	1	1
HUMAN FACTOR SYSTEMS	-	1	1
NUCLEAR-ELECTRIC SYSTEMS	-	1	2
CHEMICAL PROPULSION	-	1	1
TRACKING AND DATA ACQUISITION	-	1	2

The personnel of the North Eastern Office are distributed generally on the same ratio as Headquarters personnel to NASA programs and projects.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

PACIFIC LAUNCH OPERATIONS OFFICE

MISSION:

The Pacific Launch Operations Office (PLOO) provides a single point of contact between NASA and the Pacific Missile Range (PMR) for NASA programs requiring PMR support. In addition, the Office provides or obtains administrative, logistic, and engineering support and services to the permanent field operation groups from NASA Centers and to NASA program and project personnel temporarily located at PLOO.

LOCATION:

The Pacific Launch Operations Office is located at Point Arguello, California, within the Naval Missile Facility. Part of the Pacific Launch Operations Office organization is stationed at Point Mugu, California, to maintain direct contact with the Headquarters Staff, Pacific Missile Range. Geographically, Point Mugu is approximately 50 miles north of Los Angeles; Point Arguello is approximately 120 miles north of Point Mugu, adjacent to the southern boundary of Vandenberg Air Force Base. Both Point Mugu and Point Arguello are on the coast line of the Pacific Ocean. Just south of Point Arguello, the coast line runs east and west. This permits direct launchings into polar and high inclination orbits without overflying or endangering inhabited areas of the Western Hemisphere.

PLANT VALUE:

The value of the NASA plant at the Pacific Missile Range, including downrange sites, as of June 30, 1962, was $12,070,000.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	6	15	22
Personnel costs.....	$54,035	$157,000	$210,000
Operation of installation....	61,333	495,000	620,000
Subtotal	$115,368	$652,000	$830,000
Construction program.....	975,000	---	---
Total installation costs.	$1,090,368	$652,000	$830,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART:
PACIFIC LAUNCH OPERATIONS OFFICE

STAFFING SUMMARY

	62	63	64
GS-15	1	1	5
GS-14	1	4	3
Other GS	4	10	14
Total	6	15	22

DIRECTOR

	62	63	64
GS-15	1	1	1
Other GS	1	1	2
Total	2	2	3

EXECUTIVE ASSISTANT

	62	63	64
GS-15	0	0	1
GS-14	0	1	0
Total	0	1	1

PUBLIC SERVICES & INFORMATION DIVISION

	62	63	64
GS-14	0	0	1
Other GS	0	1	1
Total	0	1	2

ADMINISTRATIVE SERVICES DIVISION

	62	63	64
Other GS	1	3	6
Total	1	3	6

INSTRUMENTATION & COMMUNICATIONS DIVISION

	62	63	64
GS-15	0	0	1
GS-14	0	1	1
Other GS	0	1	1
Total	0	2	3

SUPPORT REQUIREMENTS DIVISION

	62	63	64
GS-15	0	0	1
GS-14	0	1	1
Other GS	2	3	3
Total	2	4	5

FACILITIES & EQUIPMENT DIVISION

	62	63	64
GS-15	0	0	1
GS-14	1	1	0
Other GS	0	1	1
Total	1	2	2

PLOO 2

RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
LAUNCH VEHICLE AND PROPULSION SYSTEMS				
Launch operations supporting technology	Support	6	-	-

Work in establishing NASA operations at PMR is covered here.

METEOROLOGICAL SATELLITES				
Nimbus	Support	-	9	11

These personnel will coordinate the launch of Nimbus satellites from PMR.

GEOPHYSICS AND ASTRONOMY				
Geophysics	Support	-	-	11

This covers coordination of the launch of the polar orbiting geophysical observatory.

International satellites	Support	-	6	-

Included is the coordination of the launch of the polar ionosphere beacon satellite.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the Index to that volume for the location of detailed project justifications.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

SPACE NUCLEAR PROPULSION OFFICE

MISSION:

The Space Nuclear Propulsion Office (SNPO) is a joint office of the NASA and the AEC. SNPO was established to assure the formulation and execution of an integrated development program for nuclear rockets which fulfills the responsibilities of both agencies. SNPO has the primary objective of establishing the basic technology, developing, and providing qualified nuclear rocket engines for accomplishing operational missions in advance launch vehicles. Implementation of this program will encompass basic research on reactors, engine systems, and vehicles; development of practical heat-exchanger-type rocket reactors and engine subsystems; ground test of reactors, engines, and stages; development of reliability; and operation of nuclear-powered stages in launch vehicles for flight test purposes.

LOCATION:

The headquarters of the Space Nuclear Propulsion Office is located at Germantown, Maryland, approximately 26 miles northwest of Washington, D. C., in the U. S. Atomic Energy Commission Building.

SNPO has three extensions as follows:

Cleveland	- Located for housekeeping purposes in the NASA Lewis Research Center.
Albuquerque	- Located for housekeeping purposes at the Atomic Energy Commission's Albuquerque Operations Office.
Nevada	- Located at Las Vegas, Nevada, in space rented by the Atomic Energy Commission's Nevada Operations Office.

LAND:

The only land for which the Space Nuclear Propulsion Office has responsibility by interagency agreement with the AEC is the Nuclear Rocket Development Station (NRDS, formally a portion of the AEC Nevada Test Site), comprising approximately 90,000 acres. In addition, a buffer zone is established to the north of the area, which will not be used without the mutual agreement of AEC and NASA.

PLANT VALUE:

At June 30, 1962, all facilities under construction at NRDS were AEC funded, since up to that time facilities were for the purpose of testing KIWI

reactors. NASA-funded facilities were under design in fiscal year 1962, and actual construction began in fiscal year 1963. The plant value as of June 30, 1962, for the AEC funded projects was $56,000,000.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	40	106	160
Personnel costs.....	$203,000	$946,000	$1,771,000
Operation of installation.....	72,000	221,000	505,000
Subtotal.....	$275,000	$1,167,000	$2,276,000
Construction program.....	22,930,000	17,470,000	20,490,000
Total installation costs.	$23,205,000	$18,637,000	$22,766,000

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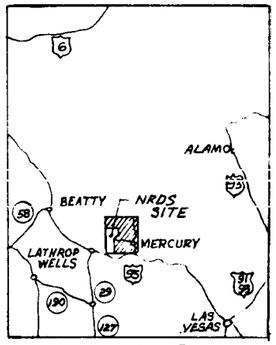
NUCLEAR ROCKET DEVELOPMENT STATION

FISCAL YEAR 1964 ESTIMATES

LOCATION PLAN



KEY MAP

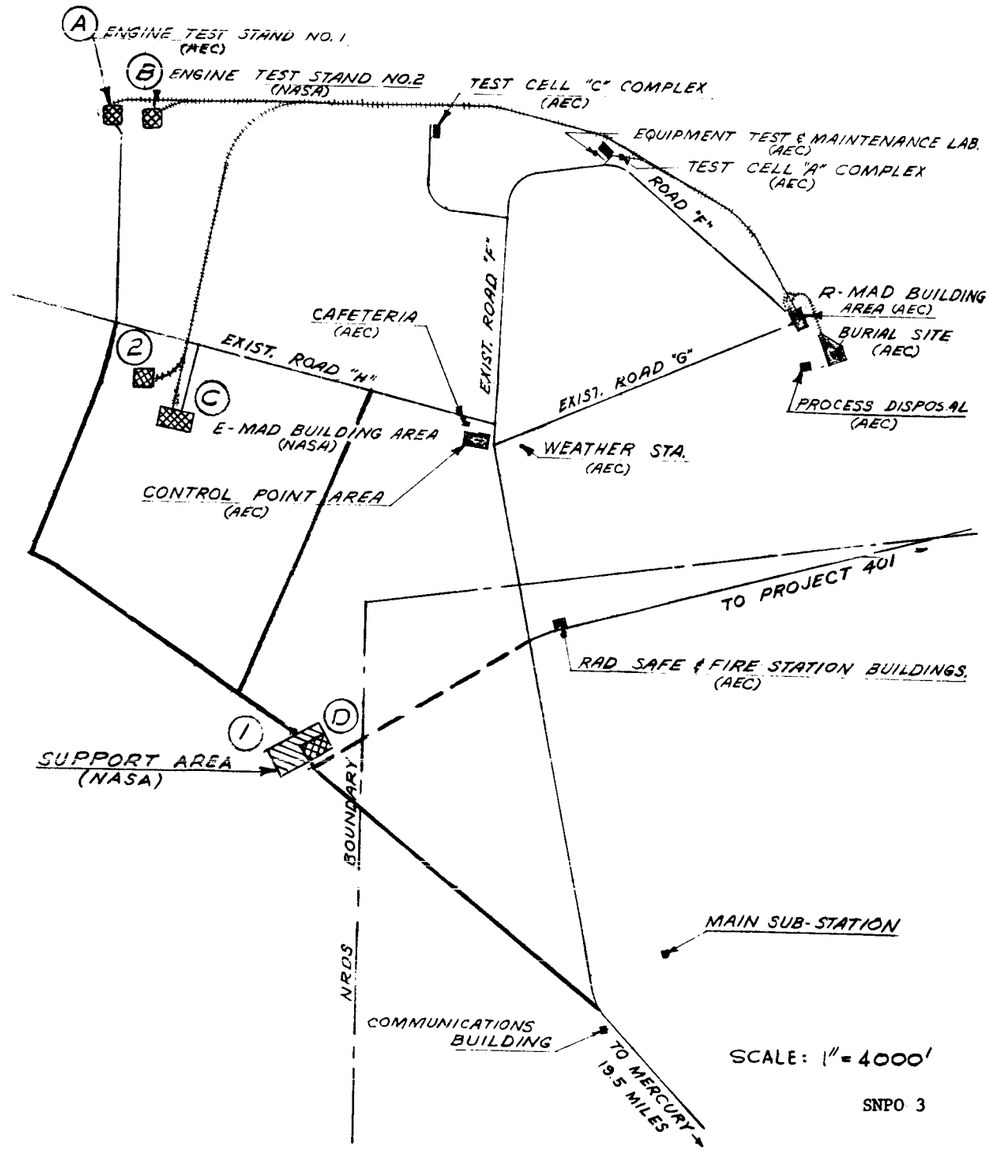
NO SCALE

FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

A. ENGINE TEST STAND NO. 1
B. ENGINE TEST STAND NO. 2
C. E-MAD BUILDING
D. SUPPORT FACILITIES

PROPOSED 1964 PROJECTS

1. SUPPORT FACILITIES
   ADMINISTRATION AND ENGINEERING BUILDING
   TECHNICAL SHOP
   TECHNICAL STORAGE
   MAINTENANCE SHOP AND STORAGE
2. RADIOACTIVE MATERIAL HANDLING COMPLEX



LEGEND

- EXIST. FACILITY
- FAC. AUTHORIZED & UNDER CONSTRUCTION FY. 63
- PROPOSED FY 64 PROJECTS.

SNPO 3

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART:
SPACE NUCLEAR PROPULSION OFFICE

Staffing Summary

	62	63	64
Excepted	2	2	2
GS-15	12	19	23
GS-14	10	33	37
Other GS	16	52	98
Total	40	106	160

OFFICE OF THE MANAGER

	62	63	64
GS-15	1	1	1
GS-14	0	1	2
Other GS	1	1	1
Total	2	3	4

CLEVELAND EXTENSION

	62	63	64
Excepted	2	2	2
GS-15	7	8	8
GS-14	9	16	19
Other GS	14	33	66
Total	32	59	95

NERVA BRANCH

	62	63	64
GS-15	2	2	3
GS-14	1	3	2
Other GS	0	0	2
Total	3	5	7

ALBUQUERQUE EXTENSION

	62	63	64
Excepted	0	0	0
GS-15	0	0	0
GS-14	0	1	2
Other GS	0	0	0
Total	0	1	2

ADVANCED ENGINE BRANCH

	62	63	64
GS-15	1	2	2
GS-14	0	0	0
Other GS	1	1	2
Total	2	3	4

NEVADA EXTENSION

	62	63	64
Excepted	0	0	0
GS-15	0	5	7
GS-14	0	11	12
Other GS	0	16	26
Total	0	32	45

FACILITIES BRANCH

	62	63	64
GS-15	1	1	2
GS-14	0	1	0
Other GS	0	1	1
Total	1	3	3

RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

NUCLEAR ROCKETS		Number of Personnel		
		1962	1963	1964
Supporting research and technology	Direct	3	4	6

This project provides for evaluation of the feasibility of advanced concepts which may offer substantial improvements in performance potential and the establishment of a technological basis for the development of future nuclear rocket engines which are required to meet anticipated mission requirements.

KIWI	Direct	3	7	7

This project provides for NASA support of the design, development, fabrication and test of the KIWI experimental reactors.

NERVA	Direct	34	61	100

This project covers work on the design, development, fabrication, ground testing and qualification of a nuclear rocket engine, based on a selected reactor design from the KIWI Project.

NRDS operations	Direct	-	34	47

This project provides for the NASA share of the people necessary for maintenance and operation of the Nuclear Rocket Development Station. Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the Index to that volume for the location of detailed project justifications.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

WALLOPS STATION

MISSION:

The mission of Wallops Station, established in 1945, is to conduct non-orbital and orbital experiments with rocket-propelled vehicles carrying payloads used for aeronautical and space research. These payloads may be in the form of reentry or space flight models, models of manned-space capsules, ionized layer data-gathering and other sounding devices, or any other space research device capable of being carried by the vehicles up to Scout size which Wallops Station can launch. Occasionally, research is conducted at Wallops Station with free-fall instrumented payloads or models dropped from aircraft, or launched from aircraft and ships.

Vehicles containing up to six rocket stages have been used to launch research payloads from Wallops Station. Missiles have flown higher than 3,500 miles above the Atlantic Ocean and at speeds in excess of 20,000 miles an hour for the purpose of space flight research. Thus far, more than 4,000 models have been launched at Wallops, with over 200 research vehicles being launched each year.

Wallops Station has available on Wallops Island and aboard ship, radars and telemetry systems for gathering research data from vehicles launched at Wallops Island or other ranges. In addition to radar and telemetry data, most tests are supported with photographic coverage and optical facilities. Facilities are also available at the Station to give meteorological coverage before or after a specific launching, and the Station serves as a readout location for the Tiros meteorological satellite. If necessary, special assistance may be obtained from outside agencies to support the standard equipment available at the Station, which includes down-range recovery of payloads or vehicles.

LOCATION:

Wallops Station is located approximately 20 miles from Pocomoke City, Maryland, near Chincoteague, Virginia. The firing sites of Wallops Station are located on Wallops Island, which is a comparatively flat, sparsely wooded, sandy island on the Atlantic Coast on the Delmarva Peninsula. Wallops Station is composed of three major areas: Wallops Island, south of Chincoteague; Wallops mainland, on the mainland behind the island; and the main base, west of Chincoteague.

LAND:

A total area of 6,478 acres is occupied, of which 2,230 acres is occupied by the main base, 108 acres by the mainland area, 3,000 acres by the island and 1,140 acres is marsh land. All of this land is NASA-owned.

PLANT VALUE:

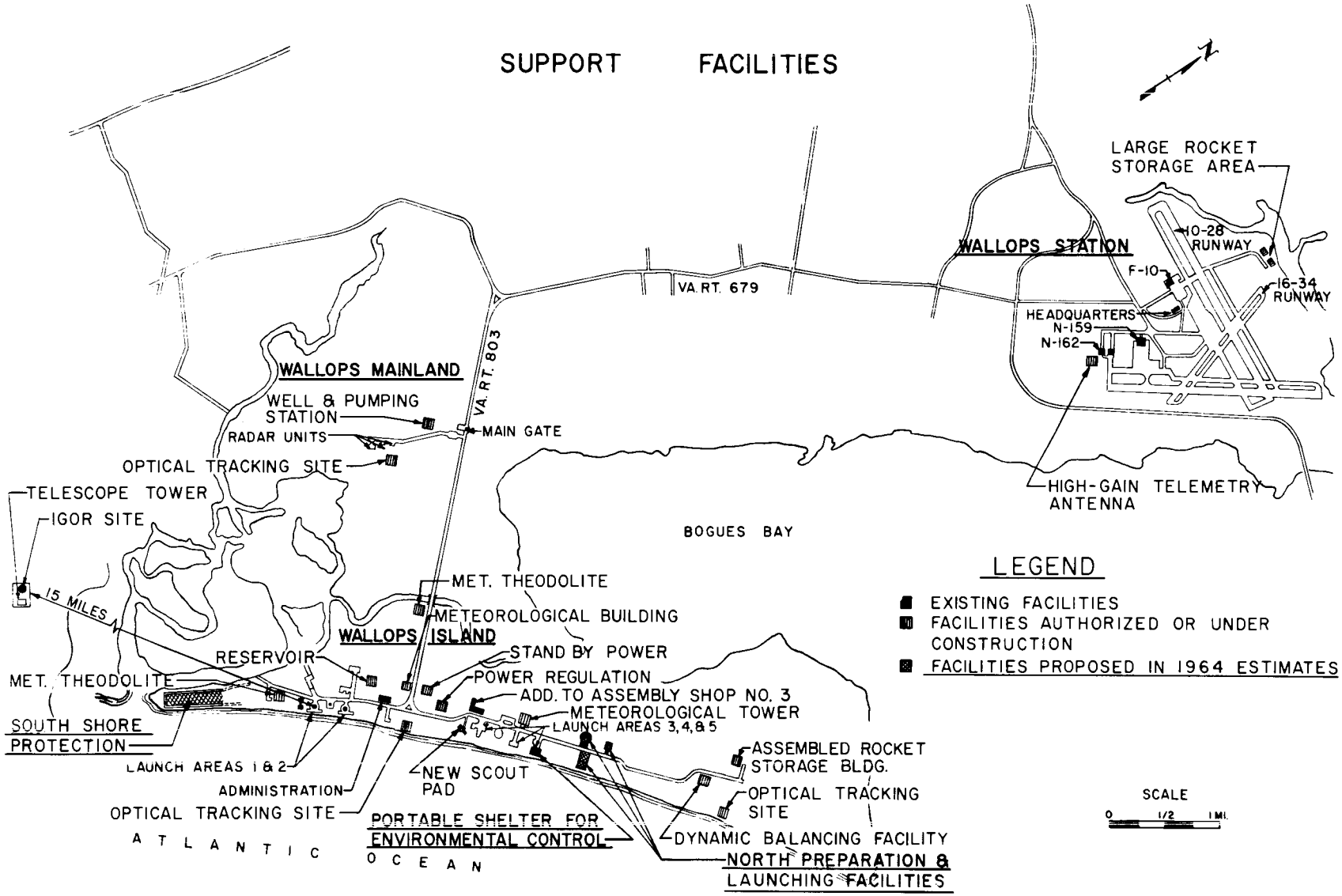
The plant value as of June 30, 1962, was $52,133,000.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	407	465	530
Personnel costs.....	$2,930,750	$3,569,000	$4,360,000
Operation of installation....	4,086,250	5,231,000	6,100,000
Subtotal.....	$7,017,000	$8,800,000	$10,460,000
Construction program.....	11,714,000	4,160,750	2,000,000
Total installation costs.	$18,731,000	$12,960,750	$12,460,000

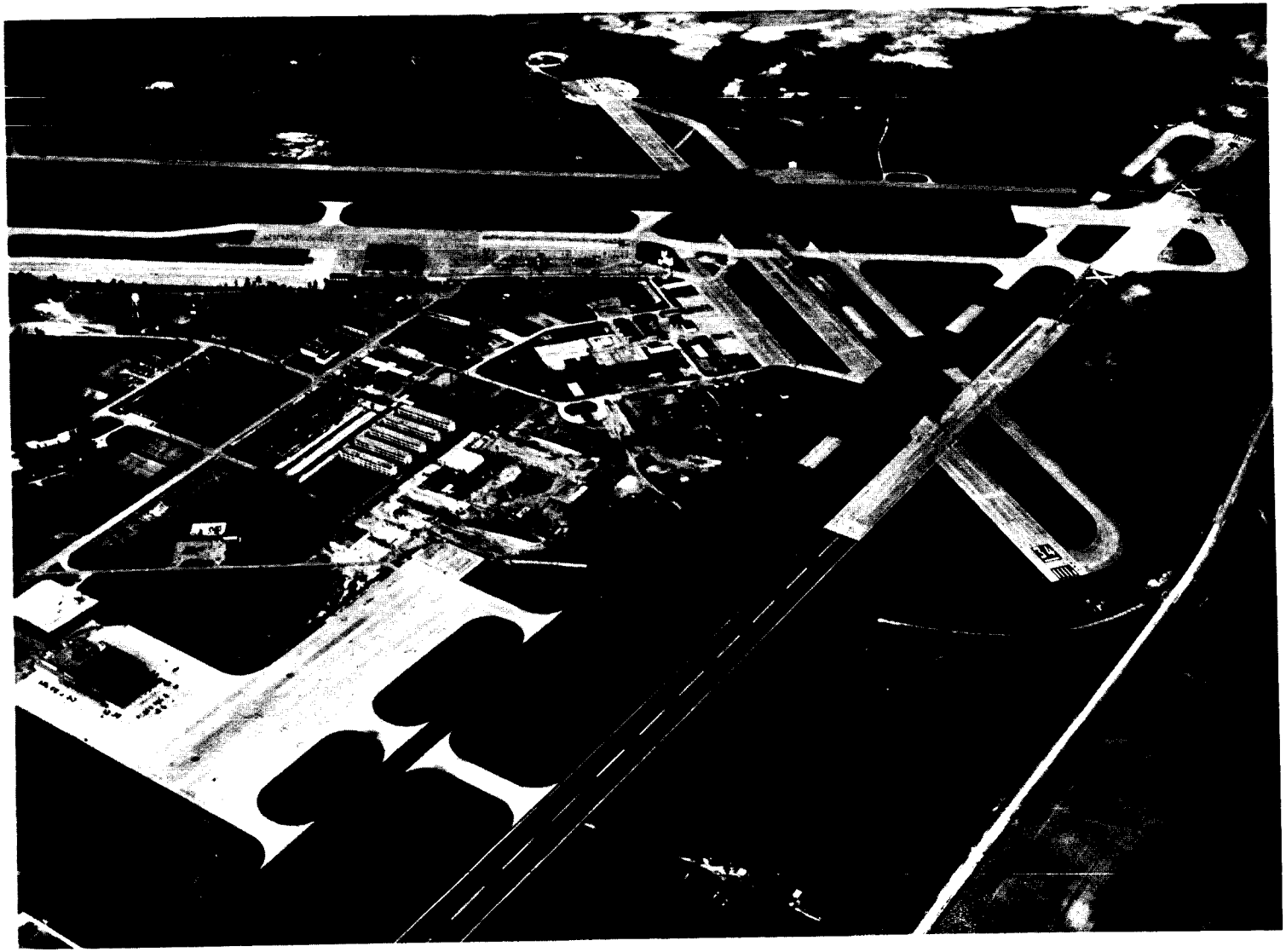
WALLOPS STATION
FISCAL YEAR 1964 ESTIMATES

SUPPORT FACILITIES



LOCATION PLAN

WALLOPS STATION
Virginia



AERIAL VIEW - Wallops Station

WALLOPS STATION
Virginia

AERIAL VIEW - Wallops Island

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ORGANIZATIONAL AND STAFFING CHART:

WALLOPS STATION

STAFFING SUMMARY

	62	63	64
EXCEPTED	2	2	2
GS-15	2	3	3
GS-14	7	9	9
OTHER GS	184	215	251
WB	212	236	265
TOTAL	407	465	530

DIRECTOR

	62	63	64
EXCEPTED	1	1	1
GS-14		1	1
OTHER GS	2	2	3
TOTAL	3	4	5

FLIGHT TEST DIVISION

	62	63	64
EXCEPTED	1	1	1
GS 15	2	1	1
GS 14	4	3	3
OTHER GS	32	43	53
WB	83	91	109
TOTAL	122	139	167

RANGE ENGINEERING DIVISION

	62	63	64
EXCEPTED	--	--	--
GS 15	--	2	2
GS 14	1	3	3
OTHER GS	60	67	87
WB	9	11	17
TOTAL	70	83	109

ADMINISTRATIVE MANAGEMENT DIVISION

	62	63	64
GS 14	1	1	1
OTHER GS	63	73	78
WB	9	10	11
TOTAL	73	84	90

TECHNICAL SERVICES DIVISION

	62	63	64
GS 14	1	1	1
OTHER GS	27	30	30
WB	111	124	128
TOTAL	139	155	159

RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
METEOROLOGICAL SATELLITES				
Tiros	Direct	15	15	15
	Support	20	20	20
	Total	35	35	35

A major effort in Tiros satellite tracking and telemetry reception will continue during 1964 at the Station.

Nimbus	Direct	-	-	4
	Support	-	-	4
	Total	-	-	8

These personnel will provide Wallops' support of the Nimbus project.

Meteorological sounding rocket systems	Direct	6	8	9
	Support	11	17	18
	Total	17	25	27

Wallops personnel will provide launch services for this project.

COMMUNICATIONS SATELLITES				
Echo	Direct	3	3	3
	Support	5	5	5
	Total	8	8	8

Station personnel provide launch support and tracking coverage for the Echo project.

Syncom	Direct	-	1	-

Covers minor Wallops work on Syncom project.

INDUSTRIAL APPLICATIONS	Direct	-	1	1
	Support	-	-	1
	Total	-	1	2

Work represents Wallops' effort to identify and disseminate useful innovations from the space program to industry.

		Number of Personnel		
		1962	1963	1964
GEOPHYSICS AND ASTRONOMY				
International satellites	Direct	3	8	11
	Support	1	6	6
	Total	4	14	17

Activities of the personnel include advising and training international teams in the details of space technology, to fire rockets at NASA and foreign locations, and to plan their own ranges for rocket launchings.

Sounding rockets and geoprobes	Direct	27	28	35
	Support	48	48	65
	Total	75	76	100

As part of their general support of sounding rocket and geoprobe firings, Wallops personnel plan for range users, provide prelaunch support, perform and monitor launches in some cases, track and receive telemetry data from flights, and in some cases recover payloads from the ocean after flights.

LUNAR AND PLANETARY EXPLORATION				
Supporting research and technology	Direct	-	1	2
	Support	-	1	2
	Total	-	2	4

Personnel support the flight and testing of lunar and planetary vehicle subsystems, components, and instrumentation techniques by NASA experimenters.

BIOSCIENCE				
Supporting research and technology	Direct	-	3	12
	Support	-	-	3
	Total	-	3	15

Work in this area supports the flight test on rocket probes of components and subsystems of future bioscience spacecraft, and the test of experimental techniques prior to the development of full scale spacecraft.

Biosatellite	Direct	1	1	-

Wallops personnel provided advice for the launching of the BIOS probe from the Pacific Missile Range.

		Number of Personnel		
		1962	1963	1964
LAUNCH VEHICLE DEVELOPMENT				
Operational support	Direct	8	7	15
	Support	2	7	28
	Total	10	14	43

Station personnel support the launch of Scout vehicles for the Air Force and the Navy.

Scout development	Direct	19	20	6
	Support	36	40	10
	Total	55	60	16

Wallops Station personnel participated in the development and developmental launchings of the Scout vehicles. This effort will phase out after fiscal year 1964.

SPACE VEHICLE SYSTEMS				
Supporting research and technology	Direct	8	5	5
	Support	10	5	6
	Total	18	10	11

Personnel at Wallops Station conduct investigations and provide advice to range users on the projects fired from the Station.

Scout reentry heating	Direct	4	4	4
	Support	5	6	6
	Total	9	10	10

Station personnel conduct the launching, tracking, and data acquisition of the Scout vehicles used for the reentry heating experiments.

Scout-launched meteoroid satellite	Direct	2	2	2
	Support	2	4	4
	Total	4	6	6

Wallops personnel support the checkout, preparation, launch, and tracking of the Scout-launched meteoroid satellite experiments.

Small space vehicle flight experiments	Direct	18	12	14
	Support	12	16	19
	Total	30	28	33

A significant station effort is conducted for the launching and subsequent tracking and data acquisition of flight experiments flown on small rockets.

		Number of Personnel		
		1962	1963	1964
NUCLEAR-ELECTRIC SYSTEMS				
Supporting research and technology	Direct	6	6	9
	Support	10	12	16
	Total	16	18	25

Personnel of Wallops Station conduct the preparation and launch of experiments flown on small rockets.

SNAP-8 development	Direct	2	2	2
	Support	3	4	4
	Total	5	6	6

Wallops Station personnel aid in the planning for and the conduct of rocket flights necessary for the SNAP-8 development program.

MECCA	Direct	-	2	2
	Support	-	3	3
	Total	-	5	5

Wallops will provide launch services for the MECCA Wasp vehicles.

Space electric rocket tests	Direct	4	4	4
	Support	7	7	7
	Total	11	11	11

Rocket tests of space electric systems and subsystems are launched and tracked by the personnel of Wallops Station.

CHEMICAL PROPULSION				
Supporting research and technology	Direct	-	3	4
	Support	-	3	4
	Total	-	6	8

Personnel support the launching of chemical propulsion experiments.

TRACKING AND DATA ACQUISITION				
Supporting research and technology	Direct	20	24	26
	Support	30	36	39
	Total	50	60	65

Personnel working in this area perform and monitor effort aimed at the development of new and improved tracking and data acquisition systems.

		Number of Personnel		
		1962	1963	1964
Network operations and equipment and components	Direct	24	26	30
	Support	35	39	45
	Total	59	65	75

These personnel operate the tracking and data acquisition systems located at the Station, and procure additional and replacement equipment for Wallops instrumentation systems.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the Index to that volume for the location of detailed project justifications.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

WESTERN OPERATIONS OFFICE

MISSION:

The Western Operations Office represents NASA in the area of the United States west of Denver to support technical and contractual requirements placed on the Office by NASA Program Offices and field installations. The Office's responsibilities are:

1. To enter into and/or administer NASA contracts as assigned by Headquarters or Centers; provide contracting officer's representatives for the performance of specific contract administration functions as delegated; survey industrial organizations to assess their capability to perform specific NASA contracts; assist small businesses; and inform industry of business opportunities with NASA.

2. To manage the contract with the California Institute of Technology for operation of the Jet Propulsion Laboratory.

3. To provide reliability and quality assurance personnel and contract management on Apollo and Saturn projects at the Downey, California, plant of North American Aircraft Corporation.

4. To provide technical support for project management officers as assigned by Headquarters or Centers.

5. To survey industrial organizations which are, or may be NASA contractors to assess the effectiveness of their reliability and quality assurance programs and report findings to all interested NASA organizations.

6. To maintain liaison with industrial organizations and colleges and universities in order to advise Headquarters and Centers on:

a. New developments in advanced technologies of interest to NASA and their relation to NASA-supported research, and

b. Capabilities of the organizations to perform NASA research and development projects.

7. To provide public information services in connection with major NASA activities with special reference to their impact on local conditions and interests.

8. To provide necessary administrative and management support and service to NASA and its contractors as required to carry out assignments in the fields of financial management, legal and patent matters, industrial

security, and educational programs.

LOCATION:

Western Operations Office is at Santa Monica, California, approximately twenty miles west of downtown Los Angeles, and is housed in rented facilities totalling 36,714 square feet.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	136	440	500
Personnel costs.....	$936,000	$2,779,000	$5,222,000
Operation of installation.....	439,000	1,077,000	1,700,000
Total installation costs.....	$1,375,000	$3,856,000	$6,922,000

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NATIONAL AERONAUTICS & SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART:
WESTERN OPERATIONS OFFICE

STAFFING SUMMARY

	1962	1963	1964
Excepted	3	3	3
GS-15	8	13	15
GS-14	23	44	64
Other GS	102	380	418
Total	136	440	500

DIRECTOR

	1962	1963	1964
Excepted	2	2	2
Other GS	2	4	4
Total	4	6	6

NASA-O

	1962	1963	1964
GS-15	2	2	2
GS-14	1	3	6
Other GS	14	215	222
Total	17	220	230

PROCUREMENT & CONTRACTS

	1962	1963	1964
Excepted	1	1	1
GS-15	-	1	1
GS-14	5	9	11
Other GS	30	55	73
Total	36	66	86

TECHNICAL DIVISION

	1962	1963	1964
GS-15	3	7	9
GS-14	14	25	37
Other GS	14	23	19
Total	31	55	65

LEGAL DIVISION

	1962	1963	1964
GS-15	3	3	3
GS-14	2	4	5
Other GS	3	8	9
Total	8	15	17

FINANCIAL MANAGEMENT

	1962	1963	1964
GS-14	1	1	1
Other GS	8	19	25
Total	9	20	26

EDUCATIONAL PROGRAMS

	1962	1963	1964
GS-14	--	1	1
Other GS	--	2	3
Total	--	3	4

ADMINISTRATIVE DIVISION

	1962	1963	1964
GS-14	--	--	1
Other GS	24	41	45
Total	24	41	46

PUBLIC INFORMATION DIV.

	1962	1963	1964
GS-14	--	--	1
Other GS	5	7	8
Total	5	7	9

PERSONNEL DIVISION

	1962	1963	1964
GS-14	--	1	1
Other GS	2	6	10
Total	2	7	11

RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
MANNED SPACECRAFT SYSTEMS				
Apollo	Direct	8	100	125
	Support	4	20	22
	Total	12	120	147

The effort on Apollo is centered at the Downey, California, plant of North American Aircraft Corporation, where Western Operations Office personnel furnish technical liaison, reliability and quality assurance, and contract administration support to the Apollo project contractor.

LAUNCH VEHICLES AND PROPULSION SYSTEMS				
Launch vehicle supporting technology	Direct	1	1	-
	Support	2	1	-
	Total	3	2	-

This effort reflects the Office's support of contract administration, technical and financial management services for NASA West Coast contracts involved in this project.

Advanced Saturn	Direct	5	85	99
	Support	3	15	22
	Total	8	100	121

These personnel support NASA contractor effort on the S-II stage of the Advanced Saturn vehicle at the Downey, California plant of North American Aircraft, supplying technical liaison services, reliability and quality assurance control, and contract administration support.

METEOROLOGICAL SATELLITES				
Supporting research and technology	Direct	2	1	1
	Support	1	1	1
	Total	3	2	2

Western Operations Office personnel are involved in financial management of contracts supporting this effort on the West Coast, as well as in technical reporting of data obtained.

Nimbus	Direct	3	3	2
	Support	1	1	1
	Total	4	4	3

The effort on Nimbus includes support of West Coast contractors doing

		Number of Personnel		
		1962	1963	1964

research and development on the problems of stabilization, guidance and control of the Nimbus spacecraft.

COMMUNICATIONS SATELLITES

Syncom	Direct	1	1	-

This effort reflects Western Operations' technical and financial management support of the Syncom project through coordination and liaison with the Hughes Aircraft Corporation and the Jet Propulsion Laboratory, contractors for the spacecraft and "apogee kick" rocket motor, respectively.

INDUSTRIAL APPLICATIONS	Direct	-	1	2

These personnel reflect Western Operations Office's role in the NASA Industrial Applications Program, designed to seek out and disseminate information concerning new technological developments for other industrial uses.

LUNAR AND PLANETARY EXPLORATION

Supporting research and technology	Direct	2	5	7
	Support	2	4	3
	Total	4	9	10

The personnel shown here are engaged in supporting the research and technological studies being undertaken at Jet Propulsion Laboratory and other West Coast contractors. The support furnished includes technical liaison with NASA Headquarters and field centers, financial administration and contract monitoring services.

Ranger	Direct	13	30	30
	Support	10	7	8
	Total	23	37	38

The Ranger effort at the Jet Propulsion Laboratory receives extensive support from Western Operations Office personnel in the areas of contract administration, financial management, and technical liaison.

Surveyor	Direct	14	37	40
	Support	9	7	9
	Total	23	44	49

The Surveyor project is managed by the Jet Propulsion Laboratory, which receives support from the Western Operations Office in financial management control, administration and technical liaison with NASA Headquarters and field installations.

		Number of Personnel		
		1962	1963	1964
Mariner	Direct	16	24	23
	Support	10	15	15
	Total	26	39	38

Western Operations Office personnel support the development of the Mariner spacecraft at the Jet Propulsion Laboratory.

LAUNCH VEHICLE DEVELOPMENT

Operational support	Direct	-	20	25
	Support	-	8	9
	Total	-	28	34

Western Operations Office effort in this area reflects support of NASA contracts for launch vehicle procurement with West Coast contractors, including coordination of minor configuration changes made necessary by specific mission requirements.

Delta development	Direct	4	-	-
	Support	2	-	-
	Total	6	-	-

This effort reflects Western Operations Office support of the Douglas Aircraft Corporation contract for Delta development.

SPACE VEHICLE SYSTEMS

Supporting research and technology	Direct	1	3	3
	Support	-	3	3
	Total	1	6	6

The Western Operations Office supports NASA effort in this area through technical reporting, financial management, and administration of contracts with various industrial and nonprofit contractors on the West Coast.

NUCLEAR-ELECTRIC SYSTEMS

SNAP-8 development	Direct	2	2	3
	Support	-	-	2
	Total	2	2	5

Personnel are involved in technical support and contract administration of the Aeroject-General Corporation, the contractor on this project.

		Number of Personnel		
		1962	1963	1964
NUCLEAR ROCKETS				
NERVA	Direct	2	2	2
	Support	1	1	1
	Total	3	3	3

This work is in support of NASA's contract effort to procure liquid hydrogen for the NERVA nuclear engine.

TRACKING AND DATA ACQUISITION				
Supporting research and technology	Direct	2	6	6
	Support	-	4	4
	Total	2	10	10
Network operations and equipment and components	Direct	10	22	25
	Support	5	10	7
	Total	15	32	32

This effort reflects support of the Jet Propulsion Laboratory's activities in tracking research and technology, and operation of the deep space network. The Western Operations Office effort is directed to contract administration, financial management support, and technical monitoring of JPL efforts.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the index to that volume for the location of detailed project justifications.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

ELECTRONICS RESEARCH CENTER

MISSION:

In fiscal year 1963, NASA is taking initial steps towards the establishment of the Electronics Research Center in the greater Boston area. In the fiscal year 1964 Construction of Facilities estimates, NASA is requesting authority and funds to acquire land and to design the Center. This new Center is planned to strengthen advanced research and technology in the important field of space electronics, in order to provide a capability to anticipate and understand problems in this crucial field prior to the initiation of development projects. The new Center will act as the focal point of the agency's electronics and related physics research and will establish an in-house competency based on intimate theoretical knowledge and related practical experience. The Center's activities will be directed toward:

(1) Expanding the frontiers of electronics and related physics research with the prime motive of deriving concepts, techniques, components and systems for utilization in space exploration, missions, and applications.

(2) Providing objective, mature and knowledgeable advice and direction to the other NASA Centers on the fundamental electronics and related physics aspects of their respective missions and projects.

(3) Establishing a team of experienced scientists and engineers, informed on the nature of the technical problems to be encountered in space, to pursue potential solutions to be extracted from electronics and related physics research. This group will furnish invaluable assistance in maximizing the yield of the efforts of the nation's vast and capable electronics research and development industry.

The Center staff will include experts in the fields of electronics, physics, space guidance, control and information theory, computation and data processing, space electric power, and space flight mechanics. The scientist and engineers assigned to planned laboratories will conduct and direct research in the fundamental disciplines of electrostatics, microwave radiation, inertial sensing, optics, solid state physics and energy conversion. Technique and component advances will be refined to demonstrate instrumentation applications and system utility or feasibility for communi-

cations, data processing, control and guidance systems. The basic and original research conducted will also provide the background and substance for close liaison and scientific exchange with the university research community, other government research and development laboratories, and industrial research organizations, particularly those having an interest in or actively pursuing space-oriented electronics and related physics research and development.

Man's ventures into space for longer periods and greater distances, his desire for additional and refined knowledge of the universe about him, and his goal of utilizing space for peaceful applications, all require refinements in sensors, instrumentation, computation and data processing systems if the more stringent performance and long-operational-life goals of the future are to be met. The efforts of the Electronics Research Center are planned to assure that the electronics and related disciplines are fully exploited to assist NASA and the nation in meeting its goals.

LOCATION:

This Center is planned for the greater Boston area.

SUMMARY OF RESOURCES REQUESTED:

	1962	1963	1964
Number of permanent employees (end of year).....	---	50	250
Personnel costs.....	---	$255,000	$2,725,000
Operation of installation....	---	150,000	800,000
Subtotal.....	---	$405,000	$3,525,000
Construction program.....	---	---	5,000,000
Total installation costs.	---	$405,000	$8,525,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART:
ELECTRONICS RESEARCH CENTER

DIRECTOR

	63	64
Excepted	1	1
GS-15	1	2
Other GS	1	2
Total	3	5

STAFFING SUMMARY

	63	64
Excepted	4	4
GS-15	4	20
GS-14	5	23
Other GS	29	151
Wage Board	8	52
Total	50	250

PROGRAM OFFICE

	63	64
Excepted	1	1
GS-15	-	1
GS-14	1	3
Other GS	3	10
Total	5	15

TECH. SERVICES DIV.

	63	64
Excepted	-	-
GS-15	1	2
GS-14	1	2
Other GS	10	10
Wage Board	5	15
Total	17	29

ADMINISTRATIVE DIV.

	63	64
Excepted	-	-
GS-15	1	3
GS-14	2	3
Other GS	8	22
Wage Board	3	13
Total	14	41

ELECTRONICS DIVISION

	63	64
Excepted	1	1
GS-15	1	7
GS-14	-	8
Other GS	4	66
Wage Board	-	10
Total	6	92

GUIDANCE & CONTROL DIV.

	63	64
Excepted	1	1
GS-15	-	5
GS-14	1	7
Other GS	3	41
Wage Board	-	14
Total	5	68

RELATION OF INSTALLATION STAFFING TO PROGRAMS AND PROJECTS:

		Number of Personnel		
		1962	1963	1964
ELECTRONIC SYSTEMS				
Supporting research and technology	Direct	-	10	152
	Support	-	37	88
	Total	-	47	240

The primary efforts of the Center will be applied to research and advanced technology in this area. Emphasis will be placed on research involving microwave radiation, optical communications, and electronic components such as microelectronics and radiation resistant materials for active and passive circuit elements. Space guidance methods and techniques will receive concentrated emphasis through research into high accuracy, low drift components and techniques for deep space missions; and technology and fabrication techniques related to gyroscopes and accelerometers, stellar trackers, target seekers and radiation detectors. Computation and data processing research will be pursued in the areas of electric, magnetic, pneumatic, and hydraulic techniques to yield high-speed, adaptive computing systems for flight and earth-based data handling.

SPACE POWER				
Supporting research and technology	Direct	-	1	8
	Support	-	2	2
	Total	-	3	10

This effort will concentrate primarily on phenomena related to energy conversion. Exploiting more efficient and adaptable means for providing electrical energy requires detailed research into solar-electric, chemical-electric, nuclear-electric and thermionic phenomena. The technical principles, fabrication and container aspects of batteries suitable for long-life space use are representative of the tasks in this project.

Further information on projects briefly described above may be found in Volume II, Research, Development, and Operation. See the Index to that volume for the location of detailed project justifications.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

RESEARCH, DEVELOPMENT, AND OPERATION

SUMMARY BY OBJECT CLASSIFICATION OF
PERSONNEL SERVICES AND OPERATION OF INSTALLATIONS

	Fiscal Year 1962	Fiscal Year 1963	Fiscal Year 1964
Total permanent positions, end of year	22,156	28,547	32,500
Reimbursable	-140	-106	-104
Direct	22,016	28,441	32,396
Direct Funds:			
11 Personnel compensation	$163,898,314	$239,407,000	$298,487,000
12 Personnel benefits	11,375,557	18,248,000	20,981,000
21 Travel and transportation of persons	9,160,536	16,777,000	21,882,000
Regular travel	(8,554,138)	(15,782,000)	(20,626,000)
Local transportation	(334,664)	(644,000)	(747,000)
Rental of passenger motor vehicles	(271,734)	(351,000)	(509,000)
22 Transportation of things	4,299,228	6,167,000	7,789,000
23 Rent, communications and utilities	24,850,294	45,986,000	59,026,000
Rent	(15,493,027)	(30,645,000)	(39,971,000)
Communications	(4,115,110)	(6,453,000)	(8,464,000)
Utilities	(5,242,157)	(8,888,000)	(10,591,000)
24 Printing and reproduction	1,604,000	3,032,000	4,847,000
25 Other services	45,581,973	62,295,717	91,684,000
26 Supplies and materials	24,750,869	21,207,000	25,959,000
31 Equipment	26,385,003	21,627,000	29,433,000
42 Insurance claims and indemnities	22,429	159,000	212,000
Total direct obligations	311,928,203	434,905,717	560,300,000
Unobligated balance lapsing	555,952	-	-
TOTAL	$312,484,155	$434,905,717	$560,300,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

10 PERSONAL SERVICES AND BENEFITS

Summary analysis by types of compensation	1962	1963	1964
Total permanent positions, end of year.....	22,156	28,547	32,500
Position lapses.....	- 3,307	- 2,834	- 1,123
Average number of permanent positions.....	18,849	25,713	31,377
Net cost of all positions.....	$152,445,246	$225,611,000	$279,611,000
Other compensation.....	12,253,476	14,717,000	19,796,000
Personnel benefits.....	11,437,840	18,327,000	21,060,000
Total personnel costs....	$176,136,562	$258,655,000	$320,467,000
Reimbursable.....	- 862,691	- 1,000,000	- 999,000
Direct.....	$175,273,871	$257,655,000	$319,468,000

STAFFING REQUIREMENTS

The estimates submitted for the fiscal year 1964 support a proposed end of year staffing level of 32,500 permanent employees, an increase of 3,953 over the anticipated level for the current fiscal year. A summary by installation is as follows:

	FY 1962 End Year	FY 1963 End Year	FY 1964 End Year	Increase
NASA Headquarters.....	1,360	1,900	2,300	+ 400
Ames Research Center.....	1,674	2,025	2,309	+ 284
Flight Research Center.....	524	575	593	+ 18
Goddard Space Flight Center....	2,414	3,200	3,700	+ 500
Langley Research Center.....	3,770	4,025	4,296	+ 271
Launch Operations Center.....	333	800	1,200	+ 400
Lewis Research Center.....	3,678	4,658	5,128	+ 470
Manned Spacecraft Center.....	1,620	3,196	3,980	+ 784
Marshall Space Flight Center...	6,194	7,062	7,492	+ 430
North Eastern Office.....	---	30	40	+ 10
Pacific Launch Operations Office.....	6	15	22	+ 7
Space Nuclear Propulsion Office.....	40	106	160	+ 54

	FY 1962 End Year	FY 1963 End Year	FY 1964 End Year	Increase
Wallops Station.....	407	465	530	+ 65
Western Operations Office.....	136	440	500	+ 60
Electronics Research Center.....	---	50	250	+ 200
Total permanent positions, end of year.....	22,156	28,547	32,500	+ 3,953
Reimbursable.....	− 140	− 106	− 104	+ 2
Direct.....	22,016	28,441	32,396	+ 3,955

The personnel requirements of the National Aeronautics and Space Administration are directly related to the missions to be carried out as discussed under the research and development program justifications contained in Volume II of this budget. However, since a major part of the research and development work is carried out by private industry, the need for additional personnel is not on a one-to-one basis with the additional funds for research and development, but only includes the additional needs for in-house effort and the supervision of the expanded contract programs. In the preceding section of this volume under tab labeled "Installation Presentations" a complete detailed breakdown of the current and planned utilization of personnel by project at each installation is provided to amplify further the staffing required for fiscal year 1964. Research and development estimates for the fiscal year 1964 are approximately twice the amount appropriated for the fiscal year 1963. However, the new positions requested represent only a 16 percent increase. Some of the programs for which substantial increases are requested and their impact on personnel requirements are discussed as follows:

The programs for Manned Spacecraft Systems and Launch Vehicle and Propulsion Systems are planned to double in cost in fiscal year 1964 over the fiscal year 1963 plan. The workload connected with this increase falls mainly on three installations: the Manned Spacecraft Center at Houston, Texas; the Marshall Space Flight Center at Huntsville, Alabama; and the Launch Operations Center at Cocoa Beach, Florida. Technical and scientific personnel must be obtained to plan and coordinate the essential elements of the expanded programs; administrative personnel must be available to negotiate and supervise the execution of the contracts, maintain the financial records, and provide supporting services; and wage-board employees are necessary to carry out the various in-house operations and fabrication jobs. A total of about 1600 new positions, an increase of about 15 percent, is requested for these three centers to support adequately the program planned for fiscal year 1964.

The Meteorological Satellites, Communications Satellites, Geophysics and Astronomy, and Tracking and Data Acquisition programs are estimated to reach $540 million in fiscal year 1964, an increase of $169 million over the fiscal year 1963 plan. The administration of these programs is carried

out mainly at the Goddard Space Flight Center, Greenbelt, Maryland, where the personnel increase requested is 500, or about 16 percent over fiscal year 1963. The projects involved range from small instrumented rockets to large and extremely complicated satellites, together with the attendant tracking, data acquisition, and data processing operations. Since each spacecraft is different from its predecessors, extensive technical and scientific effort must be applied to the planning, design, manufacture, assembly and supervision for each launch, and to the work necessary to obtain and interpret the data for dissemination to the scientific community. Goddard also performs work on the Telstar and Nimbus projects on a reimbursable basis.

The major portion of the Lunar and Planetary Exploration program is carried out at the Jet Propulsion Laboratory at Pasadena, California, under the NASA contract with the California Institute of Technology. Monitoring of this contract, and also other contracts with industrial organizations, such as North American Aviation Corp., in that area, is the responsibility of the Western Operations Office at Santa Monica, California. Since contractual effort is expected to be significantly larger in fiscal year 1964, an increase of 60 personnel is requested for the Western Operations Office.

The Lewis Research Center at Cleveland, Ohio, has a major responsibility in the Centaur Launch Vehicle Development program and also in the Nuclear-Electric Systems, Chemical Propulsion and Space Power programs, and to a lesser degree the Nuclear Rocket program; all of which are estimated to total about $234 million in fiscal year 1964, an increase of about $82 million over the current fiscal year 1963 plan. Additional personnel are needed at Lewis to utilize the extensive specialized laboratory and test facilities at this Center for prosecution of these programs in-house on an intensified basis. Lewis personnel will also be required to supervise the contractual effort necessary for substantial portions of the work to accomplish the planned programs. The personnel increase requested for the Lewis Research Center is 470, or about a 10 percent increase.

Much of the research in the nuclear rocket area is the responsibility of the Space Nuclear Propulsion Office, which has personnel stationed at Cleveland, Ohio; Germantown, Maryland (AEC); New Mexico; and Nevada. As the facilities complex at the test site in Nevada becomes operational, and as the research and development work progresses, an additional 54 people will be required by the end of fiscal year 1964.

The Space Vehicle Systems, Electronic Systems, and Aeronautics programs, which involve specialized facilities and instrument research capability, are carried out at the Langley Research Center, Hampton, Virginia, and the Ames Research Center, Moffett Field, Sunnyvale, California; and a very important part of the Aeronautics program is performed at the Flight Research Center at Edwards, California, where the X-15 and other research aircraft

are flown. The Ames Research Center also has a relatively new responsibility for the Bioscience program. These programs will be intensified in FY 1964, and the increases in staff requested are: 284 at Ames, 271 at Langley, and 18 at Flight, a percentage increase of about 9 percent.

The Wallops Station at Wallops Island, Virginia, serves as a launching site for sounding rockets and vehicles up to the size of the Scout, and also serves as a tracking and data readout station. As the number of launchings increases and the instrumentation becomes more complex, it is estimated that this installation will require 65 more personnel in fiscal year 1964 to support the expanded program.

A new activity, the Electronics Research Center, will be established in fiscal year 1963 to increase and concentrate NASA's research effort in this expanding field. It is estimated that a staff of 250 will be required by the end of fiscal year 1964.

The mission of the NASA Headquarters is planning and providing executive direction for the programs established to implement the national objectives stated in the National Aeronautics and Space Act of 1958 (72 Stat.426), as amended, which are:

(1) To conduct research into problems of flight within and outside the earth's atmosphere with a view to their practical solution;

(2) To develop, construct, test, and operate aeronautical and space vehicles for research purposes;

(3) To conduct such activities as may be required for the exploration of space;

(4) To arrange for participation by the scientific community in planning scientific measurements and observations to be made; and

(5) To provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.

To provide adequate support to the proposed expansion of NASA programs, it is estimated that 400 additional positions, or an increase of 21 percent, will be required in fiscal year 1964 to strengthen the various program, staff and functional offices at the Headquarters. These additional positions are planned to be allocated as follows:

Program planning, direction, coordination and related scientific and technical support.....	311
Other technical and administrative support:	
In Washington.....	55

Assigned to Headquarters, but physically located outside Washington to perform audit, contract administration, and inspection activities.....	34
Total.....	400

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

21 TRAVEL AND TRANSPORTATION OF PERSONS

Location	1962	1963	1964
NASA Headquarters	$1,838,039	$3,039,000	$3,253,000
Ames Research Center	257,893	510,000	620,000
Flight Research Center	142,040	200,000	240,000
Goddard Space Flight Center	1,403,036	2,202,000	3,000,000
Langley Research Center	726,000	1,171,000	1,645,000
Launch Operations Center	164,320	785,000	1,190,000
Lewis Research Center	477,272	985,000	995,000
Manned Spacecraft Center	1,490,805	3,602,000	4,593,000
Marshall Space Flight Center	2,406,465	3,585,000	5,362,000
North Eastern Office	---	35,000	47,000
Pacific Launch Operations Office	---	30,000	47,000
Space Nuclear Propulsion Office	64,726	170,000	220,000
Wallops Station	76,760	133,000	150,000
Western Operations Office	113,180	300,000	395,000
Electronics Research Center	---	30,000	125,000
Total	$9,160,536	$16,777,000	$21,882,000

Analysis by Types of Travel

Travel of Employees			
Direction and coordination of program and business activities	1,685,186	3,433,000	4,786,000
Coordination of program activities with other Government agencies, contractors, and the scientific community	2,945,980	5,584,000	7,213,000
Travel to launching sites and global tracking stations	1,109,462	2,857,000	3,666,000
Meetings of NASA technical committees and working panels, and technical and scientific societies	866,960	1,294,000	1,727,000
Travel to initial duty stations, temporary assignments and transfers, and emergency relocation site	626,645	808,000	1,043,000
Travel of consultants and lecturers	136,136	224,000	280,000
Charter aircraft service	982,456	1,306,000	1,440,000
All other travel of employees	201,313	276,000	471,000
Subtotal	8,554,138	15,782,000	20,626,000

	1962	1963	1964
Local Transportation and Toll Charges	$132,418	$277,000	$303,000
Shuttle Bus Services.....	62,597	172,000	172,000
Rental of Passenger Motor Vehicles by Installations.....	271,734	351,000	509,000
Travel Under 31 U.S.C. 22a.....	13,980	23,000	23,000
Other Non-Employee Travel.....	125,669	172,000	239,000
Subtotal.....	606,398	995,000	1,256,000
Total.....	$9,160,536	$16,777,000	$21,882,000

The increase in travel and transportation of persons estimate of $5.1 million represents an increase of approximately 25 per cent over fiscal year 1963, compared to an increase of $7.6 million (or about 83%) in fiscal year 1963 over 1962. Eighty-seven per cent of the increase requested is required for the following types of travel:

(1) Direction and coordination of program and business activities at NASA installations.

(2) Coordination of program activities with other Government agencies, contractors, and the scientific community.

(3) Travel to launching sites and global tracking stations.

(4) Meetings of NASA technical committees and working panels, and technical and scientific societies.

Increased requirements for 1964 are primarily related to the planned activities of Goddard Space Flight Center, Langley Research Center, Manned Spacecraft Center, Marshall Space Flight Center, and the Launch Operations Center.

In the case of the Langley Research Center, the increase in employee travel is due primarily to the growth of relatively complex flight projects and to activities related to the design and development of new research techniques and facilities. Flight projects, such as FIRE, Micrometeoroid Satellite and the Supersonic Transport, require the close technical and management integration of the efforts of personnel at NASA Headquarters and Centers. As the Center assigned project responsibility, Langley bears much of the burden of assuring that such integration takes place including that needed at the launch sites and tracking stations. The design and development of new research techniques and facilities, such as the supersonic transport simulator and various advanced instrumentation systems, also requires considerable travel for technical monitoring and coordination purposes, particularly to contractor locations.

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The increase in travel requirements at the Goddard Space Flight Center is due largely to expanded activity in monitoring, supervising, and evaluating research and development contractual effort, and to participation of Goddard technical personnel in the installation and calibration of electronic equipment at the various worldwide tracking stations. In the former instance, increased employee travel is planned consonant with the increase in the dollar magnitude of the Goddard research and development contract program. In the latter case, the installation and checkout of various 85 foot antennas at the Data Acquisition Facilities constitutes a particularly significant example of the contribution made by Goddard technicians.

For the Manned Spacecraft Center, the largest portion of the increase in the travel estimate results directly from the two major manned space flight projects actively underway in fiscal year 1964 - Gemini and Apollo. The increase in the size and complexity of the contractor effort on these projects in fiscal year 1964, with the related increase in size, number, and complexity of contracts, and the increase in the number of Manned Spacecraft Center personnel engaged in the technical and administrative supervision and direction of these contracts contribute to the increased requirement. In addition, program activity will expand in fiscal year 1964 to support the planned provision of landing and recovery sites in the Pacific area, thus necessitating additional employee travel.

The role of the Marshall Space Flight Center is changing from its historic in-house development mission to a role more of the project manager providing technical guidance and systems integration to development contractors. The need for Marshall personnel to travel to contractor locations to provide continuous technical direction, coordination and liaison substantially increases as the Marshall role changes. This reorientation of Marshall activity is reflected in the fiscal year 1964 travel estimate, together with other increases related to the growth of activity at the Michoud Plant and the Mississippi Test Faciltiy, the increased emphasis being placed on inspection and quality assurance, and increased requirements for charter airlift service to support project management at the widely dispersed NASA and contractor locations now involved in the large rocket projects.

The increase in the estimate for travel for the Launch Operations Center is related principally to the coordination of program and business activities, for which the Center is responsible due to its assigned mission to provide launch support and a common logistic and administrative support service to all NASA elements utilizing the Atlantic Missile Range. This coordination involves employee travel to NASA Headquarters and virtually all field activities at an increased rate commensurate with the scope, cost and importance of the technical effort to be conducted by NASA at the Atlantic Missile Range.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

22 TRANSPORTATION OF THINGS

Location	1962	1963	1964
NASA Headquarters	$627,914	$800,000	$1,025,000
Ames Research Center	63,099	70,000	90,000
Flight Research Center	25,495	45,000	35,000
Goddard Space Flight Center	1,475,253	1,909,000	2,624,000
Langley Research Center	319,000	330,000	330,000
Launch Operations Center	23,831	322,000	576,000
Lewis Research Center	400,514	430,000	546,000
Manned Spacecraft Center	937,565	1,355,000	1,616,000
Marshall Space Flight Center	344,938	643,000	600,000
North Eastern Office	---	10,000	10,000
Pacific Launch Operations Office	---	11,000	15,000
Space Nuclear Propulsion Office	5,494	31,000	35,000
Wallops Station	61,827	147,000	150,000
Western Operations Office	14,298	54,000	70,000
Electronics Research Center	---	10,000	67,000
Total	$4,299,228	$6,167,000	$7,789,000

Analysis by Types of Services

Shipment of household goods and personal effects	$1,171,552	$1,736,000	$1,790,000
Aircraft transfer cost	173,163	290,000	324,000
Rental of trucks and other transportation equipment	313,800	469,000	901,000
Freight, Express, and Drayage	2,613,803	3,608,500	4,674,000
Other	26,910	63,500	100,000
Total	$4,299,228	$6,167,000	$7,789,000

The estimates under this heading cover requirements for the transportation of personal effects and household goods, commodities, and technical equipment; the shipping of parcel post and express items; and the rental of trucks, trailers, and contractual aircraft support.

In the interest of attracting and retaining qualified personnel in shortage categories, funds for the transportation and shipment of household goods are provided for new appointees to certain engineering, scientific, and other technical positions and employees being transferred. Major increases over the fiscal year 1963 level are planned for the Goddard Space Flight Center, Lewis Research Center, and the Launch Operation Center, while a decrease over fiscal

year 1963 is anticipated for the Manned Spacecraft Center. The estimates for fiscal year 1964 reflect primarily requirements to support planned new recruitments.

Aircraft transfer cost estimates are based on contractual aircraft support required for expanding manned space flight operations in the Apollo and Gemini projects at the launch site, and in the Pacific Ocean area. Cargo type aircraft are required for rapid transportation of critical spare parts, subassemblies, and components in order to minimize interruption to complex and costly flight operations. The fiscal year 1964 estimates are based on requirements primarily for the Manned Spacecraft Center and the Launch Operations Center.

Estimates for rental of trucks and other transportation equipment are based on requirements for vehicular support to deliver supplies and equipment ranging from minute electronic parts to complete booster stages, primarily from location to location within the NASA installations. Expeditious delivery service is important to minimize adverse effect on the mission accomplishment, particularly at the various fabrication, static test and launch sites. The requirements in fiscal year 1964 are primarily at the Manned Spacecraft Center and the Launch Operations Center, which is a reflection of the geographic dispersion involved at those centers; however, requirements at the Marshall Space Center are less than in fiscal year 1963 due to increased support by Government-owned cargo vehicles.

Freight, express and drayage include local commercial transfer services and Government bills of lading, which cover first destination costs of shipping equipment and supplies where such costs have not been included in purchase costs. A major portion of the fiscal year 1964 estimate relates to shipment of equipment to the worldwide tracking network stations, and shipment of prototype and operational spacecraft from contractors to NASA activities, including launch sites. A large part of the shipments to tracking stations involves trailers equipped to perform tracking functions, which are shipped about in the United States or overseas depending on the particular tracking assignment.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

23 RENT, COMMUNICATIONS, AND UTILITIES

Location	1962	1963	1964
NASA Headquarters	$ 961,783	$ 2,020,000	$ 3,450,000
Ames Research Center	2,742,210	3,954,000	4,548,000
Flight Research Center	318,717	305,000	339,000
Goddard Space Flight Center	7,178,325	14,977,000	18,620,000
Langley Research Center	3,329,038	4,574,000	4,556,000
Launch Operations Center	366,345	1,186,000	3,105,000
Lewis Research Center	2,241,757	3,622,000	4,353,000
Manned Spacecraft Center	1,206,811	3,992,000	6,265,000
Marshall Space Flight Center	5,937,056	10,226,000	11,460,000
North Eastern Office	---	38,000	68,000
Pacific Launch Operations Office	---	63,000	73,000
Wallops Station	401,226	665,000	1,304,000
Western Operations Office	167,026	331,000	645,000
Electronics Research Center	---	33,000	240,000
Total	$24,850,294	$45,986,000	$59,026,000

Analysis by Types of Services

Rents:			
Land	$ 13,602	$ 15,000	$ 14,000
Structures	888,515	2,355,000	3,411,000
Electronic equipment:			
Research computations	13,360,120	26,575,000	34,990,000
Business operations	658,533	730,000	405,000
Other business equipment	243,024	400,000	602,000
All other equipment	329,233	570,000	549,000
	15,493,027	30,645,000	39,971,000
Communications:			
Leased lines	734,817	1,176,000	2,068,000
Local telephone and exchange services	1,590,800	2,530,000	3,102,000
Long distance toll calls	1,039,642	1,735,000	2,113,000
Telegraph	68,796	212,000	231,000
TWX service	106,758	94,000	159,000
Postage, other than parcel post	255,669	337,000	415,000
Other	318,628	369,000	376,000
	4,115,110	6,453,000	8,464,000

	1962	1963	1964
Utilities:			
Electricity	$ 4,661,112	$ 6,991,000	$ 8,199,000
Heat	---	906,000	1,090,000
Water	134,611	349,000	422,000
Gas	410,340	506,000	642,000
Other	36,094	136,000	238,000
	5,242,157	8,888,000	10,591,000
Total	$24,850,294	$45,986,000	$59,026,000

Rent

Electronic equipment:

The conduct of the NASA program requires the collection, processing, storage and use of a rapidly increasing volume of both technical and administrative data. The increase in technical data handling requirements arises from the increasing number of more complex projects, plus the increasing density of the flight schedule, thus expanding the need for both real-time systems and for data reduction subsequently. The administrative data load increase is due largely to the continued expansion of the NASA contract programs for research and development and construction of facilities; the activation of new activities and the increases in personnel staffing also contribute to heavier demands for administrative data capacity. The figure shown for business operations, however, decreases due to planned purchase of EAM equipment in 1964 in lieu of rental equipment at the Marshall Space Flight Center. The capacity, speed, and flexibility of electronic data processing and computing equipment provides the most adequate solution available. While observing fully the provisions of Bureau of the Budget regulations, which established Executive Branch policy regarding lease vs. purchase of such equipment, NASA encounters many situations in which rental remains more attractive, primarily because it avoids Government capital investment in equipment which may be outmoded quickly due to advances in electronic equipment technology.

The estimate for fiscal year 1964 increases over that for fiscal year 1963 largely because of two factors: (a) fiscal year 1964 will be the first full year of operation of many of the pieces of equipment; and (b) the capability is being improved as advanced equipment becomes available, such as the conversion of IBM 7090 machines to the 7094 type. Other increases are due to more intense shift utilization and provision of additional equipment. A list of the proposed equipment to be rented for fiscal year 1964 follows:

RENTAL OF ELECTRONIC COMPUTING EQUIPMENT

	Number of Units	Fiscal Year 1964 Funding			
		Prime Shift	Second Shift	Third Shift	Total Rental
NASA Headquarters:					
IBM - 1620.....	1	$300,000	---	---	$300,000
IBM - 1401.....	2	200,000	---	---	200,000
EAM - 1401.....	1	190,000	---	---	190,000
		690,000	---	---	690,000
Ames Research Center:					
M-H 1800.....	1	660,000	$230,000	$66,000	956,000
IBM - 1401.....	1	137,040	---	---	137,040
IBM - 7094.....	1	987,360	---	---	987,360
Miscellaneous.....	-	59,600	---	---	59,600
		1,844,000	230,000	66,000	2,140,000
Flight Research Center:					
IBM - 407.....	1	18,500	---	---	18,500
IBM - 704.....	1	103,000	---	---	103,000
IBM - 1401.....	1	72,000	---	---	72,000
Miscellaneous.....	-	21,500	---	---	21,500
		215,000	---	---	215,000
Goddard Space Flight Center:					
IBM - 1401.....	8	480,000	128,000	---	608,000
IBM - 1410.....	2	560,000	210,000	---	770,000
IBM - 7094.....	5	5,771,000	2,167,000	1,895,000	9,833,000
UNIVAC - 1107.....	1	1,008,000	400,000	200,000	1,608,000
EAM.....	-	116,000	---	---	116,000
Miscellaneous.....	-	3,825,000	---	---	3,825,000
		11,760,000	2,905,000	2,095,000	16,760,000
Langley Research Center:					
IBM - 1401.....	2	419,000	126,000	---	545,000
IBM - 1620.....	2	106,000	15,000	---	121,000
IBM - 7070.....	1	516,000	30,000	---	546,000
IBM - 7090.....	1	963,000	180,000	---	1,143,000
Miscellaneous.....	-	140,000	---	---	140,000
		2,144,000	351,000	---	2,495,000

	Number of Units	Fiscal Year 1964 Funding			
		Prime Shift	Second Shift	Third Shift	Total Rental
Launch Operations Center:					
IBM - 1410.....	1	$120,000	$80,000	---	$200,000
GE - 225.....	1	256,000	---	---	256,000
EAM.....	1	99,000	---	---	99,000
		475,000	80,000	---	555,000
Lewis Research Center:					
IBM - 7090.....	1	807,720	274,625	---	1,082,345
IBM - 1401.....	2	200,620	63,111	---	263,731
IBM - 610.....	1	13,800	---	---	13,800
Miscellaneous.....	-	68,124	---	---	68,124
		1,090,264	337,736	--	1,428,000
Manned Spacecraft Center:					
IBM - 1401.....	3	385,000	87,000	---	472,000
IBM - 7090.....	2	1,660,000	710,000	---	2,370,000
Miscellaneous.....	-	688,000	27,000	---	715,000
		2,733,000	824,000	---	3,557,000
Marshall Space Flight Center:					
IBM - 1401.....	10	762,000	288,000	---	1,050,000
IBM - 1410.....	2	458,000	216,000	---	674,000
IBM - 1620.....	4	170,000	---	---	170,000
IBM - 7090.....	2	1,704,000	720,000	---	2,424,000
Miscellaneous.....	-	2,184,000	131,000	---	2,315,000
		5,278,000	1,355,000	---	6,633,000
Wallops Station:					
IBM - 709.....	1	922,000	---	---	922,000
		922,000	---	---	922,000
Total.....		$27,151,264	$6,082,736	$2,161,000	$35,395,000

Lands and Structures:

The increase of $1,056,000 is based primarily on the increase in personnel positions, the establishment and expansion of certain installations, and the necessity to rent space to supplement Government facilities on an interim basis.

NASA Headquarters will vacate rented space now occupied and will move to a new building during the first quarter of FY 1964.

The Launch Operations Center currently leases office facilities outside the Cape Canaveral Missile Test Annex area. Functions such as financial management, procurement and contracting, automatic data processing and personnel operations have been relocated to these off-site facilities pending availability of Government facilities on Merritt Island. Additional functions are in the process of being relocated to these off-site facilities at the present time. Rental space to accommodate expanded NASA activity at the Center in fiscal year 1964 is proposed, since Government facilities on Merritt Island will eventually house many of these functions; therefore, rental space offers the most economical and flexible interim arrangement.

The expansion of the North Eastern Office, which was activated in September 1962, and the establishment of the Electronics Research Center in the greater Boston area present additional space requirements. The increasing number of personnel at the Manned Spacecraft Center at Houston, Texas has made it necessary to rent office, laboratory, and shop space from non-Government sources. This is a temporary situation pending the availability of a Government-owned permanent site now under construction at Clear Lake.

The Jet Propulsion Laboratory in Pasadena, California, has additional space rental requirements due to the increased number of personnel planned for fiscal year 1964. These requirements are being funded by the Western Operations Office.

Communications

The increased funding requested for fiscal year 1964 for communications is based directly upon expansion of the pace and scope of the NASA program, as reflected in the occupancy of new facilities, addition of personnel requiring local and long distance telephone and exchange service, and the increasing need to use telephonic communications for coordination and consultation due to the urgency of meeting schedules.

When the constant volume of message traffic between two or more locations reaches a certain level, or when a specific need for an independent system arises, it is more economical and advantageous to the Government to lease lines rather than use commercial long distance toll facilities.

The proposed schedule of leased lines for fiscal year 1964 follows:

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COMMUNICATION - LEASED LINES

	1962	1963	1964
NASA Headquarters:			
Headquarters to Wallops Island.....	4,000	4,000	4,000
Headquarters to Langley Research Center..	7,000	5,000	5,000
Headquarters to Lewis Research Center....	12,000	9,000	9,000
Headquarters to Pacific Launch Operations Office.....	5,000	4,000	4,000
Western Operations Office to Jet Propulsion Laboratory.....	9,000	8,000	8,000
Flight Research Center to Western Operations Office.....	5,000	4,000	4,000
Ames Research Center to Western Operations Office.....	12,000	9,000	9,000
Miscellaneous tie lines and circuits.....	9,000	7,000	7,000
	63,000	50,000	50,000
Flight Research Center:			
Edwards, California to San Bernardino, California.....	9,000	18,000	18,000
Edwards to Ely, Nevada.....	91,000	50,000	---
	100,000	68,000	18,000
Langley Research Center:			
Langley to Wallops Island, Virginia.....	4,000	4,000	4,000
Langley to Norfolk, Virginia.....	1,000	1,000	1,000
Langley to Newport News, Virginia.....	---	1,000	1,000
Langley to Washington, D. C.	2,000	8,000	8,000
	7,000	14,000	14,000
Launch Operations Center:			
Cape Canaveral to Marshall Space Flight Center.....	5,000	15,000	189,000
Cape Canaveral to Washington, D. C.	3,000	10,000	210,000
Cape Canaveral to Houston, Texas.....	2,000	6,000	37,000
Cape Canaveral to Huntsville, Alabama....	12,000	42,000	40,000
Cape Canaveral to Merritt Island, Florida.....	---	---	5,000
Cape Canaveral to Patrick Air Force Base.	1,000	3,000	9,000
	23,000	76,000	490,000

	1962	1963	1964
Lewis Research Center:			
Lewis to Plumbrook, Ohio.....	10,000	8,000	13,000
Wide area telephone lines.....	52,000	149,000	202,000
Lewis to Washington, D. C.	8,000	10,000	53,000
Miscellaneous circuits.....	---	---	14,000
	70,000	167,000	282,000
Manned Spacecraft Center:			
Houston to Washington, D. C.	44,000	44,000	66,000
Houston to Cape Canaveral.....	33,000	49,000	83,000
Houston to White Sands, New Mexico.....	13,000	26,000	26,000
Houston to Downey, California.....	51,000	77,000	77,000
Houston to St. Louis, Missouri.....	14,000	20,000	39,000
Houston to Santa Monica, California.....	19,000	28,000	28,000
Houston to Marshall Spacecraft Center....	5,000	8,000	8,000
MacDonald, St. Louis to Cape Canaveral...	18,000	29,000	29,000
Wide area telephone lines.....	---	94,000	94,000
	197,000	375,000	450,000
Marshall Space Flight Center:			
Marshall to Ames Research Center.....	118,000	124,000	124,000
Marshall to Patrick Air Force Base.....	14,000	14,000	14,000
Marshall to NASA Headquarters, Washington, D. C.	28,000	28,000	28,000
Marshall to Birmingham, Alabama.....	17,000	17,000	17,000
Marshall to key local points.....	23,000	42,000	53,000
Marshall to Langley Research Center.....	13,000	14,000	14,000
Marshall to New Orleans, Louisiana.....	21,000	72,000	72,000
Marshall to Santa Monica, California.....	40,000	55,000	55,000
Marshall to Manned Spacecraft Center.....	---	6,000	6,000
Marshall to San Diego, California.....	---	6,000	18,000
Marshall to Wichita, Kansas.....	---	4,000	10,000
Marshall to Seattle, Washington.....	---	6,000	18,000
Marshall to Mississippi Test Facility....	---	12,000	34,000
Marshall to Jackass Flats, Nevada.....	---	---	18,000
Marshall to Rockmart, Georgia.....	---	---	5,000
Marshall to Edwards Air Force Base.....	---	---	18,000
Michoud to Seattle, Washington.....	---	12,000	36,000
Michoud to Sterling, Michigan.....	---	8,000	20,000
Michoud to Wichita, Kansas.....	---	6,000	12,000
Michoud to Rockmart, Georgia.....	---	---	5,000
Mississippi Test Facility to Rockmart, Georgia.....	---	---	5,000

	1962	1963	1964
Mississippi Test Facility to Santa Monica, California.....	---	---	24,000
Mississippi Test Facility to San Diego, California.....	---	---	24,000
Mississippi Test Facility to Seattle, Washington.....	---	---	18,000
Mississippi Test Facility to Sterling, Michigan.....	---	---	12,000
	274,000	426,000	660,000
Western Operations Office:			
Western Operations Office to Edwards Air Force Base.....	---	---	4,000
Western Operations Office to Ames Research Center.....	---	---	16,000
Western Operations Office to Denver, Colorado.....	---	---	22,000
Western Operations Office to San Diego, California.....	---	---	6,000
Western Operations Office to Sunnyvale, California.....	---	---	16,000
Western Operations Office to Canoga Park, California.....	---	---	3,000
Western Operations Office to Seattle, Washington.....	---	---	19,000
Western Operations Office to Azusa, California.....	---	---	2,000
Western Operations Office to Sacramento, California.....	---	---	16,000
	---	---	104,000
Total.....	734,000	1,176,000	2,068,000

Minor increases are requested for telegraphic service, postage, and penalty mailings in direct support of the program level proposed for the budget year.

Utilities

Electric power:

Major requirements for electric power are directly related to the operation of large facilities, such as wind tunnels and heavy machinery. The completion of the new industrial complex on Merritt Island near Cape Canaveral in 1964 will involve the use of additional amounts of electric power for machine tools and large materials handling equipment.

Approximately $900,000 will be required for this purpose at the Launch Operations Center. Other new facilities coming into operation at the Goddard and Marshall Space Flight Centers and at the Manned Spacecraft Center will require additional electric power for which about $300,000 is requested. The consumption of electric power in 1964 at other locations is expected to remain at approximately the same level as in 1963.

Other utilities:

The increased costs for other utilities, including heat, water, and gas, are roughly proportional to the extent of new facilities scheduled for completion in 1964.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

24 PRINTING AND REPRODUCTION

Location	1962	1963	1964
NASA Headquarters	$ 814,571	$1,300,000	$1,750,000
Ames Research Center	24,848	27,000	40,000
Flight Research Center	1,100	5,000	7,000
Goddard Space Flight Center	226,546	200,000	250,000
Langley Research Center	26,000	35,000	35,000
Launch Operations Center	2,754	165,000	750,000
Lewis Research Center	30,278	40,000	55,000
Manned Spacecraft Center	72,027	615,000	1,100,000
Marshall Space Flight Center	394,630	582,000	762,000
North Eastern Office	---	3,000	4,000
Pacific Launch Operations Office	---	5,000	5,000
Wallops Station	762	15,000	15,000
Western Operations Office	10,484	35,000	50,000
Electronic Research Center	---	5,000	24,000
Total	$1,604,000	$3,032,000	$4,847,000

Analysis by Types of Printing

Printing, Duplicating and Binding-Gov't Agencies	$ 962,007	$1,713,000	$2,663,000
Printing, Duplicating and Binding—Commercial	508,860	1,013,000	1,679,000
Photostating, Blueprinting and Photography	131,493	247,000	347,000
Microfilming	1,640	59,000	158,000
Total	$1,604,000	$3,032,000	$4,847,000

The funds requested for printing and reproduction are used to defray the cost of printing of NASA scientific and technical reports and publications, special reports and brochures, printed forms and letterheads, and miscellaneous printing and binding. NASA's research in the field of space exploration is fundamental; consequently, there is an increasing need for reporting of the results of this research. These reports, together with translations of pertinent foreign space research publications, are disseminated by NASA for widespread use by the Department of Defense, other Government agencies, the aerospace industries, educational institutions and scientific organizations. Often NASA is the only source of particular

information on space research; and many of the scientific and technical documents published by NASA are used as permanent reference documents by the recipients.

To the extent that government facilities are available, these are utilized. However, contract printing is used by NASA installations during peak workloads and for jobs beyond the capability of the available Government reproduction facilities, such as silk screen work and special printing.

The estimates include funds for photostating, blueprinting, and still and movie photography services required for various laboratory, ground and flight testing activities.

The storage problems involved with retention of a rapidly increasing volume of technical reports and research data have led to an increasing use of microfilming processes.

The increased funding level proposed in the fiscal year 1964 estimates is a direct reflection of the increasing magnitude and complexity of NASA technical and administrative activities.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

25 OTHER SERVICES

Location	1962	1963	1964
NASA Headquarters	$8,446,279	$19,604,250	$28,949,000
Ames Research Center	2,386,262	1,500,000	2,000,000
Flight Research Center	1,829,235	991,000	2,857,000
Goddard Space Flight Center	4,017,166	3,601,000	3,980,000
Langley Research Center	4,736,153	2,709,000	2,709,000
Launch Operations Center	1,841,143	4,346,000	11,740,000
Lewis Research Center	3,236,058	3,000,000	3,817,000
Manned Spacecraft Center	2,862,243	7,286,000	10,215,000
Marshall Space Flight Center	14,508,118	16,210,000	21,700,000
North Eastern Office	---	21,000	47,000
Pacific Launch Operations Office	---	354,000	440,000
Space Nuclear Propulsion Office	8,023	20,000	250,000
Wallops Station	1,674,103	2,471,000	2,581,000
Western Operations Office	37,190	145,467	255,000
Electronics Research Center	---	37,000	144,000
Total	$45,581,973	$62,295,717	$91,684,000

Analysis by Types of Services			
Service contracts	$13,401,868	$19,013,000	$28,866,000
Maintenance, repairs, alterations, and minor construction	11,089,011	17,424,000	20,918,000
Custodial services	3,782,647	4,690,000	6,079,000
Other contractual services	7,033,361	12,470,000	23,406,000
Services of other government agencies	10,258,372	8,672,467	12,380,000
Other miscellaneous services	16,714	26,250	35,000
Total	$45,581,973	$62,295,717	$91,684,000

The estimates for this object class include services performed by other government agencies and contractors for the operation of NASA installations, as required on a non-recurring, seasonal, or other intermittent basis, or to extend and supplement NASA in-house capabilities. Such services are grouped in general categories as follows: (a) service contracts, which include such effort as engineering design, computer programming and operations, and documentation services; (b) maintenance of, and repairs to, capital plant and equipment, and minor construction (projects having a value of

$250,000 or less), such as maintenance and repairs of instrumentation and other research, office, shop, and vehicular equipment; (c) custodial services, such as security, janitorial, laundry, and fire protection services; (d) other contractual services, including aircraft operation and maintenance, preparation and dissemination of educational exhibits and materials, and motion picture services; (e) services of other government agencies, including administration, auditing, and inspection of NASA research and development contracts; and (f) other miscellaneous services (i.e. representation allowance for Headquarters only).

Service contracts

The largest consumers of service contract effort are NASA Headquarters, the Manned Spacecraft Center, Marshall Space Flight Center, and the Launch Operations Center. The contract work performed in support of Headquarters consists primarily of independent (i.e. from the Centers and industrial contractors) evaluations of reliability and quality assurance in NASA programs, and preparation, printing, and dissemination of technical documents under the NASA technical information program; increases are planned in both areas in fiscal year 1964. At the Manned Spacecraft Center, the major use of service contracts in fiscal year 1964 is to provide for the installation and checkout of technical mission and support equipment in the permanent facilities to become available in the Houston complex during fiscal year 1964; service contracts are also utilized for engineering and shop services and for commercial laboratory analysis services. The Marshall Space Flight Center uses a variety of rather small engineering service contracts for such purposes as installation master planning, conduct of specialized electronic tests, and model fabrication for which specialized capabilities of private firms are particularly suited; however, the major increase in fiscal year 1964 is in the area of computer work, involving the contract supporting the Computation Division, development of the Data Center, and purchase of supplementary computer time from the Army Missile Command to meet peak workload conditions. Some increase in service contract support is required at the Launch Operations Center in fiscal year 1964 to expand special engineering study capabilities, computer activities, and documentation services commensurate with the expanded program activity planned for the Atlantic Missile Range in fiscal year 1964.

Maintenance, repairs, alterations, and minor construction

There is a continuing need for routine repairs and alterations to existing buildings, facilities and equipment of a support-type nature and, more importantly, for facilities and components directly related to specific space missions which are operated close to maximum capacity on urgent programs. In addition, as new techniques related to the space exploration effort are developed and perfected, alterations to facilities become essential to permit their utilization in the most effective manner. The urgency of this effort further requires the accomplishment of minor construction projects under $250,000 which would otherwise have to wait for the next

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annual authorization bill (e.g. liquid hydrogen storage facilities at Marshall Space Flight Center, hanger and spin test facility modifications at the Launch Operations Center, alterations to the Range Engineering Building at Wallops Station, etc.).

Custodial services

The continuing requirements for custodial and housekeeping services (primarily security guard and janitorial services) increase in fiscal year 1964 at virtually all NASA installations, due to the increase in the level of operations and the occupancy of new facilities in fiscal year 1964. In the case of Marshall Space Flight Center, the custodial service category also includes special chemical cleaning of liquid oxygen lines, propellant storage tanks, and other propellant handling equipment related to the launch vehicle development mission of Marshall.

Other contractual services

The aircraft maintenance and operation services included in this category provide primarily for support of the following aircraft: F-104 aircraft used at the Flight Research Center for pilot proficiency training, F-102 aircraft for astronaut proficiency flying and a Gulfstream at the Manned Spacecraft Center, and an Aerocommander and a Jetstar at the Launch Operations Center. The estimates also provide for increases in fiscal year 1964 for preparation and dissemination of exhibits, brochures, motion pictures, and other materials in support of NASA's technical, educational and public information programs.

Services of other government agencies

In the interests of economy and efficiency NASA will continue to utilize the services of other government agencies wherever practicable. The estimates in this category are based on such services for which NASA reimburses the performing agency. Arrangements with other government agencies to obtain custodial and maintenance services, contract administration, machine shop services, etc. have been satisfactory. Advantage has been taken of the ability of the Air Force to render all types of logistical support to support launch operations at the Launch Operations Center, Cocoa Beach, Fla.; of the facilities of the Army to provide Industrial Health Services and Technical Library Services at the Marshall Space Flight Center; of the capability of the Army, Navy, and Air Force to administer contracts and to provide auditing services; of the capability of the Air Force to provide underground trunk lines for telephone circuits at the Flight Research Center; and of the Agriculture Research Center to provide labor, material, and equipment for maintenance, packing and crating services at Goddard Space Flight Center.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

26 SUPPLIES AND MATERIALS

Location	1962	1963	1964
NASA Headquarters	$493,193	$600,000	$875,000
Ames Research Center	2,007,446	1,800,000	2,000,000
Flight Research Center	164,132	262,000	331,000
Goddard Space Flight Center	1,714,127	1,487,000	1,487,000
Langley Research Center	5,853,000	2,919,000	2,768,000
Launch Operations Center	766,161	1,716,000	3,642,000
Lewis Research Center	5,037,962	3,360,000	4,059,000
Manned Spacecraft Center	1,377,250	2,570,000	3,371,000
Marshall Space Flight Center	6,335,416	5,400,000	6,050,000
North Eastern Office	---	4,000	4,000
Pacific Launch Operations Office	---	19,000	27,000
Wallops Station	983,004	1,000,000	1,100,000
Western Operations Office	19,178	62,000	125,000
Electronics Research Center	---	8,000	120,000
Total	$24,750,869	$21,207,000	$25,959,000

Analysis by Types of Supplies

Building materials	$832,204	$959,000	$938,000
Chemicals	2,260,390	2,039,000	2,776,000
Electrical	1,988,208	1,724,000	2,156,000
Electronic	3,837,971	2,636,000	3,197,000
Fuels and lubricants	1,697,765	971,000	1,093,000
General maintenance	1,028,927	1,144,000	1,286,000
General operating	1,888,663	1,803,000	2,317,000
General service	684,917	680,000	827,000
Hardware	861,713	698,000	795,000
Instrumentation	1,452,888	1,035,000	1,354,000
Metals	2,521,265	1,723,000	1,979,000
Missiles, aircraft and vehicles	247,613	215,000	256,000
Office	2,673,648	3,156,000	4,017,000
Photographic	1,127,001	1,267,000	1,645,000
Pipes, valves and fittings	1,117,506	702,000	723,000
Subscriptions	135,448	155,000	168,000
Pamphlets and documents	176,443	299,000	430,000
Special equipment expended on acquisition	218,299	1,000	2,000
Total	$24,750,869	$21,207,000	$25,959,000

Funds requested under this object classification are for the procurement and issue of all non-program oriented supplies and materials ordinarily consumed or expended within one year after issue, or converted in the process of construction or manufacture, or used to form a minor part of equipment or fixed property. Supplies and materials fall into general categories such as those needed for general maintenance, general operating supplies, administrative supplies and materials, general service items, and photographic supplies. Included are building materials, hardware, pipes, valves, fittings, chemicals for test chambers and scientific projects, propellants, fuels and lubricants for vehicles, vehicular repair parts, tubes, transistors and instruments and components used for measuring heat, velocity, range, etc., in research apparatus, auxiliary equipment and test rigs.

Substantial amounts are requested under this heading for expendable items of a general housekeeping nature such as office, medical, security, safety, janitorial and photographic supplies, and for miscellaneous supplies such as hand tools, brushes, paints, sealers, pamphlets and documents, and for subscriptions to magazines and other periodicals.

The estimates for fiscal year 1964 are based on specific requirements, historical usage factors, and maintenance of optimum inventory levels. Specific requirements include items for the operation of new facilities and propellants for scheduled tests of experimental devices. Usage factors for such materials as general operating, general service, and office supplies are related to the number of personnel served, and increases in staff result in proportional increases in usage of such materials. Optimum inventory levels which permit uninterrupted operations without overstocking are maintained by continuous analysis of known requirements, actual issue documents, and lead time for procurement.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

31 EQUIPMENT

Location	1962	1963	1964
NASA Headquarters	$709,646	$520,000	$652,000
Ames Research Center	1,631,264	539,000	1,202,000
Flight Research Center	298,802	365,000	641,000
Goddard Space Flight Center	4,406,148	3,034,000	3,034,000
Langley Research Center	2,832,003	4,710,000	4,200,000
Launch Operations Center	301,307	1,775,000	5,047,000
Lewis Research Center	6,272,517	2,562,000	3,224,000
Manned Spacecraft Center	4,321,641	4,260,000	5,720,000
Marshall Space Flight Center	4,673,968	2,850,000	4,650,000
North Eastern Office	---	22,000	10,000
Pacific Launch Operations Office	---	13,000	13,000
Wallops Station	867,000	800,000	800,000
Western Operations Office	70,707	150,000	160,000
Electronics Research Center	---	27,000	80,000
Total	$26,385,003	$21,627,000	$29,433,000

Analysis by Types of Equipment

Electrical and mechanical equipment	$6,677,307	$3,062,000	$4,439,000
Instrumentation and electronic equipment	10,245,780	7,088,000	11,012,000
Portable hand tools	200,733	204,000	347,000
Photographic, reproduction, and drafting equipment	1,758,831	1,245,000	1,451,000
Machine and fabrication equipment	2,313,706	2,236,000	3,864,000
Chemical equipment	5,176	9,000	139,000
Office and laboratory equipment	3,788,510	2,846,000	3,250,000
Motorized vehicles and manual handling equipment	1,055,426	4,463,000	4,078,000
Firefighting equipment	5,340	49,000	73,000
Medical and safety equipment	88,392	149,000	392,000
Books	245,802	276,000	388,000
Total	$26,385,003	$21,627,000	$29,433,000

The requirements for equipment to support the operation of NASA installations are included above. Funds for program-related equipment are requested under the appropriate program, and funds for equipment which forms an integral part of a new facility are set forth under the construction project for the facility.

The fiscal year 1964 estimate of $29.4 million is an increase of $7.8 million, which is 26.5 per cent over 1963 and 10.4 per cent over 1962. The categories covering the large equipment items are: electrical and mechanical, instrumentation and electronic, machine and fabrication, office and laboratory, and motorized utilities and manual handling equipment.

The increased funding for electrical and mechanical equipment includes high speed analog equipment for data reduction in support of both flight and ground tests, and purchase of electronic accounting machines, in lieu of rentals, for handling business operations and as accessories for research computations.

The requirement for instrumentation and electronic equipment reflects an increase of approximately $4 million to provide for new and replacement equipment items for communications, instrumentation, and radar and telemetry systems.

The increase in machine and fabrication equipment consists primarily of shop equipment and is required for replacement and purchase of new general purpose items for manufacturing and maintenance shops.

The increase in office and laboratory equipment is directly related to the planned personnel increase, and the equipping of new buildings to be occupied in fiscal year 1964.

The motorized vehicles and manual handling equipment category includes funds to cover the procurement cost of motor vehicles, cranes and fork lifts, and other manual handling equipment of a larger type necessary to provide a capability for handling of large spacecraft components.

Requirements for fire fighting equipment, other than replacement of worn-out items, are based on providing portable equipment at the newer installations and in temporary and new facilities to become available in fiscal year 1964. Estimates for medical and safety equipment increase in order to establish and maintain first aid stations in close proximity to the working force at the division level.

The funds for books provide for library acquisitions and technical manuals and reference texts for issue to engineering personnel.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1964 ESTIMATES

42 INSURANCE CLAIMS AND INDEMNITIES

Location	1962	1963	1964
NASA Headquarters	$10,429	$117,000	$123,000
Langley Research Center	12,000	12,000	12,000
Launch Operations Center	---	5,000	50,000
Lewis Research Center	---	1,000	1,000
Manned Spacecraft Center	---	20,000	20,000
Marshall Space Flight Center	---	4,000	6,000
Total	$22,429	$159,000	$212,000
Analysis by Types of Payments			
Tort claims	$2,679	$34,000	$42,000
Awards	19,750	125,000	170,000
Total	$22,429	$159,000	$212,000

The estimates under this classification provide for the payment of accidental damage claims to property resulting from the conduct of NASA's operations, and for the payment of monetary awards for scientific and technical contributions pursuant to Section 306 of the National Aeronautics and Space Act of 1958.

Under the provisions of 28 U. S. C. 2672 the heads of Federal Agencies are authorized to settle and pay claims for property loss or damage, personal injury or death caused by negligent or wrongful acts or omissions of any Government employee. This law places the Government in virtually the same position as a private person with respect to claims and law suits. Fiscal year 1964 funds in the amount of $42,000 cover the estimated payments for minor motor vehicle accidents, insurance torts, and claims based on expanded mission operations.

NASA's program of awards for scientific and technical contributions of value to the United States and to NASA reflects a modest increase of $45,000 in fiscal year 1964, to a total of $170,000.

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