E

National Aeronautics and Space Administration

N.A.S.A. PERMANENT
HISTORICAL FILE
NO.

BUDGET ESTIMATES

FISCAL YEAR 1962

GENERAL DATA AND SUMMARY

SALARIES AND EXPENSES

CONSTRUCTION OF FACILITIES

REVISED

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

APPROPRIATION SUMMARY

	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1961 Supplemental	Fiscal Year 1962
SALARIES AND EXPENSES.....	$91,400,000	$170,760,000	---	$196,686,000
RESEARCH AND DEVELOPMENT....	347,550,000	621,453,000	$49,000,000	919,539,000
CONSTRUCTION OF FACILITIES..	84,625,000	122,787,000	---	119,075,000
TOTAL.....	$523,575,000	$915,000,000	$49,000,000	$1,235,300,000

N.A.S.A. PERMANENT
HISTORICAL FILE

NO. _____

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

APPROPRIATION SUMMARY

	Salaries and Expenses	Research and Development	Construction of Facilities	Total
FISCAL YEAR 1960:				
Supplemental Appropriation Act 1960; P.L. 86 213...	$91,400,000	$347,550,000	$84,625,000	$523,575,000
Appropriation transfers; P.L. 86-213.....	-550,000	-14,450,000	+15,000,000	---
Total.....	$90,850,000	$333,100,000	$99,625,000	$523,575,000
FISCAL YEAR 1961:				
Independent Offices Appropriation Act; P.L. 86-626	$170,760,000	$621,453,000	$122,787,000	$915,000,000
Appropriation transfers; P.L. 86-213.....	---	-3,538,000	+3,538,000	---
Total.....	$170,760,000	$617,915,000	$126,325,000	$915,000,000
FISCAL YEAR 1961:				
Supplemental estimates....	---	$49,000,000	---	$49,000,000
FISCAL YEAR 1962:				
Regular estimates.....	$196,686,000	$919,539,000	$119,075,000	$1,235,300,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

SALARIES AND EXPENSES

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

SALARIES AND EXPENSES

SUMMARY

Page No.	Object	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
SE1-1	Personal Services and Benefits..	$76,427,501	$145,004,600	$161,396,000
SE3-1	Travel and Transportation of Persons.....	2,741,424	6,074,000	8,395,000
SE4-1	Transportation of Things.....	165,534	568,000	740,000
SE5-1	Rent, Communications, and Utilities.....	9,159,642	23,131,400	27,344,000
SE6-1	Printing and Reproduction.....	264,718	816,000	1,000,000
SE7-1	Security Investigations.....	496,960	1,248,000	1,115,000
SE8-1	Insurance Claims and Indemnities.....	118,761	57,000	110,000
	Total.....	89,374,540	176,899,000	200,100,000
	Administrative reserve.....	---	385,000	---
	Unobligated balance.....	1,475,460	---	---
	Transferred to Research and Development.....	+550,000	---	---
	Less anticipated reimbursements.	---	-6,524,000	-3,414,000
	Total appropriations.....	$91,400,000	$170,760,000	$196,686,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

SALARIES AND EXPENSES

SUMMARY

Location	Number of employees at end of			Appropriations		
	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
NASA Headquarters.....	589	784	951	$6,558,644	$10,913,000	$13,302,000
Langley Center.....	3,202	3,220	3,330	27,289,979	30,253,000	32,197,000
Ames Center.....	1,437	1,437	1,437	14,198,029	15,568,000	16,134,000
Lewis Center.....	2,734	2,741	2,824	24,466,117	26,554,000	28,284,000
Flight Center.....	411	419	494	3,084,752	3,919,000	4,268,000
Goddard Center.....	1,265	1,998	2,668	11,399,263	25,794,000	35,684,000
Wallops Station.....	229	299	299	1,623,205	2,901,000	3,118,000
Marshall Center.....	382	5,511	5,960	427,120	60,105,900	65,319,000
Western Office.....	37	59	85	327,431	766,100	1,107,000
AEC-NASA Nuclear Office.....	---	4	23	---	27,000	211,000
Life Sciences Station.....	---	21	51	---	98,000	476,000
Total.....	10,286	16,493	18,122	89,374,540	176,899,000	200,100,000
Administrative reserve.....				---	385,000	---
Unobligated balance.....				1,475,460	---	---
Transferred to Research and Development.....				+550,000	---	---
Less anticipated reimbursements.....				---	-6,524,000	-3,414,000
Total appropriations...				$91,400,000	$170,760,000	$196,686,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

SUMMARY - SALARIES AND EXPENSES

	NASA Headqtrs.	Langley Center	Ames Center	Lewis Center	Flight Center	Goddard Center	Wallops Station	Marshall Center	Western Office	AEC-NASA Nuclear Office	Life Science Facility	Total
Estimated end of year employment	951	3,330	1,437	2,824	494	2,668	299	5,960	85	23	51	18,122
	$8,976,346	$25,301,240	$11,392,000	$22,592,445	$3,567,139	$22,477,595	$2,014,146	$46,482,024	$748,790	$254,125	$459,285	$144,265,135
10 Personal services and benefits	9,523,000	27,507,000	12,327,000	24,704,000	3,788,000	24,150,000	2,608,000	55,298,000	842,000	204,000	445,000	161,396,000
21 Travel and transportation of persons	1,368,000	643,000	160,000	312,000	165,000	2,960,000	90,000	2,550,000	117,000	5,000	25,000	8,395,000
22 Transportation of things	50,000	12,000	15,000	25,000	20,000	540,000	5,000	30,000	20,000	1,000	2,000	740,000
23 Rent, communications, and utilities:												
Rent	120,000	2,185,000	1,231,000	900,000	235,000	7,480,000	125,000	6,551,000	90,000	---	---	18,917,000
Communications	400,000	105,000	55,000	100,000	25,000	374,000	80,000	595,000	35,000	1,000	4,000	1,774,000
Utilities	---	1,719,000	2,331,000	2,233,000	30,000	140,000	200,000	---	---	---	---	6,653,000
24 Printing and reproduction	616,000	26,000	15,000	10,000	5,000	40,000	10,000	275,000	3,000	---	---	1,000,000
25 Security investigations	1,115,000	---	---	---	---	---	---	---	---	---	---	1,115,000
42 Insurance claims and indemnities	110,000	---	---	---	---	---	---	---	---	---	---	110,000
Total	$13,302,000	$32,197,000	$16,134,000	$28,284,000	$4,268,000	$35,684,000	$3,118,000	$65,319,000	$1,107,000	$211,000	$476,000	$200,100,000
Anticipated reimbursements												-3,414,000
Total appropriation												$196,686,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

10 PERSONAL SERVICES AND BENEFITS

Analysis by Location	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
NASA Headquarters	$4,778,654	$7,490,000	$9,523,000
Langley Center	24,162,386	26,279,000	27,507,000
Ames Center	11,315,430	12,283,000	12,327,000
Lewis Center	21,657,517	23,520,000	24,704,000
Flight Center	2,856,723	3,594,000	3,788,000
Goddard Center	9,613,646	17,884,000	24,150,000
Wallops Station	1,466,967	2,464,700	2,608,000
Marshall Center	358,633	50,793,000	55,298,000
Western Office	217,545	571,900	842,000
AEC-NASA Nuclear Office	---	27,000	204,000
Life Science Facility	---	98,000	445,000
Total	$76,427,501	$145,004,600	$161,396,000

Analysis by Types of Compensation			
End of year employment	10,286	16,493	18,122
Position lapses	699	330	532
Average number of positions	9,587	16,163	17,590
Net cost of positions	$68,911,963	$124,832,400	$139,715,000
Other compensation	2,802,956	10,749,100	11,026,000
Personnel benefits	4,712,582	9,423,100	10,655,000
Total	$76,427,501	$145,004,600	$161,396,000

STAFFING LEVELS

The fiscal year 1962 budget for the National Aeronautics and Space Administration proposes a staffing level of 18,122 employees, an increase of 1,629 employees over the number estimated for the current year. The increase is

distributed among the following NASA installations:

NASA Headquarters.....	167
Langley Research Center.....	110
Lewis Research Center.....	83
Flight Research Center.....	75
Goddard Space Flight Center.....	670
Marshall Space Flight Center.....	449
Life Science Facility.....	30
Other Offices.....	45
Total.....	1,629

A table summarizing requirements for personal services and benefits at each NASA location is presented on the next page. Staffing charts for the fiscal year 1962 may be found in the section beginning with page SE2-1. Summary statements for each location follow:

NASA Headquarters

The required increase for the operation of the NASA Headquarters is summarized as follows:

Office of the Administrator.....	30
Office of Advanced Research Programs.....	16
Office of Space Flight Programs.....	29
Office of Launch Vehicle Programs.....	12
Office of Life Science Programs.....	3
Office of Technical Information and Educational Programs.....	18
Office of Business Administration.....	59
Total.....	167

The staff increases requested for the Office of the Administrator and for the five program offices are required to provide an adequate staffing level to plan, coordinate and direct the technical aspects of the NASA program functions and responsibilities. The effective evaluation and appraisal of the agency's operations can only be attained through the continuous review of program requirements and progress, including related studies on the operational reliability of major developmental and space mission projects. The requested personnel will provide management with the level of technical capability essential to the proper coordination of NASA effort with related work of other Governmental agencies and the scientific community.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

SUMMARY ANALYSIS OF PERSONAL SERVICES

	NASA Headqtrs.	Langley Center	Ames Center	Lewis Center	Flight Center	Goddard Center	Wallops Station	Marshall Center	Western Office	AEC-NASA Nuclear Office	Life Science Facility	Total
1960 Authorized end of year employment..	602	3,202	1,439	2,734	414	1,265	229	383	38	---	---	10,306
1960 Actual end of year employment.....	589	3,202	1,437	2,734	411	1,265	229	382	37	---	---	10,286
	$5,210,279	$22,303,494	$10,587,437	$20,072,125	$2,875,241	$9,569,407	$1,343,041	$2,263,374	$300,065	---	---	$74,544,463
1961 Estimated end of year employment...	784	3,220	1,437	2,741	419	1,998	299	5,511	59	4	21	16,493
	7,383,446	24,316,310	11,312,000	21,798,000	3,098,000	16,537,600	1,994,921	42,340,979	516,400	$39,400	$214,495	129,551,551
1961 Net cost of permanent positions....	6,684,400	23,751,500	11,271,500	21,330,000	3,083,700	14,886,000	1,901,500	41,072,070	482,000	24,800	90,000	124,577,470
1961 All other personal services and benefits.....	805,600	2,527,500	1,011,500	2,190,000	510,300	2,998,000	563,200	9,720,930	89,900	2,200	8,000	20,427,130
1961 Total personal services and benefits.....	$7,490,000	$26,279,000	$12,283,000	$23,520,000	$3,594,000	$17,884,000	$2,464,700	$50,793,000	$571,900	$27,000	$98,000	$145,004,600
Within-grade salary advancements...	$78,000	$156,780	$80,000	$142,110	$21,915	$180,000	$19,225	$415,325	$14,000	$165	$800	$1,108,320
New positions.....	167	110	---	83	75	670	---	449	26	19	30	1,629
	1,514,900	828,150	---	652,335	447,224	5,759,995	---	3,725,720	218,390	214,560	243,990	13,605,264
Estimated end of year employment...	951	3,330	1,437	2,824	494	2,668	299	5,960	85	23	51	18,122
	8,976,346	25,301,240	11,392,000	22,592,445	3,567,139	22,477,595	2,014,146	46,482,024	748,790	254,125	459,285	144,265,135
Deduct regular lapses.....	36,351	62,000	53,000	90,055	40,239	52,995	11,536	220,084	18,400	420	1,685	586,765
Deduct new position lapses.....	357,995	207,150	---	163,335	244,000	2,282,200	---	562,000	27,390	71,625	49,200	3,964,895
Deduct within-grade lapses.....	39,000	78,390	40,000	71,055	10,900	90,000	9,610	207,600	7,000	80	400	554,035
Add terminal leave.....	13,000	25,300	35,000	75,000	6,000	12,600	---	15,660	4,000	---	---	186,560
Net lapse deduction.....	420,346	322,240	58,000	249,445	289,139	2,412,595	21,146	974,024	48,790	72,125	51,285	4,919,135
Personnel compensation:												
1962 Permanent positions.....	8,556,000	24,979,000	11,334,000	22,343,000	3,278,000	20,065,000	1,993,000	45,508,000	700,000	182,000	408,000	139,346,000
1962 Intermittent employment.....	100,000	---	---	---	---	125,000	---	12,000	---	---	---	237,000
1962 Temporary employment.....	---	---	---	---	---	---	---	132,000	---	---	---	132,000
Other compensation:												
Overtime and holiday pay.....	165,000	579,000	60,000	589,000	260,000	2,000,000	400,000	6,100,000	15,000	5,000	5,000	10,178,000
Nightwork differential.....	---	45,000	65,000	65,000	1,000	60,000	32,000	104,000	---	---	---	372,000
Additional pay for service abroad	---	---	---	---	---	45,000	---	---	---	---	---	45,000
Reimbursable details.....	60,000	---	8,000	---	---	297,000	---	---	66,000	---	---	431,000
Personnel benefits:												
Living and quarters allowances...	3,000	---	---	---	---	25,000	17,000	---	---	---	---	45,000
Uniform allowances.....	---	1,000	1,000	7,000	1,000	---	2,000	1,000	---	---	---	13,000
Life insurance.....	30,000	81,000	40,000	73,000	12,000	70,000	7,000	131,000	4,000	2,000	2,000	452,000
Health programs.....	53,000	199,000	90,000	179,000	27,000	154,000	25,000	420,000	7,000	3,000	3,000	1,160,000
Retirement contributions.....	551,000	1,620,000	725,000	1,445,000	203,000	1,299,000	131,000	2,784,000	48,000	12,000	27,000	8,845,000
Taxes.....	4,000	2,000	3,000	2,000	4,000	5,000	1,000	75,000	1,000	---	---	97,000
Incentive awards.....	1,000	1,000	1,000	1,000	2,000	5,000	---	31,000	1,000	---	---	43,000
Total, personal services and benefits.....	$9,523,000	$27,507,000	$12,327,000	$24,704,000	$3,788,000	$24,150,000	$2,608,000	$55,298,000	$842,000	$204,000	$445,000	$161,396,000

In order to strengthen the business activities of the NASA, 59 additional employees are required to provide technical and clerical assistance for the agency's personnel administration program in areas concerning employees benefits, recruiting, and manpower evaluation and development; to provide the necessary technical and clerical assistance in procurement matters relating to contract negotiation and administration and to the acquisition and disposal of property; to improve and strengthen the budgetary and fiscal functions of the agency; and to meet an expanding workload in audit, administrative services, management analysis, and other supporting activities.

Langley Research Center

The mission of the Langley Center is to provide the basic technical background to support the development of advanced types of manned vehicles. The technical disciplines in which the major part of the research effort of the Langley Center is placed are aerodynamics, fluid mechanics, structures, materials, and flight mechanics. Studies are also being directed toward the structural and operating problems of the supersonic transport and other type aircraft employing the variable swept-wing concept. Considerable effort is being expended on problems involving lunar and planetary landings, booster recovery, passive communications satellites, and other related space assignments. An additional 110 employees are requested for the conduct of research on problems relating to the supersonic transport.

Ames Research Center

The major portion of the total research effort of the Ames Center is in support of the space missions of the agency. Studies are continuing on the advanced types of aircraft of interest to both the military and commercial operators. Considerable effort will be expended toward the solution of problems involving the reentry of space vehicles, guidance and control of manned space vehicles, and human behavior under space environmental conditions. No increase in staff is proposed for this center for the fiscal year 1962.

Lewis Research Center

The work of the Lewis Center is in support of experimental and developmental projects associated with propulsion systems, fuels, and the effects of nuclear radiation and temperature on materials. The Center also conducts fundamental research to enable the development of advanced propulsion systems. Much of the work is applied toward obtaining solutions on developmental problems on rocket engine performance in support of the agency's vehicle development program. Investigations are also underway in direct support of nuclear propulsion systems and other related projects.

A total of 83 additional employees is requested of which 70 will be engaged in the conduct of research on problems relating to the supersonic transport propulsion system. The balance of 13 employees is requested for the purpose of monitoring contracts on nuclear and electrical generation systems, for which project responsibilities were recently assigned to this center.

Flight Research Center

The basic mission of the Flight Research Center is the conduct of full-scale flight operations involved in the performance evaluation of manned aircraft. The current personnel of the Center are presently utilized almost entirely in support of the X-15 flight research program. It is proposed to continue this level of effort in the fiscal year 1962 in investigating the performance of the X-15 aircraft employing larger thrust engines. An additional 75 employees is required in the fiscal year 1962 to support the joint Air Force-NASA Dyna-Soar project and to conduct flight operations on the problems of the supersonic transport. A B-58 aircraft will be utilized as the initial vehicle for supersonic transport flight studies pending the delivery of a B-70 aircraft at a later date.

Goddard Space Flight Center

The Goddard Center is assigned the responsibility for development of all earth orbiting spacecraft and for the manned satellite program of NASA. This includes the development of sounding rockets for investigation of the earth's upper atmosphere and probes into near space, scientific satellites to orbit the earth for the purpose of obtaining scientific data to increase man's knowledge of space environment, applications satellites designed to provide scientific advancement in technology such as weather predictions, communications via satellites, and other areas involving future practical applications. In addition, the center is responsible for maintaining a world-wide network for both manned and unmanned satellite tracking. A total of 660 additional employees is requested for the fiscal year 1962 in the following major areas:

(1) An increase of 115 employees is required in the space science and satellite applications group to provide project management personnel to monitor large systems contracts. The project managers will be responsible for the technical direction of the development projects being carried out by industrial contractors.

(2) An increase of 253 employees is required for the manned satellite group in order to provide the technical capability to meet the heavy operational schedule of the Mercury program and to evaluate and analyze the results obtained in preparation for future manned space flights.

(3) An increase of 138 employees is required for the tracking and data systems area. The increase in personnel is requested to manage the development of new and advanced tracking systems and equipment; to meet increased operational responsibilities due to more numerous and more complex space flights; to provide for increased data acquisition, reduction, and analysis; and to supervise operation and control of ground space communication networks.

(4) An increase of 108 employees is required for the preflight testing and evaluation of spacecraft under simulated flight conditions and to provide additional shop fabrication personnel to perform such services not covered by contract.

(5) An increase of 45 employees is needed in the business administration area. The increase will provide the administrative personnel required in connection with the negotiation and administration of the additional contracts required by the accelerated space programs. An additional 11 employees are required to strengthen the general management functions of the Center.

Wallops Station

This small launching organization conducts the numerous launchings of the sounding rocket program and the solid propellant orbital vehicles in response to the needs of the sounding rocket and satellite programs. No increase in staff is requested for the fiscal year 1962.

Marshall Space Flight Center

The Marshall Center is assigned the responsibility for the development of launch vehicles to meet the NASA space mission requirement; for conducting feasibility studies on propulsion and fueling systems; and for the supervision of launch operations of NASA vehicles developed by industry. Launch operations are conducted at the Atlantic and Pacific Missile Ranges, and at the Wallops Station. At the present time, the Marshall Center is charged with management responsibility for the Saturn and Centaur vehicle development programs; the procurement and launch of operational Mercury-Redstone and Agena-B launch vehicles; and the development of the 1,500,000-pound thrust F-1 engine and the 200,000-pound thrust J-2 engine. Later in calendar year 1961, management of the Scout program will also be placed at the Marshall Center.

The planned expansion and acceleration of program activity in the fiscal year 1962 will require additional staffing at the Marshall Center. Some part of the total staffing requirement will be realized through the reassignment of personnel presently engaged in the Department of Defense weapons systems work that will be partially phased out during the fiscal year 1962. A net increase of 449 employees is requested for the fiscal year 1962 in the following major areas:

(1) An increase of 292 employees is required in the vehicle development area to increase technical direction and project management capabilities. This increased capability is required as a result of accelerated program activity and to meet the tight schedules of the Saturn, Centaur, Agena, and Scout vehicles. The Marshall Center has entered into a number of major contracts for design, development and integration of Saturn stages and the Centaur engine and stages; for propulsion technology and development projects; and for procurement of Agena-B launch vehicles. The negotiation and management of these contracts have resulted in critical requirements for professional and project management type personnel. The additional personnel are required for the technical supervision of the contract and for the advance of in-house technology. The in-house technology supports the contractor effort, the technical supervision of the contracts, and forms a base of knowledge on which the development of more advanced vehicles can rest.

(2) An increase of 67 employees is required in the areas of propulsion and advanced vehicle technology. The propulsion technology area covers major development contracts for the F-1 and 200K engines as well as development in solid, electric and nuclear propulsion systems. The advanced vehicle technology area includes expanded efforts in orbital operations, future vehicle configurations and launch operations development work.

(3) An increase of 90 employees is required in the business administration area. Within this area, the most significant increase is for personnel required for negotiation and administration of additional contracts generated by expansion and acceleration of the Research and Development pro-

grams. Increases in the other administrative areas are required to meet additional workload resulting from increased program activity.

Life Science Facility

An increase of 30 employees is required for the development of internal competence and for the management and evaluation of the life science programs being conducted through grants and contracts.

Other Offices

Twenty-six additional employees are required for the Western Operations Office to meet the increasing workload in connection with management and monitoring of contracts with development contractors on the West Coast. Nineteen additional employees are required to adequately staff the NASA segment of the joint AEC-NASA Nuclear Office.

FUNDING REQUIREMENTS

The funding levels proposed for the fiscal year 1962 are required to finance on a full-year basis the staffing levels authorized for the end of the current fiscal year; the additional within-grade salary advancements due in the budget year; and the funding for the 1,629 additional employees requested. The position lapse rate for new positions is estimated at approximately 30 per cent. A lapse rate of 50 per cent has been used for the within-grade salary advancements becoming due in the fiscal year 1962. The funding requirements for these purposes are listed by location on page SE1-3.

Funding requirements for other compensation and for personnel benefits are summarized in the following table:

Other Compensation	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
Overtime and holiday pay.....	$1,725,972	$9,500,000	$10,178,000
Nightwork differential.....	160,874	353,000	372,000
Pay above 52-week base.....	565,800	499,100	---
Pay for services abroad.....	1,519	39,000	45,000
Reimbursable details.....	348,791	358,000	431,000
Total.....	$2,802,956	$10,749,100	$11,026,000
Personnel Benefits			
Living and quarters allowances.....	$7,526	$32,400	$45,000
Uniform allowances.....	9,905	12,200	13,000
Federal life insurance.....	218,771	324,600	452,000

	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
Health benefits program.....	---	$993,500	$1,160,000
Retirement contributions.....	$4,465,122	7,942,500	8,845,000
Social security taxes.....	9,903	80,900	97,000
Employees incentive awards.....	1,355	37,000	43,000
Total.....	$4,712,582	$9,423,100	$10,655,000

The major portion of the increase requested for overtime and holiday pay is required for operational requirements in connection with the complex logistic and preflight check-outs on spacecraft and instrumentation before launchings, particularly for the Mercury program. The increases in life insurance, health benefits, retirement contributions, and other personnel benefits are required to support the personnel level proposed for the fiscal year 1962.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

STAFFING CHARTS

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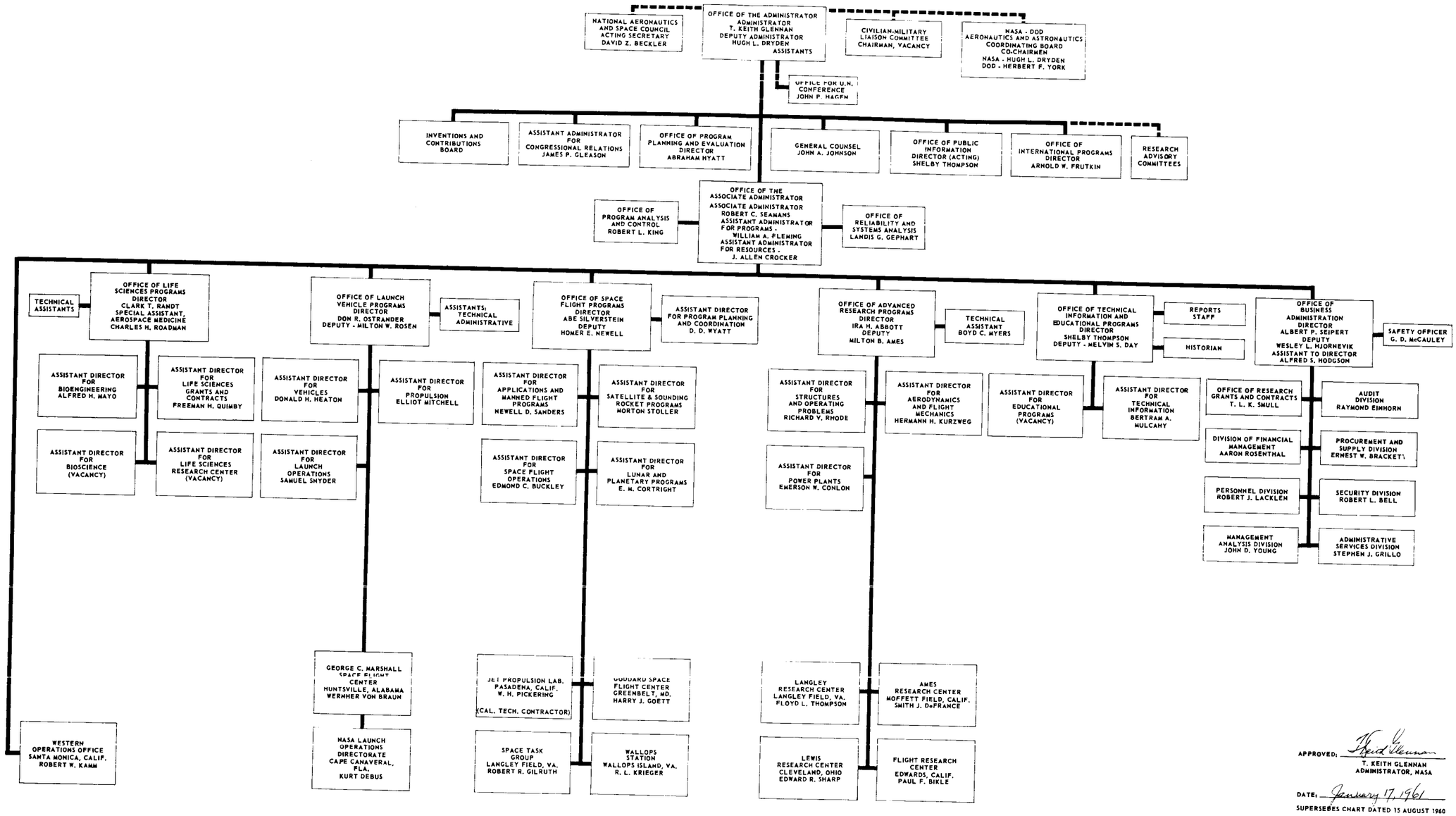
SE2-6	Flight Research Center
SE2-7	Goddard Space Flight Center
SE2-8	Wallops Station
SE2-9	Marshall Space Flight Center
SE2-10	Western Operations Office
SE2-11	AEC-NASA Nuclear Office
SE2-12	Life Science Facility

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION



APPROVED: T. Keith Glennan
T. KEITH GLENNAN
ADMINISTRATOR, NASA

DATE: January 17, 1961

SUPERSEDES CHART DATED 15 AUGUST 1960

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED PERSONNEL STAFFING CHART
FISCAL YEAR 1962
NASA HEADQUARTERS

OFFICE OF THE ADMINISTRATOR

1 Excepted Administrator	$ 22,500
1 Excepted Deputy Administrator	21,500
1 Excepted Assistant to the Administrator	17,000
1 GS-15 Assistant to the Deputy Administrator	13,730
1 GS-14 Staff Assistant	12,210
1 GS-14 Scientist, Special Staff Assistant	12,470
7 Other GS Personnel	43,985
13	$143,395

OFFICE FOR U. N. CONFERENCE

1 Excepted Assistant to the Administrator for U. N. Conference	$ 19,000
1 Excepted Chief, Technical Papers Branch	16,000
1 GS-15 Chief, Technical Exhibits	15,030
1 GS-15 Director of Administration	15,030
1 GS-15 Technical Director	13,730
1 GS-14 Deputy Director of Administration	13,250
1 GS-14 Assistant to Director for Program Planning	12,470
11 Other GS Personnel	81,432
18	$184,952

ASSISTANT ADMINISTRATOR FOR CONGRESSIONAL RELATIONS

1 Excepted Assistant Administrator for Congressional Relations	$19,000
1 GS-15 Legislative Liaison Officer	15,290
1 GS-14 Legislative Assistant	12,470
6 Other GS Personnel	51,445
9	$98,205

OFFICE OF PROGRAM PLANNING AND EVALUATION

1 Excepted Director of Program Planning and Evaluation	$ 21,000
1 Excepted Scientist for Propulsion	19,000
1 Excepted Scientist for Vehicle Design	17,500
1 Excepted Scientist for Advanced Technology	17,000
1 Excepted Scientist for Guidance and Control	16,000
1 Excepted Scientist for Electronics	16,000
1 GS-15 Scientist, Rocket Propulsion	14,055
5 Other GS Personnel	27,720
12	$148,275

OFFICE OF THE ASSOCIATE ADMINISTRATOR

1 Excepted Associate Administrator	$ 21,000
1 Excepted Assistant Administrator for Programs	19,000
1 Excepted Director of Reliability and Systems Analysis	16,750
1 Excepted Director of Program Management	16,500
1 Excepted Deputy Director of Reliability and Systems Analysis	16,000
1 Excepted Chief, Technical Program Analysis	15,250
2 GS-15 Special Assistant to Associate Administrator	27,460
1 GS-15 Mathematical Statistician	14,380
1 GS-15 Scientist, Systems Reliability Analysis	14,055
1 GS-15 Scientist, Measurement Systems	13,730
1 GS-15 Scientist, Structures	13,730
4 GS-15 Scientist, Aeronautics	54,920
1 GS-15 Mathematician	13,730
5 GS-14 Scientist	62,610
26 Other GS Personnel	203,328
48	522,443

OFFICE OF GENERAL COUNSEL

1 Excepted General Counsel	$ 20,500
3 Excepted Assistant General Counsel	50,000
1 Excepted Assistant General Counsel for Patent Matters	16,500
2 GS-15 Attorney Advisor	29,410
1 GS-15 Patent Attorney	14,380
1 GS-15 Executive Secretary, Committee on Long Range Studies	14,705
2 GS-14 Attorney Advisor	25,200
1 GS-14 Patent Attorney	12,990
1 GS-14 Patent Advisor	12,730
20 Other GS Personnel	132,040
33	$328,455

OFFICE OF INTERN

1 Excepted Director, Of International Progra	
1 GS-15 Facilities Progr	
1 GS-15 Joint Projects C	
1 GS-15 Chief, Internati Organizations	
1 GS-14 Chief, Personne	
1 GS-14 Programs Assis Cooperative Projects	
8 Other GS Personnel	
14	

INVENTIONS AND CONTRIBUTIONS BOARD

1 GS-15 Secretary to the Board	$14,380
2 Other GS Personnel	11,020
3	$25,400

SECURITY CLASSIFICATION BOARD

3 GS Personnel	$22,135

OFFICE OF SPACE FLIGHT PROGRAMS

1 Excepted Director of Space Flight Programs	$ 21,000
1 Excepted Deputy Director	19,000
2 Excepted Technical Assistant to the Director	33,500
1 Excepted Senior Scientific Coordinator	16,000
5 Other GS Personnel	26,260
10	$115,760

PROGRAM PLANNING AND COORDINATION

1 Excepted Assistant Director	$ 19,000
1 GS-15 Scientist, Space Sciences	14,055
1 GS-15 Program Management Officer	14,055
1 GS-15 Scientist, Program Coordination	14,055
1 GS-14 Scientist, Program Coordination	12,210
1 GS-14 Scientist, Technical Coordination	12,210
1 GS-14 Program Management Assistant	12,210
11 Other GS Personnel	66,410
18	$184,105

SATELLITE AND SOUNDING ROCKET PROGRAMS

1 Excepted Assistant Director	$ 19,000
1 Excepted Chief, Geophysics Programs	17,250
1 Excepted Staff Scientist, Geophysical Programs	15,500
1 Excepted Chief, Astrophysics Programs	15,500
1 Excepted Staff Scientist, Energetic Particles	15,500
1 Excepted Staff Scientist, Aeronomy	15,250
1 GS-15 Scientist, Flight System	15,290
1 GS-15 Scientist, Ionospheric Physics	14,380
1 GS-15 Scientist, Aeronomy	13,730
1 GS-15 Scientist, Solar Astronomy	13,730
1 GS-15 Scientist, Galactic Astronomy	13,730
1 GS-15 Scientist, Astrophysics	13,730
3 GS-14 Scientist, Payload Systems	37,150
1 GS-14 Scientist, Telemetry Systems	12,730
10 Other GS Personnel	64,755
26	$297,225

LUNAR AND PLANETARY PROGRAMS

1 Excepted Assistant Director	$ 19,000
1 Excepted Chief, Science Programs	17,500
1 Excepted Chief, Flight Systems	17,000
1 Excepted Chief, Programs Coordination	17,000
1 Excepted Staff Scientist, Lunar Flight Systems	16,500
1 Excepted Staff Scientist, Spacecraft Technology	15,500
1 Excepted Staff Scientist, Planetary Flight Systems	15,500
1 GS-15 Scientist, Space Probes	14,705
2 GS-15 Scientist, Instrumentation	27,785
2 GS-15 Scientist, Lunar and Planetary Sciences	27,460
1 GS-15 Scientist, Spacecraft Technology	13,730
1 GS-15 Scientist, Lunar Services	13,730
1 GS-14 Scientist, Planetary Sciences	12,730
1 GS-14 Scientist, Instrumentation	12,210
8 Other GS Personnel	48,315
24	$288,665

APPLICATION AND MANNED SATELLITE PROGRAMS

1 Excepted Assistant Director	$ 19,000
1 Excepted Chief, Manned Space Flight Programs	16,500
1 Excepted Chief, Advanced Technology Programs	16,000
1 Excepted Chief, Communications Satellite Program	15,750
1 Excepted Chief, Meteorological Satellite Programs	15,500
1 Excepted Assistant Chief, Meteorological Satellite Programs	15,500
1 Excepted Staff Scientist, Manned Satellites	15,500
1 Excepted Staff Scientist, Advanced Manned Systems	15,500
1 GS-15 Executive Assistant	15,030
1 GS-15 Scientist, Flight Components and Subsystems	14,055
2 GS-15 Scientist, Communications Satellite Systems	27,460
1 GS-15 Scientist, Meteorological Satellites	13,730
1 GS-15 Scientist, Manned Satellites	13,730
1 GS-14 Scientist, Space Power Technology	12,210
1 GS-14 Scientist, Meteorological Satellites	12,210
2 GS-14 Scientist, Manned Satellites	24,420
14 Other GS Personnel	84,800
33	$360,625

SPACE FLIGHT OPERATIONS

1 Excepted Assistant Director	$ 19,000
1 Excepted Chief of Operations	16,500
1 Excepted Chief, Advanced Development	16,000
1 Excepted Chief, Flight Operations	16,000
1 Excepted Staff Scientist, Communications Operations	16,000
1 Excepted Staff Scientist, Telemetry and Instrumentation	16,000
1 GS-15 Scientist, Computers and Celestial Mechanics	15,030
1 GS-15 Electronic Engineer	15,030
4 GS-15 Scientist, Instrumentation	56,220
1 GS-15 Technical Assistant	14,055
1 GS-15 Scientific Representative for NASA	15,290
3 GS-15 Scientist, Tracking Programs Coordination	41,190
1 GS-15 Scientist, Data and Computing Systems	13,730
1 GS-15 Scientist, Tracking Systems Analyst	13,730
1 GS-14 Scientist, Communications Systems	12,470
12 Other GS Personnel	68,350
32	$364,595

OFFICE OF LAUNCH VEHICLE PROGRAMS

1 Excepted Director of Launch Vehicle Programs	$ 21,000
1 Excepted Deputy Director	19,000
1 Excepted Chief, Analysis and Requirements	16,000
1 GS-15 Budget and Programming Specialist	14,380
1 GS-15 Aeronautical Power Plant Research Engineer	14,380
2 GS-15 Scientist, Launch Vehicle Analysis	27,785
2 GS-15 Scientist, Mission Analysis and Requirements	28,110
1 GS-15 Technical Assistant to Director	13,730
2 GS-14 Budget and Programming Specialist	24,680
1 GS-14 Scientist, Propulsion Program Coordinator	12,730
20 Other GS Personnel	157,155
33	$348,950

VEHICLES

1 Excepted Assistant Director for Vehicles	$ 19,000
1 Excepted Chief, Advanced Vehicle Development Programs	17,500
1 Excepted Chief, Saturn Class Vehicle Programs	17,000
1 Excepted Chief, Scout Class Vehicle Programs	16,000
2 GS-15 Scientist, Vehicle Development	29,410
1 GS-15 Scientist, Guidance Systems	14,705
1 GS-15 Scientist, Structures	14,380
1 GS-14 Scientist, Vehicle Systems Analysis	13,510
1 GS-14 Scientist, Launch Vehicle Programs	12,730
1 GS-14 Assistant Chief, Saturn Class Vehicles Program	12,210
1 GS-14 Scientist, Electronics	12,210
1 GS-14 Scientist, Aeroballistics	12,210
1 GS-14 Physicist	12,210
6 Other GS Personnel	34,365
20	$237,440

PROPULSION

1 Excepted Assistant Director for Propulsion	$ 19,000
1 Excepted Chief, Liquid Rocket Programs	16,000
1 Excepted Manager, AEC-NASA Nuclear Propulsion Project	17,000
1 Excepted Scientist, Nuclear Propulsion	15,500
1 Excepted Chief, Space Propulsion Programs	15,500
1 Excepted Staff Scientist, Liquid Rocket Propulsion	15,500
1 Excepted Chief, Solid Rocket Development	15,500
1 GS-15 Scientist, Nuclear Electric Generating Systems	14,705
1 GS-15 Scientist, Advanced Propulsion Systems	14,055
1 GS-15 Scientist, Solid Rocket Propulsion	14,055
1 GS-14 Scientist, Propulsion Executive Assistant	13,510
1 GS-14 Manager, Rocket Development and Sounding Rockets Project	12,210
8 Other GS Personnel	49,390
21	$245,805

LAUNCH OPERATIONS

1 Excepted Assistant Director for Launch Operations	$ 17,500
1 Excepted Chief, Range Support	15,500
1 Excepted Chief, Launch Projects	15,500
1 GS-14 Technical Staff Assistant	12,730
1 GS-14 Scientist, Instrumentation	12,990
1 GS-14 Construction Coordination Engineer	12,470
1 GS-14 Manager, Range Support	12,210
1 GS-14 Manager, Launch Projects	12,210
3 Other GS Personnel	16,190
11	$127,300

OFFICE OF ADVANCED RESEARCH PROGRAMS

1 Excepted Director of Advanced Research Programs	$ 21,000
1 Excepted Deputy Director	19,000
3 Other GS Personnel	19,140
5	$ 59,140

TECHNICAL ASSISTANTS

1 Excepted Technical Assistant to Director	$ 16,500
1 Excepted Staff Scientist, Research Program Coordination	15,000
1 GS-15 Technical Assistant for Research Facilities	15,290
1 GS-15 Technical Assistant for Research Reports	15,030
1 GS-14 Technical Assistant for Research Program Analysis	12,730
13 Other GS Personnel	80,780
18	$155,330

ASSISTANT DIRECTOR FOR AERODYNAMICS AND FLIGHT MECHANICS

1 Excepted Assistant Director	$19,000
1 Other GS Personnel	6,345
2	$25,345

AERODYNAMICS AND FLIGHT MECHANICS RESEARCH DIVISION

1 Excepted Chief	$ 17,000
1 Excepted Assistant Chief	15,750
1 Excepted Staff Scientist, Stability and Control	15,500
3 GS-15 Research Engineer, Aerodynamics	42,825
1 GS-15 Scientist, Hypervelocity Aerodynamics	13,730
2 GS-14 Research Engineer, Stability and Control	26,240
1 GS-14 Research Engineer, Aerodynamics	12,210
1 GS-14 Physicist	12,210
7 Other GS Personnel	42,275
18	$197,730

ASSISTANT DIRECTOR FOR STRUCTURES AND MATERIALS AND OPERATING PROBLEMS

1 Excepted Assistant Director	$19,000
1 Other GS Personnel	5,850
2	$24,850

STRUCTURES AND OPERATING PROBLEMS RESEARCH DIVISION

1 Excepted Chief	$ 17,000
1 Excepted Assistant Chief	15,500
1 GS-15 Research Engineer	14,705
1 GS-14 Research Engineer, Aerodynamic Loads	13,510
1 GS-14 Scientist, Meteorology	12,730
1 GS-14 Scientist, Noise and Human Factors	12,730
2 GS-14 Scientist, Structures	24,420
1 GS-14 Aeronautical Research Engineer	12,210
4 Other GS Personnel	21,990
13	$144,795

MATERIALS RESEARCH DIVISION

1 Excepted Chief	$ 16,000
5 GS-14 Research Engineer, Materials	62,870
1 GS-14 Physicist, Solid State	12,210
5 Other GS Personnel	29,655
12	$120,735

ASSISTANT DIRECTOR FOR POWER PLANTS

1 Excepted Assistant Director	$19,000
1 Other GS Personnel	5,685
2	$24,685

POWER PLANTS RESEARCH DIVISION

1 Excepted Chief	$ 17,000
1 GS-15 Research Engineer, Rocket Power Plants	15,030
1 GS-15 Research Engineer, Nuclear Propulsion	14,705
1 GS-15 Scientist, Electrical Propulsion Systems	14,380
1 GS-14 Research Engineer, Fuels and Combustion	12,990
1 GS-14 Research Engineer, Nuclear Propulsion	12,730
1 GS-14 Aeronautical Research Engineer	12,210
2 GS-14 Scientist, Propulsion Systems	24,420
6 Other GS Personnel	36,245
15	$159,710

OFFICE OF BUSINESS ADMINISTRATION

1 Excepted Director of Business Administration	$19,000
1 Excepted Assistant to the Director	16,500
1 Excepted Deputy Director	16,250
2 Other GS Personnel	11,760
5	$63,510

STAFF ASSISTANTS

Management Analysis:	
1 Excepted Director of Management Analysis	$ 16,500
3 GS-15 Management Analyst	45,515
1 GS-14 Management Analyst	12,210
8 Other GS Personnel	60,705
13	$130,950
Safety:	
1 GS-15 Safety Officer	$14,380
1 Other GS Personnel	5,355
2	$19,715
Construction Analysis and Standards:	
1 GS-15 Construction Engineer	$13,730
1 GS-14 Facility Specialist	12,730
1 GS-14 Construction Engineer	12,210
4 Other GS Personnel	29,655
7	$68,325

AUDIT DIVISION

1 Excepted Director of Audits	$ 16,500
1 GS-15 Supervisory Auditor	14,705
4 GS-14 Supervisory Auditor	50,660
12 Other GS Personnel	110,110
18	$191,975

PROCUREMENT AND SUPPLY DIVISION

1 Excepted Director of Procurement and Supply	$ 17,250
1 Excepted Assistant Director	15,500
1 GS-15 Procurement and Supply Officer	15,030
1 GS-15 Assistant Procurement and Supply Officer	14,705
2 GS-15 Contract Specialist	27,785
1 GS-14 Procurement Specialist	12,730
6 GS-14 Contract Specialist	74,820
1 GS-14 Facility Specialist	12,730
1 GS-14 Transportation Specialist	12,470
1 GS-14 Industrial Specialist	12,470
1 GS-14 Electric Rate Specialist	12,470
1 GS-14 Contract Negotiator	12,210
64 Other GS Personnel	482,475
82	$722,645

SECURITY DIVISION

1 Excepted Director of Security	$ 15,500
1 GS-15 Assistant Director	14,705
1 GS-14 Personnel Security Officer	12,470
1 GS-14 Security Specialist	12,470
24 Other GS Personnel	177,660
28	$232,805

FINANCIAL MANAGEMENT DIVISION

1 Excepted Director of Financial Management	$ 17,250
1 Excepted Budget Officer	16,000
1 GS-15 Fiscal Officer	14,380
1 GS-15 Chief, Accounting Systems	14,055
3 GS-14 Budget Analyst	39,230
1 GS-14 System Accountant	12,470
47 Other GS Personnel	322,155
55	$435,540

PERSONNEL DIVISION

1 Excepted Director of Personnel	$ 16,500
1 GS-15 Classification and Organization Officer	14,380
1 GS-15 Examinations and Standards Officer	14,380
1 GS-14 Personnel Regulations and Procedures Officer	12,990
1 GS-14 Assistant Classification and Organization Officer	12,730
1 GS-14 Personnel Management Evaluation Officer	12,470
1 GS-14 Personnel Officer, Headquarters	12,470
1 GS-14 Personnel Projects and Recruitment Officer	12,470
27 Other GS Personnel	203,050
35	$311,440

RESEARCH GRANTS AND CONTRACTS DIVISION

1 Excepted Director of Research Grants and Contracts	$ 16,500
1 GS-15 Deputy Director	15,030
1 GS-14 Program Administrator	12,210
13 Other GS Personnel	88,060
16	$131,800

ADMINISTRATIVE SERVICES DIVISION

1 GS-15 Director of Administrative Services	$ 14,055
1 GS-15 Mobilization Planning Officer	14,055
1 GS-14 Chief of Automatic Data Processing	12,210
61 Other GS Personnel	368,868
15 Wage Board Personnel	71,094
79	$480,282

3	$25,400

3 GS Personnel	$22,135

26 Other GS Personnel	203,326
28	522,443

1 GS-14 Chief, Personnel Exchanges	13,730
1 GS-14 Programs Assistant, Cooperative Projects	12,210
8 Other GS Personnel	49,390
14	$133,125

OFFICE OF SPACE FLIGHT PROGRAMS

1 Excepted Director of Space Flight Programs	$ 21,000
1 Excepted Deputy Director	19,000
2 Excepted Technical Assistant to the Director	[illegible]
1 Excepted Senior Scientific Coordinator	16,000
5 Other GS Personnel	26,260
10	$135,760

PROGRAM PLANNING AND COORDINATION

1 Excepted Assistant Director	$ 19,000
1 GS-15 Scientist, Space Sciences	14,055
1 GS-15 Program Management Officer	14,055
1 GS-15 Scientist, Program Coordination	14,055
1 GS-14 Scientist, Program Coordination	12,210
1 GS-14 Scientist, Technical Coordination	12,210
1 GS-14 Program Management Assistant	12,210
11 Other GS Personnel	66,210
18	$164,105

SATELLITE AND SOUNDING ROCKET PROGRAMS

1 Excepted Assistant Director	$ 19,000
1 Excepted Chief, Geophysics Programs	17,250
1 Excepted Staff Scientist, Geophysical Programs	15,500
1 Excepted Chief, Astrophysics Programs	17,000
1 Excepted Staff Scientist, Energetic Particles	15,000
1 Excepted Staff Scientist, Aeronomy	15,500
1 GS-15 Scientist, Flight Systems	15,290
1 GS-15 Scientist, Ionospheric Physics	14,380
1 GS-15 Scientist, Aeronomy	13,730
1 GS-15 Scientist, Solar Astronomy	13,730
1 GS-15 Scientist, Galactic Astronomy	13,730
1 GS-15 Scientist, Astrophysics	13,730
1 GS-14 Scientist, Payload Systems	37,150
1 GS-14 Scientist, Telemetry Systems	12,730
10 Other GS Personnel	64,755
26	$307,225

LUNAR AND PLANETARY PROGRAMS

1 Excepted Assistant Director	$ 19,000
1 Excepted Chief, Science Programs	17,500
1 Excepted Chief, Flight Systems	17,000
1 Excepted Chief, Programs Coordination	17,000
1 Excepted Staff Scientist, Lunar Flight Systems	16,500
1 Excepted Staff Scientist, Spacecraft Technology	15,500
1 Excepted Staff Scientist, Planetary Flight Systems	15,500
1 GS-15 Scientist, Space Probes	14,705
2 GS-15 Scientist, Instrumentation	27,785
2 GS-15 Scientist, Lunar and Planetary Sciences	27,460
1 GS-15 Scientist, Spacecraft Technology	13,730
1 GS-15 Scientist, Lunar Services	13,730
1 GS-14 Scientist, Planetary Sciences	12,730
1 GS-14 Scientist, Instrumentation	12,210
8 Other GS Personnel	48,315
24	$288,665

APPLICATION AND MANNED SATELLITE PROGRAMS

1 Excepted Assistant Director	$ 19,000
1 Excepted Chief, Manned Space Flight Programs	16,500
1 Excepted Chief, Advanced Technology Programs	16,000
1 Excepted Chief, Communications Satellite Program	15,750
1 Excepted Chief, Meteorological Satellite Programs	15,500
1 Excepted Assistant Chief, Meteorological Satellite Programs	15,500
1 Excepted Staff Scientist, Manned Satellites	15,500
1 Excepted Staff Scientist, Advanced Manned Systems	15,500
1 GS-15 Executive Assistant	15,030
1 GS-15 Scientist, Flight Components and Subsystems	14,055
2 GS-15 Scientist, Communications Satellite Systems	27,460
1 GS-15 Scientist, Meteorological Satellites	13,730
1 GS-15 Scientist, Manned Satellites	13,730
1 GS-14 Scientist, Space Power Technology	12,210
1 GS-14 Scientist, Meteorological Satellites	12,210
2 GS-14 Scientist, Manned Satellites	24,420
14 Other GS Personnel	84,800
33	$360,625

SPACE FLIGHT OPERATIONS

1 Excepted Assistant Director	$ 19,000
1 Excepted Chief of Operations	16,500
1 Excepted Chief, Advanced Development	16,000
1 Excepted Chief, Flight Operations	16,000
1 Excepted Staff Scientist, Communications Operations	16,000
1 Excepted Staff Scientist, Telemetry and Instrumentation	16,000
1 GS-15 Scientist, Computers and Celestial Mechanics	15,030
1 GS-15 Electronic Engineer	15,030
4 GS-15 Scientist, Instrumentation	56,220
1 GS-15 Technical Assistant	14,055
1 GS-15 Scientific Representative for NASA	15,290
3 GS-15 Scientist, Tracking Programs Coordination	41,190
1 GS-15 Scientist, Data and Computing Systems	13,730
1 GS-15 Scientist, Tracking Systems Analyst	13,730
1 GS-14 Scientist, Communications Systems	12,470
12 Other GS Personnel	68,350
32	$384,595

OFFICE OF LAUNCH VEHICLE PROGRAMS

1 Excepted Director of Launch Vehicle Programs	$ 21,000
1 Excepted Deputy Director	19,000
1 Excepted Chief, Analysis and Requirements	16,000
1 GS-15 Budget and Programming Specialist	14,380
1 GS-15 Aeronautical Power Plant Research Engineer	14,380
2 GS-15 Scientist, Launch Vehicle Analysis	27,785
2 GS-15 Scientist, Mission Analysis and Requirements	28,110
1 GS-15 Technical Assistant to Director	13,730
2 GS-14 Budget and Programming Specialist	24,680
1 GS-14 Scientist, Propulsion Program Coordinator	12,730
20 Other GS Personnel	157,155
33	$348,950

VEHICLES

1 Excepted Assistant Director for Vehicles	$ 19,000
1 Excepted Chief, Advanced Vehicle Development Programs	17,000
1 Excepted Chief, Saturn Class Vehicle Programs	17,000
1 Excepted Chief, Scout Class Vehicle Programs	16,000
2 GS-15 Scientist, Vehicle Development	29,410
1 GS-15 Scientist, Guidance Systems	14,705
1 GS-15 Scientist, Structures	14,380
1 GS-14 Scientist, Vehicle Systems Analysis	13,510
1 GS-14 Scientist, Launch Vehicle Programs	12,730
1 GS-14 Assistant Chief, Saturn Class Vehicles Program	12,210
1 GS-14 Scientist, Electronics	12,210
1 GS-14 Scientist, Aerobalistics	12,210
1 GS-14 Physicist	12,210
6 Other GS Personnel	34,365
26	$237,440

PROPULSION

1 Excepted Assistant Director for Propulsion	$ 19,000
1 Excepted Chief, Liquid Rocket Programs	16,000
1 Excepted Manager, AEC-NASA Nuclear Propulsion Project	17,000
1 Excepted Scientist, Nuclear Propulsion	15,500
1 Excepted Chief, Space Propulsion Programs	15,500
1 Excepted Staff Scientist, Liquid Rocket Propulsion	15,500
1 Excepted Chief, Solid Rocket Development	15,500
1 GS-15 Scientist, Nuclear Electric Generating Systems	14,705
1 GS-15 Scientist, Advanced Propulsion Systems	14,055
1 GS-15 Scientist, Solid Rocket Propulsion	14,055
1 GS-14 Scientist, Propulsion Executive Assistant	13,510
1 GS-14 Manager, Rocket Development and Sounding Rockets Project	12,210
8 Other GS Personnel	49,390
21	$245,805

LAUNCH OPERATIONS

1 Excepted Assistant Director for Launch Operations	$ 17,500
1 Excepted Chief, Range Support	15,500
1 Excepted Chief, Launch Projects	15,500
1 GS-14 Technical Staff Assistant	12,730
1 GS-14 Scientist, Instrumentation	12,990
1 GS-14 Construction Coordination Engineer	12,470
1 GS-14 Manager, Range Support	12,210
1 GS-14 Manager, Launch Projects	12,210
3 Other GS Personnel	16,190
11	$127,300

OFFICE OF ADVANCED RESEARCH PROGRAMS

1 Excepted Director of Advanced Research Programs	$ 21,000
1 Excepted Deputy Director	19,000
3 Other GS Personnel	19,140
5	$ 59,140

TECHNICAL ASSISTANTS

1 Excepted Technical Assistant to Director	$ 16,500
1 Excepted Staff Scientist, Research Program Coordination	15,000
1 GS-15 Technical Assistant for Research Facilities	15,290
1 GS-15 Technical Assistant for Research Reports	15,030
1 GS-14 Technical Assistant for Research Program Analysis	12,730
13 Other GS Personnel	80,780
18	$155,330

ASSISTANT DIRECTOR FOR AERODYNAMICS AND FLIGHT MECHANICS

1 Excepted Assistant Director	$19,000
1 Other GS Personnel	6,345
2	$25,345

AERODYNAMICS AND FLIGHT MECHANICS RESEARCH DIVISION

1 Excepted Chief	$ 17,000
1 Excepted Assistant Chief	15,750
1 Excepted Staff Scientist, Stability and Control	15,500
3 GS-15 Research Engineer, Aerodynamics	42,815
1 GS-15 Scientist, Hypervelocity Aerodynamics	13,730
2 GS-14 Research Engineer, Stability and Control	26,240
1 GS-14 Research Engineer, Aerodynamics	12,210
1 GS-14 Physicist	12,210
7 Other GS Personnel	42,275
18	$187,730

ASSISTANT DIRECTOR FOR STRUCTURES AND MATERIALS AND OPERATING PROBLEMS

1 Excepted Assistant Director	$19,000
1 Other GS Personnel	5,850
2	$24,850

STRUCTURES AND OPERATING PROBLEMS RESEARCH DIVISION

1 Excepted Chief	$ 17,000
1 Excepted Assistant Chief	15,500
1 GS-15 Research Engineer	14,705
1 GS-14 Research Engineer, Aerodynamic Loads	13,510
1 GS-14 Scientist, Meteorology	12,730
1 GS-14 Scientist, Noise and Human Factors	12,730
2 GS-14 Scientist, Structures	24,420
1 GS-14 Aeronautical Research Engineer	12,210
4 Other GS Personnel	21,990
13	$144,795

MATERIALS RESEARCH DIVISION

1 Excepted Chief	$ 16,000
5 GS-14 Research Engineer, Materials	62,870
1 GS-14 Physicist, Solid State	12,210
5 Other GS Personnel	29,655
12	$120,735

ASSISTANT DIRECTOR FOR POWER PLANTS

1 Excepted Assistant Director	$19,000
1 Other GS Personnel	5,685
2	$24,685

POWER PLANTS RESEARCH DIVISION

1 Excepted Chief	$ 17,000
1 GS-15 Research Engineer, Rocket Power Plants	15,030
1 GS-15 Research Engineer, Nuclear Propulsion	14,705
1 GS-15 Scientist, Electrical Propulsion Systems	14,380
1 GS-14 Research Engineer, Fuels and Combustion	12,990
1 GS-14 Research Engineer, Nuclear Propulsion	12,730
1 GS-14 Aeronautical Research Engineer	12,210
2 GS-14 Scientist, Propulsion Systems	24,420
6 Other GS Personnel	36,245
15	$159,710

OFFICE OF BUSINESS ADMINISTRATION

1 Excepted Director of Business Administration	$19,000
1 Excepted Assistant to the Director	18,500
1 Excepted Deputy Director	16,250
2 Other GS Personnel	11,760
5	$63,510

STAFF ASSISTANTS

Management Analysis:	
1 Excepted Director of Management Analysis	$ 16,500
3 GS-15 Management Analyst	45,515
1 GS-14 Management Analyst	12,210
8 Other GS Personnel	60,705
13	$130,950
Safety	
1 GS-15 Safety Officer	$14,380
1 Other GS Personnel	5,335
2	$19,715
Construction Analysis and Standards:	
1 GS-15 Construction Engineer	$13,730
1 GS-14 Facility Specialist	12,730
1 GS-14 Construction Engineer	12,210
4 Other GS Personnel	29,655
7	$68,325

AUDIT DIVISION

1 Excepted Director of Audits	$ 16,500
1 GS-15 Supervisory Auditor	14,705
4 GS-14 Supervisory Auditor	50,660
12 Other GS Personnel	110,110
18	$191,975

PROCUREMENT AND SUPPLY DIVISION

1 Excepted Director of Procurement and Supply	$ 17,250
1 Excepted Assistant Director	15,500
1 GS-15 Procurement and Supply Officer	15,030
1 GS-15 Assistant Procurement and Supply Officer	14,705
2 GS-15 Contract Specialist	27,785
1 GS-14 Procurement Specialist	12,730
6 GS-14 Contract Specialist	74,820
1 GS-14 Facility Specialist	12,730
1 GS-14 Transportation Specialist	12,470
1 GS-14 Industrial Specialist	12,470
1 GS-14 Electric Rate Specialist	12,470
1 GS-14 Contract Negotiator	12,210
64 Other GS Personnel	486,475
82	$722,645

SECURITY DIVISION

1 Excepted Director of Security	$ 15,500
1 GS-15 Assistant Director	14,705
1 GS-14 Personnel Security Officer	12,470
1 GS-14 Security Specialist	12,470
24 Other GS Personnel	177,660
28	$232,805

FINANCIAL MANAGEMENT DIVISION

1 Excepted Director of Financial Management	$ 17,250
1 Excepted Budget Officer	16,000
1 GS-15 Fiscal Officer	14,380
1 GS-15 Chief, Accounting Systems	14,055
3 GS-14 Budget Analyst	39,230
1 GS-14 System Accountant	12,470
47 Other GS Personnel	322,155
55	$435,540

PERSONNEL DIVISION

1 Excepted Director of Personnel	$ 16,500
1 GS-15 Classification and Organization Officer	14,380
1 GS-15 Examinations and Standards Officer	14,380
1 GS-14 Personnel Regulations and Procedures Officer	12,990
1 GS-14 Assistant Classification and Organization Officer	12,730
1 GS-14 Personnel Management Evaluation Officer	12,470
1 GS-14 Personnel Officer, Headquarters	12,470
1 GS-14 Personnel Projects and Recruitment Officer	12,470
27 Other GS Personnel	203,050
35	$311,440

RESEARCH GRANTS AND CONTRACTS DIVISION

1 Excepted Director of Research Grants and Contracts	$ 16,500
1 GS-15 Deputy Director	15,030
1 GS-14 Program Administrator	12,210
13 Other GS Personnel	88,060
16	$131,800

ADMINISTRATIVE SERVICES DIVISION

1 GS-15 Director of Administrative Services	$ 14,055
1 GS-15 Mobilization Planning Officer	14,055
1 GS-14 Chief of Automatic Data Processing	12,210
61 Other GS Personnel	368,868
15 Wage Board Personnel	71,094
79	$480,282

OFFICE OF TECHNICAL INFORMATION AND EDUCATIONAL PROGRAMS

1 Excepted Director of Technical Information and Educational Programs	$ 18,000
1 Excepted Deputy Director	16,500
1 GS-15 Historian	14,380
1 GS-15 Information Specialist	14,055
1 GS-14 Staff Assistant	12,470
1 GS-14 Information Specialist	12,470
1 GS-14 Special Assistant to Director	12,470
1 GS-14 Reports Officer	12,210
12 Other GS Personnel	87,455
20	$200,010

TECHNICAL INFORMATION DIVISION

1 GS-15 Assistant Director for Technical Information	$ 14,380
1 GS-15 Deputy Assistant Director	13,730
1 GS-14 Chief, Machine Systems	12,210
1 GS-14 Librarian	12,210
1 GS-14 Chief, Technical Services	12,210
1 GS-14 Chief, Technical Publications	12,210
37 Other GS Personnel	266,095
43	$343,043

EDUCATIONAL PROGRAM DIVISIONS

1 GS-15 Assistant Director for Educational Programs	$13,730
1 GS-15 Educational Services Officer	14,380
1 GS-15 Deputy Assistant Director	13,730
1 GS-14 Information Specialist	12,470
1 GS-14 Educational Services Specialist	12,210
2 GS-14 Educational Programs Coordinator	14,420
1 GS-14 Speech Program Specialist	12,210
17 Other GS Personnel	126,905
25	$217,845

OFFICE OF LIFE SCIENCES PROGRAMS

1 Excepted Director of Life Sciences Programs	$ 21,000
1 Excepted Assistant Director for Bioengineering	19,000
1 Excepted Assistant Director for Life Sciences	17,000
1 Excepted Assistant Director for Bioscience	16,000
1 Excepted Scientist, Program Planning	15,000
1 GS-15 Scientist, Manned Flight Programs	14,055
1 GS-15 Scientist, Flight Physiology	14,055
1 GS-15 Scientist, Bio and Aero-Space Science	14,055
1 GS-15 Chief, Radiation Biology	13,730
1 GS-15 Aero-Space Medical Scientist	13,730
1 GS-14 Assistant for Grants and Contracts	12,210
16 Other GS Personnel	118,752
27	$288,587

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED PERSONNEL STAFFING CHART
FISCAL YEAR 1962
NASA HEADQUARTERS

OFFICE OF THE ADMINISTRATOR

1 Excepted Administrator	$ 22,500
1 Excepted Deputy Administrator	21,500
1 Excepted Assistant to the Administrator	17,000
1 GS-15 Assistant to the Deputy Administrator	13,730
1 GS-14 Staff Assistant	12,210
1 GS-14 Scientist, Special Staff Assistant	12,470
7 Other GS Personnel	43,985
13	$143,395

OFFICE FOR U. N. CONFERENCE

1 Excepted Assistant to the Administrator for U. N. Conference	$ 19,000
1 Excepted Chief, Technical Papers Branch	16,000
1 GS-15 Chief, Technical Exhibits	15,030
1 GS-15 Director of Administration	15,030
1 GS-15 Technical Director	13,730
1 GS-14 Deputy Director of Administration	13,250
1 GS-14 Assistant to Director for Program Planning	12,470
11 Other GS Personnel	81,432
18	$184,952

AERONAUTICS & ASTRONAUTICS COORDINATING BOARD

1 Excepted Secretary to the Board	$16,000
1 Other GS Personnel	5,820
2	$21,820

OFFICE OF PROGRAM PLANNING AND EVALUATION

1 Excepted Director of Program Planning and Evaluation	$ 21,000
1 Excepted Scientist for Propulsion	19,000
1 Excepted Scientist for Vehicle Design	17,500
1 Excepted Scientist for Advanced Technology	17,000
1 Excepted Scientist for Guidance and Control	16,000
1 Excepted Scientist for Electronics	16,000
1 GS-15 Scientist, Rocket Propulsion	14,055
5 Other GS Personnel	27,720
12	$148,275

SECURITY CLASSIFICATION BOARD

3 GS Personnel	$22,135

OFFICE OF THE ASSOCIATE ADMINISTRATOR

1 Excepted Associate Administrator	$ 21,000
1 Excepted Assistant Administrator for Programs	19,000
1 Excepted Director of Reliability and Systems Analysis	16,750
1 Excepted Director of Program Management	16,500
1 Excepted Deputy Director of Reliability and Systems Analysis	16,000
1 Excepted Chief, Technical Program Analysis	15,250
2 GS-15 Special Assistant to Associate Administrator	27,460
1 GS-15 Mathematical Statistician	14,380
1 GS-15 Scientist, Systems Reliability Analysis	14,055
1 GS-15 Scientist, Measurement Systems	13,730
1 GS-15 Scientist, Structures	13,730
4 GS-15 Scientist, Aeronautics	54,920
1 GS-15 Mathematician	13,730
5 GS-14 Scientist	62,610
26 Other GS Personnel	203,328
48	522,443

OFFICE OF GENERAL COUNSEL

1 Excepted General Counsel	$ 20,500
3 Excepted Assistant General Counsel	50,000
1 Excepted Assistant General Counsel for Patent Matters	16,500
2 GS-15 Attorney Advisor	29,410
1 GS-15 Patent Attorney	14,380
1 GS-15 Executive Secretary, Committee on Long Range Studies	14,705
2 GS-14 Attorney Advisor	25,200
1 GS-14 Patent Attorney	12,990
1 GS-14 Patent Advisor	12,730
20 Other GS Personnel	132,040
33	$328,455

OFFICE OF PUBLIC INFORMATION

1 Excepted Director of the Office of Public Information	$ 17,500
1 GS-15 Deputy Director, Office of Public Information	14,380
22 Other GS Personnel	165,350
24	$197,230

OFFICE OF INTERNATIONAL PROGRAMS

1 Excepted Director, Office of International Programs	$ 16,500
1 GS-15 Facilities Program Officer	15,030
1 GS-15 Joint Projects Officer	14,055
1 GS-15 Chief, International Organizations	13,730
1 GS-14 Chief, Personnel Exchanges	12,210
1 GS-14 Programs Assistant, Cooperative Projects	12,210
8 Other GS Personnel	49,390
14	$133,125

OFFICE OF LAUNCH VEHICLE PROGRAMS

1 Excepted Director of Launch Vehicle Programs	$ 21,000
1 Excepted Deputy Director	19,000
1 Excepted Chief, Analysis and Requirements	16,000
1 GS-15 Budget and Programming Specialist	14,380
1 GS-15 Aeronautical Power Plant Research Engineer	14,380
2 GS-15 Scientist, Launch Vehicle Analysis	27,785
2 GS-15 Scientist, Mission Analysis and Requirements	28,110
1 GS-15 Technical Assistant to Director	13,730
2 GS-14 Budget and Programming Specialist	24,680
1 GS-14 Scientist, Propulsion Program Coordinator	12,730
20 Other GS Personnel	157,155
33	$348,950

VEHICLES

1 Excepted Assistant Director for Vehicles	$ 19,000
1 Excepted Chief, Advanced Vehicle Development Programs	17,500
1 Excepted Chief, Saturn Class Vehicle Programs	17,000
1 Excepted Chief, Scout Class Vehicle Programs	16,000
2 GS-15 Scientist, Vehicle Development	29,410
1 GS-15 Scientist, Guidance Systems	14,705
1 GS-15 Scientist, Structures	14,380
1 GS-14 Scientist, Vehicle Systems Analysis	13,510
1 GS-14 Scientist, Launch Vehicle Programs	12,730
1 GS-14 Assistant Chief, Saturn Class Vehicles Program	12,210
1 GS-14 Scientist, Electronics	12,210
1 GS-14 Scientist, Aeroballistics	12,210
1 GS-14 Physicist	12,210
6 Other GS Personnel	34,365
20	$237,440

PROPULSION

1 Excepted Assistant Director for Propulsion	$ 19,000
1 Excepted Chief, Liquid Rocket Programs	16,000
1 Excepted Manager, AEC-NASA Nuclear Propulsion Project	17,000
1 Excepted Scientist, Nuclear Propulsion	15,500
1 Excepted Chief, Space Propulsion Programs	15,500
1 Excepted Staff Scientist, Liquid Rocket Propulsion	15,500
1 Excepted Chief, Solid Rocket Development	15,500
1 GS-15 Scientist, Nuclear Electric Generating Systems	14,705
1 GS-15 Scientist, Advanced Propulsion Systems	14,055
1 GS-15 Scientist, Solid Rocket Propulsion	14,055
1 GS-14 Scientist, Propulsion Executive Assistant	13,510
1 GS-14 Manager, Rocket Development and Sounding Rockets Project	12,210
8 Other GS Personnel	49,390
21	$245,805

LAUNCH OPERATIONS

1 Excepted Assistant Director for Launch Operations	$ 17,500
1 Excepted Chief, Range Support	15,500
1 Excepted Chief, Launch Projects	15,500
1 GS-14 Technical Staff Assistant	12,730
1 GS-14 Scientist, Instrumentation	12,990
1 GS-14 Construction Coordination Engineer	12,470
1 GS-14 Manager, Range Support	12,210
1 GS-14 Manager, Launch Projects	12,210
3 Other GS Personnel	16,190
11	$127,300

OFFICE OF ADVANCED RESEARCH PROGRAMS

1 Excepted Director of Advanced Research Programs	$ 21,000
1 Excepted Deputy Director	19,000
3 Other GS Personnel	19,140
5	$ 59,140

TECHNICAL ASSISTANTS

1 Excepted Technical Assistant to Director	$ 16,500
1 Excepted Staff Scientist, Research Program Coordination	15,000
1 GS-15 Technical Assistant for Research Facilities	15,290
1 GS-15 Technical Assistant for Research Reports	15,030
1 GS-14 Technical Assistant for Research Program Analysis	12,730
13 Other GS Personnel	80,780
18	$155,330

ASSISTANT DIRECTOR FOR AERODYNAMICS AND FLIGHT MECHANICS

1 Excepted Assistant Director	$19,000
1 Other GS Personnel	6,345
2	$25,345

AERODYNAMICS AND FLIGHT MECHANICS RESEARCH DIVISION

1 Excepted Chief	$ 17,000
1 Excepted Assistant Chief	15,750
1 Excepted Staff Scientist, Stability and Control	15,500
3 GS-15 Research Engineer, Aerodynamics	42,815
1 GS-15 Scientist, Hypervelocity Aerodynamics	13,730
2 GS-14 Research Engineer, Stability and Control	26,240
1 GS-14 Research Engineer, Aerodynamics	12,210
1 GS-14 Physicist	12,210
7 Other GS Personnel	42,275
18	$197,730

ASSISTANT DIRECTOR FOR STRUCTURES AND MATERIALS AND OPERATING PROBLEMS

1 Excepted Assistant Director	$19,000
1 Other GS Personnel	5,850
2	$24,850

STRUCTURES AND OPERATING PROBLEMS RESEARCH DIVISION

1 Excepted Chief	$ 17,000
1 Excepted Assistant Chief	15,500
1 GS-15 Research Engineer	14,705
1 GS-14 Research Engineer, Aerodynamic Loads	13,510
1 GS-14 Scientist, Meteorology	12,730
1 GS-14 Scientist, Noise and Human Factors	12,730
2 GS-14 Scientist, Structures	24,420
1 GS-14 Aeronautical Research Engineer	12,210
4 Other GS Personnel	21,990
13	$144,795

MATERIALS RESEARCH DIVISION

1 Excepted Chief	$ 16,000
5 GS-14 Research Engineer, Materials	62,870
1 GS-14 Physicist, Solid State	12,210
5 Other GS Personnel	29,655
12	$120,735

ASSISTANT DIRECTOR FOR POWER PLANTS

1 Excepted Assistant Director	$19,000
1 Other GS Personnel	5,685
2	$24,685

POWER PLANTS RESEARCH DIVISION

1 Excepted Chief	$ 17,000
1 GS-15 Research Engineer, Rocket Power Plants	15,030
1 GS-15 Research Engineer, Nuclear Propulsion	14,705
1 GS-15 Scientist, Electrical Propulsion Systems	14,380
1 GS-14 Research Engineer, Fuels and Combustion	12,990
1 GS-14 Research Engineer, Nuclear Propulsion	12,730
1 GS-14 Aeronautical Research Engineer	12,210
2 GS-14 Scientist, Propulsion Systems	24,420
6 Other GS Personnel	36,245
15	$159,710

OFFICE OF BUSINESS ADMINISTRATION

1 Excepted Director of Business Administration	$19,000
1 Excepted Assistant to the Director	16,500
1 Excepted Deputy Director	16,250
2 Other GS Personnel	11,760
5	$63,510

STAFF ASSISTANTS

Management Analysis:	
1 Excepted Director of Management Analysis	$ 16,500
3 GS-15 Management Analyst	45,515
1 GS-14 Management Analyst	12,210
8 Other GS Personnel	60,705
13	$130,950
Safety:	
1 GS-15 Safety Officer	$14,380
1 Other GS Personnel	5,355
2	$19,715
Construction Analysis and Standards:	
1 GS-15 Construction Engineer	$13,730
1 GS-14 Facility Specialist	12,730
1 GS-14 Construction Engineer	12,210
4 Other GS Personnel	29,655
7	$68,325

AUDIT DIVISION

1 Excepted Director of Audits	$ 16,500
1 GS-15 Supervisory Auditor	14,705
4 GS-14 Supervisory Auditor	50,660
12 Other GS Personnel	110,110
18	$191,975

PROCUREMENT AND SUPPLY DIVISION

1 Excepted Director of Procurement and Supply	$ 17,250
1 Excepted Assistant Director	15,500
1 GS-15 Procurement and Supply Officer	15,030
1 GS-15 Assistant Procurement and Supply Officer	14,705
2 GS-15 Contract Specialist	27,785
1 GS-14 Procurement Specialist	12,730
6 GS-14 Contract Specialist	74,820
1 GS-14 Facility Specialist	12,730
1 GS-14 Transportation Specialist	12,470
1 GS-14 Industrial Specialist	12,470
1 GS-14 Electric Rate Specialist	12,470
1 GS-14 Contract Negotiator	12,210
64 Other GS Personnel	482,475
82	$722,645

SECURITY DIVISION

1 Excepted Director of Security	$ 15,500
1 GS-15 Assistant Director	14,705
1 GS-14 Personnel Security Officer	12,470
1 GS-14 Security Specialist	12,470
24 Other GS Personnel	177,660
28	$232,805

FINANCIAL MANAGEMENT DIVISION

1 Excepted Director of Financial Management	$ 17,250
1 Excepted Budget Officer	16,000
1 GS-15 Fiscal Officer	14,380
1 GS-15 Chief, Accounting Systems	14,055
3 GS-14 Budget Analyst	39,230
1 GS-14 System Accountant	12,470
47 Other GS Personnel	322,155
55	$435,540

PERSONNEL DIVISION

1 Excepted Director of Personnel	$ 16,500
1 GS-15 Classification and Organization Officer	14,380
1 GS-15 Examinations and Standards Officer	14,380
1 GS-14 Personnel Regulations and Procedures Officer	12,990
1 GS-14 Assistant Classification and Organization Officer	12,730
1 GS-14 Personnel Management Evaluation Officer	12,470
1 GS-14 Personnel Officer, Headquarters	12,470
1 GS-14 Personnel Projects and Recruitment Officer	12,470
27 Other GS Personnel	203,050
35	$311,440

RESEARCH GRANTS AND CONTRACTS DIVISION

1 Excepted Director of Research Grants and Contracts	$ 16,500
1 GS-15 Deputy Director	15,030
1 GS-14 Program Administrator	12,210
13 Other GS Personnel	88,060
16	$131,800

ADMINISTRATIVE SERVICES DIVISION

1 GS-15 Director of Administrative Services	$ 14,055
1 GS-15 Mobilization Planning Officer	14,055
1 GS-14 Chief of Automatic Data Processing	12,210
61 Other GS Personnel	368,868
15 Wage Board Personnel	71,094
79	$480,282

OFFICE OF TECHNICAL INFORMATION AND EDUCATIONAL PROGRAMS

1 Excepted Director of Technical Information and Educational Programs	$ 18,000
1 Excepted Deputy Director	16,500
1 GS-15 Historian	14,380
1 GS-15 Information Specialist	14,055
1 GS-14 Staff Assistant	12,470
1 GS-14 Information Specialist	12,470
1 GS-14 Special Assistant to Director	12,470
1 GS-14 Reports Officer	12,210
12 Other GS Personnel	87,455
20	$200,610

TECHNICAL INFORMATION DIVISION

1 GS-15 Assistant Director for Technical Information	$ 14,380
1 GS-15 Deputy Assistant Director	13,730
1 GS-14 Chief, Machine Systems	12,210
1 GS-14 Librarian	12,210
1 GS-14 Chief, Technical Services	12,210
1 GS-14 Chief, Technical Publications	12,210
37 Other GS Personnel	266,095
43	$343,045

EDUCATIONAL PROGRAM DIVISIONS

1 GS-15 Assistant Director for Educational Programs	$13,730
1 GS-15 Educational Services Officer	14,380
1 GS-15 Deputy Assistant Director	13,730
1 GS-14 Information Specialist	12,470
1 GS-14 Educational Services Specialist	12,210
2 GS-14 Educational Programs Coordinator	14,420
1 GS-14 Speech Program Specialist	12,210
17 Other GS Personnel	126,905
25	$217,845

OFFICE OF LIFE SCIENCES PROGRAMS

1 Excepted Director of Life Sciences Programs	$ 21,000
1 Excepted Assistant Director for Bioengineering	19,000
1 Excepted Assistant Director for Life Sciences	17,000
1 Excepted Assistant Director for Bioscience	16,000
1 Excepted Scientist, Program Planning	15,000
1 GS-15 Scientist, Manned Flight Programs	14,055
1 GS-15 Scientist, Flight Physiology	14,055
1 GS-15 Scientist, Bio and Aero-Space Science	14,055
1 GS-15 Chief, Radiation Biology	13,730
1 GS-15 Aero-Space Medical Scientist	13,730
1 GS-14 Assistant for Grants and Contracts	12,210
16 Other GS Personnel	118,752
27	$288,587

NATIONAL AERONAUTICS AND

Proposed personnel s

F. Y. 1962

LANGLEY RESEARC

OFFICE OF DIRECTOR

1	Excepted	Director, Langley Research Ce	
1	Excepted	Senior Staff Associate	
1	Excepted	Research Assistant for Cooper	
1	GS-15	Executive Assistant and Budge	
1	GS-15	Management Analyst	
1	GS-14	Technical Assistant to the As	
3		All other GS personnel	
9		Total	

BUDGET OFFICE

*1	GS-15	Executive Assistant and Budget Officer	
1	GS-14	Assistant Budget Officer	$12,990
3		All other GS personnel	23,365
4		Total	$36,355

*Position not included in totals as this is a multiple function position and is included under Office of Director.

RESEARCH STAFF SCIENTIST

1	Excepted	Research Staff Scientist	$18,000

ASSISTANT DIRECTOR

1	Excepted	Assistant Director, Langley Research Center	$19,000

ASSISTANT DIRECTOR

1	Excepted	Assistant Director, Langley Research Center	$18,500

ASSISTANT DIRECTOR

1	Excepted	Assistant Director, Langley Res	
1	Excepted	Technical Assistant to the Asso	
2		All other GS personnel	
4		Total	

AERO-PHYSICS DIVISION

1	Excepted	Chief of Division	$ 18,000
1	Excepted	Assistant Chief of Division	16,250
1	Excepted	Head, Magnetoplasmadynamics Branch	15,500
1	GS-15	Assistant Chief of Division	15,030
1	GS-15	Division Executive	14,380
1	GS-15	Head, Internal Aerodynamics Branch	15,030
1	GS-15	Head, Reentry Physics Branch	14,380
1	GS-15	Head, Continuous Flow Hypersonic Tunnel Branch	14,055
1	GS-15	Head, 11-Inch Hypersonic Tunnel Section	14,705
1	GS-15	Head, 20-Inch Hypersonic Tunnel Section	14,705
1	GS-15	Head, Helium Tunnel Section	14,055
1	GS-15	Head, Magnetohydrodynamics Section	14,705
1	GS-15	Head, Plasma Application Section	14,705
1	GS-15	Head, Plasma Physics Section	14,380
4	GS-15	Aeronautical Research Engineer	56,545
1	GS-14	Assistant Head, Continuous Flow Hypersonic Tunnel Branch	12,990
1	GS-15	Head, High-Temperature Fluid Mechanics Section	13,730
1	GS-14	Head, Space Physics Group	12,990
1	GS-15	Assistant Head, Internal Aerodynamics Branch	14,055
1	GS-14	Assistant Head, Reentry Physics Branch	13,510
5	GS-14	Aeronautical Research Engineer	62,870
129		All other GS personnel	1,026,560
[illegible]		All WB personnel	7,571
151		Total	$1,430,701

FULL-SCALE RESEARCH DIVISION

1	Excepted	Chief of Division	$ 16,500
1	Excepted	Assistant Chief of Division	16,000
1	Excepted	Technical Consultant of Division	15,500
1	GS-15	Head, Advanced Configurations Group	14,055
1	GS-15	Head, Dynamics Branch	14,380
1	GS-15	Head, 8-Foot Tunnels Branch	15,030
1	GS-15	Head, Full-Scale Analysis Branch	15,030
1	GS-15	Head, General Aerodynamics Branch	14,380
1	GS-15	Head, 7- by 10-Foot Tunnels Branch	15,290
1	GS-15	Head, Large-Scale Compressible Flow Branch	15,030
1	GS-15	Head, Components Section	15,030
5	GS-15	Aeronautical Research Engineer	71,900
1	GS-14	Assistant Head, Dynamics Branch	13,510
1	GS-14	Head, Supersonic Section	13,510
1	GS-14	Head, 16-Foot Transonic Tunnel Section	13,770
1	GS-14	Head, Space Application Group	12,990
24	GS-14	Aeronautical Research Engineer	303,700
154		All other GS personnel	1,286,455
198		Total	$1,882,060

THEORETICAL MECHANICS DIVISION

1	Excepted	Chief of Division	$ 18,000
2	GS-15	Assistant Chief of Division	28,760
1	GS-15	Head, Analytical Computing Branch	14,705
1	GS-15	Head, Astromechanics Branch	15,030
1	GS-15	Assistant Head, Astromechanics Branch	14,705
1	GS-15	Head, Mathematical Physics Branch	14,055
2	GS-15	Aeronautical Research Engineer	30,190
1	GS-14	Division Executive	13,510
1	GS-14	Head, Astronautical Systems Section	12,730
1	GS-14	Head, Mission Analysis Section	12,730
1	GS-14	Head, Rendezvous Analysis Section	13,510
1	GS-14	Head, Systems Simulation Section	12,730
7	GS-14	Aeronautical Research Engineer	88,070
86		All other GS personnel	671,400
107		Total	$960,12[illegible]

UNITARY PLAN WIND TUNNEL DIVISION

1	Excepted	Chief of Division	$ 16,500
1	GS-15	Assistant Division Chief	15,030
6	GS-14	Aeronautical Research Engineer	77,160
27		All other GS personnel	211,390
35		Total	$320,080

APPLIED MATERIALS AND PHYSICS DIVISION

1	Excepted	Chief of Division	$ 16,000
2	Excepted	Assistant Chief of Division	32,000
1	Excepted	Assistant to Chief of Division	16,500
1	Excepted	Head, Flight Physics Branch	15,500
1	Excepted	Head, High Temperature Materials Branch	15,500
1	GS-15	Assistant Head, High Temperature Materials Branch	15,030
1	GS-15	Head, Spacecraft and Missile Dynamics Branch	15,030
1	GS-15	Head, Vehicle Performance Branch	14,380
1	GS-15	Head, Systems Application Section	13,730
4	GS-15	Aeronautical Research Engineer	55,245
1	GS-14	Head, Systems Analysis Section	13,510
1	GS-14	Head, Heat Transfer Section	12,990
1	GS-14	Head, Reentry Performance Section	12,990
23	GS-14	Aeronautical Research Engineer	285,510
111		All other GS personnel	889,210
8		All WB personnel	52,010
159		Total	$1,475,135

DYNAMIC LOADS DIVISION

1	Excepted	Chief of Division	$ 18,000
1	Excepted	Associate Chief of Division	16,500
1	Excepted	Assistant Chief of Division	15,500
1	GS-15	Head, Acoustics Branch	15,030
1	GS-15	Head, Landing and Impact Branch	15,030
1	GS-15	Head, Structural Dynamics Branch	14,705
1	GS-15	Assistant Head, Vibration and Flutter Branch	15,030
1	GS-15	Head, Aeroelasticity and Flutter Section	14,380
1	GS-15	Head, Analysis Section	15,030
1	GS-15	Head, Vibration and Dynamics Section	14,055
1	GS-15	Aeronautical Research Engineer	14,380
1	GS-14	Assistant Head, Structural Dynamics Branch	13,510
8	GS-14	Aeronautical Research Engineer	101,320
68		All other GS personnel	588,005
88		Total	$870,475

STRUCTURES RESEARCH DIVISION

1	Excepted	Chief of Division	$ 17,500
1	Excepted	Assistant Chief of Division	15,500
1	Excepted	Head, Structural Configurations Branch	16,000
1	GS-15	Head, Aero-Thermal Facility Branch	14,055
1	GS-15	Head, Structural Mechanics Branch	14,705
1	GS-15	Head, Pliant Structures Branch	15,030
1	GS-15	Head, Special Projects Branch	15,030
1	GS-15	Head, Fatigue Section	14,380
1	GS-15	Head, Thermal Protection Section	14,380
3	GS-15	Aeronautical Research Engineer	41,840
1	GS-14	Assistant Head, Aero-Thermal Facility Branch	12,730
1	GS-14	Head, 8-Foot High Temperature Structures Tunnel Section	12,730
1	GS-14	Head, Materials Applications Section	12,730
1	GS-14	Head, Structural Strength Section	12,990
1	GS-14	Head, Temperature Control Section	12,730
1	GS-14	Head, Solid State Physics Section	12,730
1	GS-14	Head, Impacting Structures Section	13,510
1	GS-14	Head, Dynamics and Thermo-Elasticity Section	12,730
1	GS-14	Head, Structural Analysis Section	12,730
1	GS-14	Head, Structural Heat Transfer Section	12,210
1	GS-14	Head, Thermo-Structural Dynamics Section	12,210
1	GS-14	Head, Research Techniques Section	12,210
16	GS-14	Aeronautical Research Engineer	198,480
91		All other GS personnel	672,670
131		Total	$1,104,810

AERO-SPACE MECHANICS DIVISION

1	Excepted	Chief of Division	
1	Excepted	Associate Chief of Division	
1	Excepted	Head, Guidance and Control Bra	
1	Excepted	Head, Operations Branch	
1	GS-15	Technical Assistant to Divisic	
1	GS-15	Head, Airworthiness Branch	
1	GS-15	Assistant Head, Airworthiness	
1	GS-15	Head, Dynamic Stability Branch	
1	GS-15	Head, Flight Mechanics Branch	
1	GS-15	Assistant Head, Guidance and C	
1	GS-15	Head, Recovery Systems Branch	
1	GS-15	Head, VTOL Branch	
1	GS-15	Head, VTOL Section	
1	GS-15	Head, Pilots Section	
1	GS-15	Aeronautical Research Engineer	
1	GS-15	Aeronautical Research Engineer	
1	GS-14	Assistant Head, Flight Mechanic	
1	GS-14	Head, Reentry Vehicle Dynamics	
1	GS-14	Head, Systems Analysis Section	
1	GS-14	Head, Control and Simulation Se	
2	GS-14	Aeronautical Research Engineer	
15	GS-14	Aeronautical Research Engineer	
105		All other GS personnel	
34		All WB personnel	
176		Total	

INSTRUMENT RESEARCH DIVISION

1	Excepted	Chief of Division	
1	Excepted	Assistant Chief of Division	
1	Excepted	Head, Navigation and Communicat	
1	Excepted	Head, Measurements Research Bra	
1	GS-15	Head, Data Systems Branch	
1	GS-15	Head, Ground Facilities Instrum	
1	GS-15	Head, Instruments Standards and gration Branch	
1	GS-15	Assistant Head, Navigation and Research Branch	
1	GS-15	Research Engineer (Aeronautical	
1	GS-14	Assistant Head, Data Systems Br	
1	GS-14	Head, Read-Out Equipment Develop	
1	GS-14	Head, Telemeter Instrumentation	
1	GS-14	Head, Vehicle Instrumentation Se	
1	GS-14	Head, Instrument Physics Researc	
1	GS-14	Head, Telemeter Techniques Reses	
1	GS-14	Head, Automatic Control Section	
1	GS-14	Head, Communications Research Se	
1	GS-14	Head, Systems Analysis Section	
9	GS-14	Research Engineer (Aeronautical	
188		All other GS personnel	
168		All WB personnel	
383		Total	

ASSISTANT DIRECTOR

1	Excepted	Assistant Director, Langley Research Center	$19,000

AERO-PHYSICS DIVISION

1	Excepted	Chief of Division	$ 18,000
1	Excepted	Assistant Chief of Division	16,250
1	Excepted	Head, Magnetoplasmadynamics Branch	15,500
1	GS-15	Assistant Chief of Division	15,030
1	GS-15	Division Executive	14,380
1	GS-15	Head, Internal Aerodynamics Branch	15,030
1	GS-15	Head, Reentry Physics Branch	14,380
1	GS-15	Head, Continuous Flow Hypersonic Tunnel Branch	14,055
1	GS-15	Head, 11-Inch Hypersonic Tunnel Section	14,705
1	GS-15	Head, 20-Inch Hypersonic Tunnel Section	14,705
1	GS-15	Head, Helium Tunnel Section	14,055
1	GS-15	Head, Magnetohydrodynamics Section	14,705
1	GS-15	Head, Plasma Application Section	14,705
1	GS-15	Head, Plasma Physics Section	14,380
4	GS-15	Aeronautical Research Engineer	56,545
1	GS-14	Assistant Head, Continuous Flow Hypersonic Tunnel Branch	12,990
1	GS-15	Head, High-Temperature Fluid Mechanics Section	13,730
1	GS-14	Head, Space Physics Group	12,990
1	GS-15	Assistant Head, Internal Aerodynamics Branch	14,055
1	GS-14	Assistant Head, Reentry Physics Branch	13,510
5	GS-14	Aeronautical Research Engineer	62,870
125		All other GS personnel	1,026,560
1		All WB personnel	7,371
154		Total	$1,430,701

FULL-SCALE RESEARCH DIVISION

1	Excepted	Chief of Division	$ 16,500
1	Excepted	Assistant Chief of Division	16,000
1	Excepted	Technical Consultant of Division	15,500
1	GS-15	Head, Advanced Configurations Group	14,055
1	GS-15	Head, Dynamics Branch	14,380
1	GS-15	Head, 8-Foot Tunnels Branch	15,030
1	GS-15	Head, Full-Scale Analysis Branch	15,030
1	GS-15	Head, General Aerodynamics Branch	14,380
1	GS-15	Head, 7- by 10-Foot Tunnels Branch	15,290
1	GS-15	Head, Large-Scale Compressible Flow Branch	15,030
1	GS-15	Head, Components Section	15,030
5	GS-15	Aeronautical Research Engineer	71,900
1	GS-14	Assistant Head, Dynamics Branch	13,510
1	GS-14	Head, Supersonic Section	13,510
1	GS-14	Head, 16-Foot Transonic Tunnel Section	13,770
1	GS-14	Head, Space Application Group	12,990
24	GS-14	Aeronautical Research Engineer	303,700
154		All other GS personnel	1,286,455
198		Total	$1,882,060

THEORETICAL MECHANICS DIVISION

1	Excepted	Chief of Division	$ 18,000
2	GS-15	Assistant Chief of Division	28,760
1	GS-15	Head, Analytical Computing Branch	14,705
1	GS-15	Head, Astromechanics Branch	15,030
1	GS-15	Assistant Head, Astromechanics Branch	14,705
1	GS-15	Head, Mathematical Physics Branch	14,055
2	GS-15	Aeronautical Research Engineer	30,190
1	GS-14	Division Executive	13,510
1	GS-14	Head, Astronautical Systems Section	12,730
1	GS-14	Head, Mission Analysis Section	12,730
1	GS-14	Head, Rendezvous Analysis Section	13,510
1	GS-14	Head, Systems Simulation Section	12,730
7	GS-14	Aeronautical Research Engineer	88,270
86		All other GS personnel	671,400
107		Total	$960.12

UNITARY PLAN WIND TUNNEL DIVISION

1	Excepted	Chief of Division	$ 16,500
1	GS-15	Assistant Division Chief	15,030
6	GS-14	Aeronautical Research Engineer	77,160
27		All other GS personnel	211,390
35		Total	$320,080

ASSISTANT DIRECTOR

1	Excepted	Assistant Director, Langley Research Center	$18,500

APPLIED MATERIALS AND PHYSICS DIVISION

1	Excepted	Chief of Division	$ 16,000
2	Excepted	Assistant Chief of Division	32,000
1	Excepted	Assistant to Chief of Division	16,500
1	Excepted	Head, Flight Physics Branch	15,500
1	Excepted	Head, High Temperature Materials Branch	15,500
1	GS-15	Assistant Head, High Temperature Materials Branch	15,030
1	GS-15	Head, Spacecraft and Missile Dynamics Branch	15,030
1	GS-15	Head, Vehicle Performance Branch	14,380
1	GS-15	Head, Systems Application Section	13,730
4	GS-15	Aeronautical Research Engineer	55,245
1	GS-14	Head, Systems Analysis Section	13,510
1	GS-14	Head, Heat Transfer Section	12,990
1	GS-14	Head, Reentry Performance Section	12,990
23	GS-14	Aeronautical Research Engineer	285,510
131		All other GS personnel	889,210
8		All WB personnel	52,010
159		Total	$2,475,255

DYNAMIC LOADS DIVISION

1	Excepted	Chief of Division	$ 18,000
1	Excepted	Associate Chief of Division	16,500
1	Excepted	Assistant Chief of Division	15,500
1	GS-15	Head, Acoustics Branch	15,030
1	GS-15	Head, Landing and Impact Branch	15,030
1	GS-15	Head, Structural Dynamics Branch	14,705
1	GS-15	Assistant Head, Vibration and Flutter Branch	15,030
1	GS-15	Head, Aeroelasticity and Flutter Section	14,380
1	GS-15	Head, Analysis Section	15,030
1	GS-15	Head, Vibration and Dynamics Section	14,055
1	GS-15	Aeronautical Research Engineer	14,380
1	GS-14	Assistant Head, Structural Dynamics Branch	13,510
8	GS-14	Aeronautical Research Engineer	101,320
68		All other GS personnel	588,005
88		Total	$870,475

STRUCTURES RESEARCH DIVISION

1	Excepted	Chief of Division	$ 17,500
1	Excepted	Assistant Chief of Division	15,500
1	Excepted	Head, Structural Configurations Branch	16,000
1	GS-15	Head, Aero-Thermal Facility Branch	14,055
1	GS-15	Head, Structural Mechanics Branch	14,705
1	GS-15	Head, Pliant Structures Branch	15,030
1	GS-15	Head, Special Projects Branch	15,030
1	GS-15	Head, Fatigue Section	14,380
1	GS-15	Head, Thermal Protection Section	14,380
3	GS-15	Aeronautical Research Engineer	41,840
1	GS-14	Assistant Head, Aero-Thermal Facility Branch	12,730
1	GS-14	Head, 8-Foot High Temperature Structures Tunnel Section	12,730
1	GS-14	Head, Materials Applications Section	12,730
1	GS-14	Head, Structural Strength Section	12,990
1	GS-14	Head, Temperature Control Section	12,730
1	GS-14	Head, Solid State Physics Section	12,730
1	GS-14	Head, Impacting Structures Section	13,510
1	GS-14	Head, Dynamics and Thermo-Elasticity Section	12,730
1	GS-14	Head, Structural Analysis Section	12,730
1	GS-14	Head, Structural Heat Transfer Section	12,210
1	GS-14	Head, Thermo-Structural Dynamics Section	12,210
1	GS-14	Head, Research Techniques Section	12,210
16	GS-14	Aeronautical Research Engineer	198,480
92		All other GS personnel	672,670
130		Total	$1,204,810

ASSISTANT DIRECTOR

1	Excepted	Assistant Director, Langley Research Center	$19,000
1	Excepted	Technical Assistant to the Associate Director	17,000
2		All other GS personnel	23,350
4		Total	$59,350

AERO-SPACE MECHANICS DIVISION

1	Excepted	Chief of Division	$ 16,500
1	Excepted	Associate Chief of Division	16,000
1	Excepted	Head, Guidance and Control Branch	16,000
1	Excepted	Head, Operations Branch	15,500
1	GS-15	Technical Assistant to Division Chief	15,030
1	GS-15	Head, Airworthiness Branch	14,380
1	GS-15	Assistant Head, Airworthiness Branch	14,055
1	GS-15	Head, Dynamic Stability Branch	15,030
1	GS-15	Head, Flight Mechanics Branch	15,030
1	GS-15	Assistant Head, Guidance and Control Branch	14,380
1	GS-15	Head, Recovery Systems Branch	15,030
1	GS-15	Head, VTOL Branch	15,030
1	GS-15	Head, VTOL Section	15,030
1	GS-15	Head, Pilots Section	15,030
1	GS-15	Aeronautical Research Engineer and Pilot	15,030
1	GS-15	Aeronautical Research Engineer	14,705
1	GS-14	Assistant Head, Flight Mechanics Branch	12,730
1	GS-14	Head, Reentry Vehicle Dynamics Section	13,510
1	GS-14	Head, Systems Analysis Section	12,210
1	GS-14	Head, Control and Simulation Section	12,730
2	GS-14	Aeronautical Research Engineer and Pilot	25,460
15	GS-14	Aeronautical Research Engineer	190,170
105		All other GS personnel	826,640
34		All WB personnel	246,022
176		Total	$1,581,232

INSTRUMENT RESEARCH DIVISION

1	Excepted	Chief of Division	$ 17,000
1	Excepted	Assistant Chief of Division	15,500
1	Excepted	Head, Navigation and Communications Branch	15,500
1	Excepted	Head, Measurements Research Branch	15,500
1	GS-15	Head, Data Systems Branch	14,380
1	GS-15	Head, Ground Facilities Instrumentation Branch	14,380
1	GS-15	Head, Instruments Standards and Systems Integration Branch	14,360
1	GS-15	Assistant Head, Navigation and Communications Research Branch	14,380
1	GS-15	Research Engineer (Aeronautical Instrumentation)	13,730
1	GS-14	Assistant Head, Data Systems Branch	12,730
1	GS-14	Head, Read-Out Equipment Development Section	12,730
1	GS-14	Head, Telemeter Instrumentation Section	12,730
1	GS-14	Head, Vehicle Instrumentation Section	12,730
1	GS-14	Head, Instrument Physics Research Section	13,510
1	GS-14	Head, Telemeter Techniques Research Section	12,990
1	GS-14	Head, Automatic Control Section	12,730
1	GS-14	Head, Communications Research Section	12,990
1	GS-14	Head, Systems Analysis Section	12,730
9	GS-14	Research Engineer (Aeronautical Instrumentation)	111,970
188		All other GS personnel	1,477,180
168		All WB personnel	1,152,946
383		Total	$2,992,716

OFFICE OF CHIEF, TECHNICAL SERVICES

1	Excepted	Chief of Technical Services	$16,000
1	GS-15	Assistant Chief of Technical Services	15,030
1	GS-14	Engineering Planning Officer	13,770
1		All other GS personnel	5,820
1	WB-20	Assistant to Chief of Division	12,314
5		Total	$62,934

SAFETY OFFICE

8		All other GS personnel	$15,330

PLANNING OFFICE

1	GS-13	Head, Planning Section	$11,93[illegible]
10		All other GS personnel	66,65[illegible]
1		All other WB personnel	9,38[illegible]
12		Total	$87,96[illegible]

ELECTRICAL DIVISION

1	GS-15	Chief of Division	$ 15,030
1	GS-15	Assistant Chief of Division	14,705
1	GS-15	Head, Electrical Engineering Branch	14,705
1	GS-14	Head, Electrical Distribution Section	13,510
1	GS-14	Head, Electrical Equipment and Control Section	13,510
29		All other GS personnel	242,495
186		All WB personnel	1,096,626
220		Total	$1,410,581

ENGINEERING DIVISION

1	GS-15	Chief of Division	$ 15,290
1	GS-15	Associate Chief of Division	15,290
1	GS-15	Assistant Chief of Division	14,705
1	GS-15	Technical Assistant of Division	14,705
1	GS-15	Head, Engineering Projects Analysis Office	14,380
1	GS-15	Head, Research Models and Vehicles Branch	14,705
1	GS-15	Research Equipment Design Engineer	14,055
1	GS-14	Head, Cost Engineering Staff	12,730
1	GS-14	Head, Research Facilities Branch	13,510
1	GS-14	Head, Plant Engineering Section	12,470
1	GS-14	Technical Assistant, Research Models and Vehicles Branch	13,510
1	GS-14	Head, Dynamics Analysis Staff	13,510
1	GS-14	Head, Dynamic Vehicle Section	12,990
1	GS-14	Head, Research Models and Payloads Section	13,510
1	GS-15	Head, Systems Engineering Branch	14,055
1	GS-14	Technical Assistant, Systems Engineering Branch	13,510
1	GS-14	Head, Research Equipment Design	12,210
1	GS-14	Head, Systems Control Section	13,510
3	GS-14	Structural Engineer	36,630
181		All other GS personnel	1,567,075
3		All WB personnel	18,491
205		Total	$1,844,841

MECHANICAL SERVICE DIVISION

1	GS-15	Chief of Division	$ 14,705
7		All other GS personnel	42,045
1	WB-20	Assistant Chief of Division	12,314
1	WB-20	Head, Structural Fabrications Branch	12,314
1	WB-20	Head, Modelmaking Branch	12,314
814		All other WB personnel	5,372,893
825		Total	$5,466,585

PLANT MAINTENANCE DIVISION

7		All GS personnel	$ 40,000
1	WB-18	Chief of Division	10,691
225		All other WB personnel	1,162,673
233		Total	$1,213,364

OFFICE OF CHIEF,

1	GS-15	Admini
1		All o
2		T

PATENT COUNSEL

1	GS-13	Patent
3		All o
4		

FISCAL DIVISION

1	GS-14	Chief
23		All o
24		

OFFICE SERVICES D

1	GS-13	Chief
40		All o
9		All W
50		

PERSONNEL DIVISIO

1	GS-15	Chief
1	GS-14	Assis
1	GS-14	Head
49		All o
52		

PHOTOGRAPHIC DIVI

1	GS-13	Chief
37		All o
36		All W
74		

PROCUREMENT DIVI

1	GS-15	Chief
1	GS-14	Assis Pr
1	GS-14	Atto
55		All o
26		All W
84		

ERONAUTICS AND SPACE ADMINISTRATION

Proposed personnel staffing chart

F. Y. 1962

LANGLEY RESEARCH CENTER

DIRECTOR

d	Director, Langley Research Center	$ 20,000
d	Senior Staff Associate	18,500
d	Research Assistant for Cooperative Projects	16,000
	Executive Assistant and Budget Officer	15,030
	Management Analyst	15,030
	Technical Assistant to the Associate Director	13,510
	All other GS personnel	20,250
	Total	$118,320

RESEARCH STAFF UNIT

*1	GS-15	Executive Assistant and Budget Officer	
3		All other GS personnel	$35,025
3		Total	$35,025

*Position not included in totals as this is a multiple function position and is included under Office of Director.

RESEARCH REPORTS DIVISION

1	GS-13	Chief of Division	$ 11,939
53		All other GS personnel	327,932
54		Total	$339,870

DIRECTOR

ed	Assistant Director, Langley Research Center	$19,000
ed	Technical Assistant to the Associate Director	17,000
	All other GS personnel	23,350
	Total	$59,350

OFFICE OF CHIEF, TECHNICAL SERVICES

1	Excepted	Chief of Technical Services	$16,000
1	GS-15	Assistant Chief of Technical Services	15,030
1	GS-14	Engineering Planning Officer	13,770
1		All other GS personnel	5,820
1	WB-20	Assistant to Chief of Division	12,314
5		Total	$62,934

OFFICE OF CHIEF, ADMINISTRATIVE SERVICES

1	GS-15	Administrative Management Officer	$14,705
1		All other GS personnel	5,820
2		Total	$20,525

E MECHANICS DIVISION

pted	Chief of Division	$ 16,500
pted	Associate Chief of Division	16,000
pted	Head, Guidance and Control Branch	16,000
pted	Head, Operations Branch	15,500
5	Technical Assistant to Division Chief	15,030
5	Head, Airworthiness Branch	14,380
5	Assistant Head, Airworthiness Branch	14,055
5	Head, Dynamic Stability Branch	15,030
5	Head, Flight Mechanics Branch	15,030
5	Assistant Head, Guidance and Control Branch	14,380
5	Head, Recovery Systems Branch	15,030
5	Head, VTOL Branch	15,030
5	Head, VTOL Section	15,030
5	Head, Pilots Section	15,030
5	Aeronautical Research Engineer and Pilot	15,030
5	Aeronautical Research Engineer	14,705
4	Assistant Head, Flight Mechanics Branch	12,730
4	Head, Reentry Vehicle Dynamics Section	13,510
4	Head, Systems Analysis Section	12,210
4	Head, Control and Simulation Section	12,730
4	Aeronautical Research Engineer and Pilot	25,460
4	Aeronautical Research Engineer	190,170
	All other GS personnel	826,640
	All WB personnel	246,022
	Total	$1,581,232

SAFETY OFFICE

2	All other GS personnel	$15,330

PLANNING OFFICE

1	GS-13	Head, Planning Section	$11,939
10		All other GS personnel	66,656
1		All other WB personnel	9,381
12		Total	$87,965

PATENT COUNSEL

1	GS-13	Patent Advisor (acting head)	$11,939
3		All other GS personnel	19,572
4		Total	$31,511

FISCAL DIVISION

1	GS-14	Chief of Division and Fiscal Officer	$ 12,730
53		All other GS personnel	268,960
54		Total	$281,690

ELECTRICAL DIVISION

1	GS-15	Chief of Division	$ 15,030
1	GS-15	Assistant Chief of Division	14,705
1	GS-15	Head, Electrical Engineering Branch	14,705
1	GS-14	Head, Electrical Distribution Section	13,510
1	GS-14	Head, Electrical Equipment and Control Section	13,510
29		All other GS personnel	242,495
186		All WB personnel	1,096,626
220		Total	$1,410,581

OFFICE SERVICES DIVISION

1	GS-13	Chief of Division	$ 10,895
40		All other GS personnel	190,915
9		All WB personnel	34,632
50		Total	$236,442

T RESEARCH DIVISION

pted	Chief of Division	$ 17,000
pted	Assistant Chief of Division	15,500
pted	Head, Navigation and Communications Branch	15,500
pted	Head, Measurements Research Branch	15,500
5	Head, Data Systems Branch	14,380
5	Head, Ground Facilities Instrumentation Branch	14,380
5	Head, Instruments Standards and Systems Integration Branch	14,380
5	Assistant Head, Navigation and Communications Research Branch	14,380
5	Research Engineer (Aeronautical Instrumentation)	13,730
4	Assistant Head, Data Systems Branch	12,730
4	Head, Read-Out Equipment Development Section	12,730
4	Head, Telemeter Instrumentation Section	12,730
4	Head, Vehicle Instrumentation Section	12,730
4	Head, Instrument Physics Research Section	13,510
4	Head, Telemeter Techniques Research Section	12,990
4	Head, Automatic Control Section	12,730
4	Head, Communications Research Section	12,990
4	Head, Systems Analysis Section	12,730
4	Research Engineer (Aeronautical Instrumentation)	111,970
	All other GS personnel	1,477,180
	All WB personnel	1,152,946
	Total	$2,992,716

ENGINEERING DIVISION

1	GS-15	Chief of Division	$ 15,290
1	GS-15	Associate Chief of Division	15,290
1	GS-15	Assistant Chief of Division	14,705
1	GS-15	Technical Assistant of Division	14,705
1	GS-15	Head, Engineering Projects Analysis Office	14,380
1	GS-15	Head, Research Models and Vehicles Branch	14,705
1	GS-15	Research Equipment Design Engineer	14,055
1	GS-14	Head, Cost Engineering Staff	12,730
1	GS-14	Head, Research Facilities Branch	13,510
1	GS-14	Head, Plant Engineering Section	12,470
1	GS-14	Technical Assistant, Research Models and Vehicles Branch	13,510
1	GS-14	Head, Dynamics Analysis Staff	13,510
1	GS-14	Head, Dynamic Vehicle Section	12,990
1	GS-14	Head, Research Models and Payloads Section	13,510
1	GS-15	Head, Systems Engineering Branch	14,055
1	GS-14	Technical Assistant, Systems Engineering Branch	13,510
1	GS-14	Head, Research Equipment Design	12,210
1	GS-14	Head, Systems Control Section	13,510
3	GS-14	Structural Engineer	36,630
181		All other GS personnel	1,567,075
3		All WB personnel	18,491
205		Total	$1,844,841

PERSONNEL DIVISION

1	GS-15	Chief of Division	$ 14,055
1	GS-14	Assistant Chief of Division	12,730
1	GS-14	Head, Training Section	12,470
49		All other GS personnel	303,320
52		Total	$342,575

PHOTOGRAPHIC DIVISION

1	GS-15	Chief of Division	$ 10,895
37		All other GS personnel	220,920
36		All WB personnel	185,890
74		Total	$417,705

MECHANICAL SERVICE DIVISION

1	GS-15	Chief of Division	$ 14,705
7		All other GS personnel	42,045
1	WB-20	Assistant Chief of Division	12,314
1	WB-20	Head, Structural Fabrications Branch	12,314
1	WB-20	Head, Modelmaking Branch	12,314
814		All other WB personnel	5,372,893
825		Total	$5,466,585

PROCUREMENT DIVISION

1	GS-15	Chief of Division and Procurement Officer	$ 14,705
1	GS-14	Assistant Chief of Division and Assistant Procurement Officer	12,470
1	GS-14	Attorney Advisor	12,470
55		All other GS personnel	326,280
26		All WB personnel	142,293
84		Total	$508,218

PLANT MAINTENANCE DIVISION

7		All GS personnel	$ 40,000
1	WB-18	Chief of Division	10,691
225		All other WB personnel	1,162,673
233		Total	$1,213,364

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PROPOSED PERSONNEL STAFFING CHART
FISCAL YEAR 1962
AMES RESEARCH CENTER

Director's Office

1	Excepted	Director	-$ 20,000
1	Excepted	Associate Director	10,000
1	Excepted	Aeronautical Research Scientist	- 16,000
1	Excepted	Technical Assistant to Director	- 15,500
2	GS-15	Aeronautical Research Engineer	- 30,060
4		All other GS personnel	- 32,000
10			$132,560

Budget Office

1	GS-15	Executive Assistant and Budget Officer	- $14,705
2		All other GS personnel	- 21,055
3			$35,760

Assistant Director

1	Excepted	Assistant Director	- $18,500
1	GS-15	Aeronautical Research Engineer	- 14,380
1		All other GS personnel	- 5,490
3			$38,370

Vehicle-Environment Division

1	Excepted	Chief of Division	-$ 18,000
1	GS-15	Assistant Chief of Division	- 15,030
1	GS-15	Chief, Physics Branch	- 15,030
1	GS-15	Chief, Entry Simulation Branch	- 14,705
1	GS-15	Chief, Structural Dynamics Branch	- 15,030
1	GS-15	Chief, 3.5-foot Hypersonic Wind Tunnel Branch	- 15,030
1	GS-15	Chief, Hypervelocity Ballistics Range Branch	- 15,030
3	GS-15	Aeronautical Research Engineer	- 43,790
16	GS-14	Aeronautical Research Engineer	- 202,900
74		All other GS personnel	- 608,350
42		All other Wage Board personnel	- 284,918
142			$1,247,814

Aero-Thermodynamics Division

1	Excepted	Chief of Division	- $ 18,000
1	Excepted	Assistant Chief of Division	- 16,000
2	Excepted	Aeronautical Research Scientist	- 35,000
1	Excepted	Chief, Supersonic Free-Flight Branch	- 16,000
1	Excepted	Chief, Theoretical Branch	- 16,000
1	Excepted	Chief, Heat Transfer Branch	- 16,000
1	GS-15	Chief, Fluid Mechanics Branch	- 15,030
1	GS-15	Chief, Trisonic Aerodynamics Branch	- 15,030
13	GS-15	Aeronautical Research Engineer	- 187,265
14	GS-14	Aeronautical Research Engineer	- 178,740
129		All other GS personnel	- 1,049,585
44		All other Wage Board personnel	- 296,981
209			$1,859,831

Assistant Director

1	Excepted	Assistant Director	- $18,500
1	GS-15	Aeronautical Research Engineer	- 14,380
1		All other GS personnel	- 5,655
3			$38,535

Full-Scale and Systems Research Division

1	Excepted	Chief of Division	- $ 16,500
1	Excepted	Assistant Chief of Division	- 15,500
1	Excepted	Chief, Flight and Systems Simulation Branch	- 16,000
1	GS-15	Chief, Operations Branch	- 15,030
3	GS-15	Aeronautical Research Engineer and Pilot	- 44,115
1	GS-15	Chief, 40- by 80-foot Wind Tunnel Branch	- 15,030
1	GS-15	Chief, Guidance and Control Branch	- 15,030
1	GS-15	Chief, Analog and Flight Simulator Branch	- 15,030
4	GS-15	Aeronautical Research Engineer	- 57,845
11	GS-14	Aeronautical Research Engineer	- 142,370
1	GS-14	Aeronautical Research Engineer and Pilot	- 12,210
67		All other GS personnel	- 564,310
15		All other Wage Board personnel	- 104,541
108			$1,053,511

Unitary Plan Wind Tunnel Division

1	Excepted	Chief of Division	- $ 16,000
1	GS-15	Assistant Chief of Division	- 15,030
1	GS-15	Chief, 8- by 7-foot Supersonic Wind Tunnel	- 15,030
1	GS-15	Chief, 9- by 7-foot Supersonic Wind Tunnel	- 14,705
1	GS-15	Chief, 11-foot Transonic Wind Tunnel	- 15,030
2	GS-15	Aeronautical Research Engineer	- 29,085
5	GS-14	Aeronautical Research Engineer	- 63,650
1	GS-14	Design and Construction Engineer	- 12,730
64		All other GS personnel	- 521,300
40		All other Wage Board personnel	- 277,468
117			$980,028

Instrumentation Division

1	Excepted	Chief of Division	- $ 16,000
1	Excepted	Assistant Chief of Division	- 15,500
1	GS-15	Chief, Vehicle Instrumentation Research Branch	- 15,030
1	GS-15	Chief, Facilities Instrumentation Research Branch	- 14,705
1	GS-15	Chief, Electronic Machine Computing Branch	- 15,030
1	GS-15	Research Engineer	- 15,030
1	GS-14	Aeronautical Research Engineer	- 12,990
6	GS-14	Research Engineer	- 76,640
1	GS-14	Machine Programming Mathematician	- 12,730
93		All other GS personnel	- 742,065
99		All other Wage Board personnel	- 699,778
206			$1,832,198

Office of Administrative Management Officer

1	GS-15	Administrative Management Officer	- $15,030
1	GS-14	Assistant Administrative Management Officer	- 12,730
1		All other GS personnel	- 5,655
3			$33,415

Security Office

14		All other GS personnel	- $67,305

Personnel Division

1	GS-14	Personnel Officer	- $ 13,250
15		All other GS personnel	- 96,730
16			$109,980

Procurement and Supply Division

1	GS-15	Procurement and Supply Officer	- $ 13,730
31		All other GS personnel	- 193,210
18		All other Wage Board personnel	- 98,821
50			$305,761

Fiscal Division

1	GS-14	Fiscal Officer	- $ 12,470
38		All other GS personnel	- 202,830
39			$215,300

Administrative Services Division

1	GS-11	Chief of Division	- $ 8,600
30		All other GS personnel	- 143,380
6		All other Wage Board personnel	- 28,122
37			$180,102

Technical Services Division

1	GS-15	Chief of Division	- $ 15,030
1	GS-15	Engineering Technician	- 14,380
1	GS-15	Chief Superintendent of Mechanical Shops	- 13,250
1		All other GS personnel	- 4,840
318		All other Wage Board personnel	- 2,165,869
322			$2,213,369

Engineering Services Division

1	Excepted	Chief of Division	- $ 15,500
2	GS-15	Design and Construction Engineer	- 29,735
2	GS-15	Electrical Engineer	- 29,085
1	GS-15	Research Equipment Design Engineer	- 14,705
1	GS-14	Construction Design Engineer	- 13,510
2	GS-14	Electrical Engineer	- 25,460
1	GS-14	Mechanical Equipment Design Engineer	- 12,990
1	GS-14	Design and Construction Engineer	- 12,990
87		All other GS personnel	- 702,960
57		All other Wage Board personnel	- 388,126
155			$1,245,061

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PROPOSED PERSONNEL STAFFING CHART
FISCAL YEAR 1962
LEWIS RESEARCH CENTER

OFFICE OF THE DIRECTOR

1	Excepted	Director	$20,000
1	Excepted	Associate Director	12,000
1	Excepted	Assistant to the Director	16,000
1	GS-15	Assistant to the Director	15,030
4	All other GS Personnel		22,915
8			$92,945

OFFICE OF ASSISTANT DIRECTOR

1	Excepted	Assistant Director	$18,500
1	All other GS Personnel		5,335
2			$23,835

CHEMISTRY AND ENERGY CONVERSION DIVISION

1	Excepted	Chief, Division	$16,000
1	GS-15	Technical Consultant	15,030
1	GS-15	Chief, Physical Chemistry Branch	14,705
1	GS-15	Chief, Rocket Heat Transfer Branch	15,030
1	GS-15	Chief, Direct Energy Conversion Branch	15,030
1	GS-15	Chief, Chemical Rocket Fundamentals Branch	15,030
2	GS-15	Aeronautical Research Scientists	29,410
1	GS-15	Head, Gas Dynamics Section	14,380
1	GS-15	Head, Reaction Kinetics Section	14,380
1	GS-14	Head, Thermodynamics Section	12,730
1	GS-14	Head, Cryogenic Heat Transfer Section	12,730
1	GS-14	Head, Rocket Cooling Section	12,730
1	GS-14	Head, Direct Energy Conversion Section B	12,730
1	GS-14	Head, Propellant Chemistry Section	12,730
1	GS-14	Head, Rocket Combustion Section	12,730
1	GS-14	Head, Analytical Chemistry Section	13,250
1	GS-14	Head, Research Operations Section	12,470
11	GS-14	Aeronautical Research Scientists	146,010
83	All other GS Personnel		769,605
112			$1,188,710

ROCKET AND AERODYNAMICS DIVISION

1	Excepted	Chief, Division	$17,000
1	Excepted	Assistant Chief, Division	15,500
1	Excepted	Chief, Chemical Rocket Performance Branch	15,500
1	GS-15	Chief, Mission Analysis Branch	15,030
1	GS-15	Chief, Chemical Rocket Systems Branch	15,030
1	GS-15	Chief, Propulsion Aerodynamics Branch	14,705
1	GS-15	Chief, Research Installations Branch	14,380
1	GS-15	Head, Flight Mechanics Section	15,030
2	GS-15	Aeronautical Research Scientists	30,060
1	GS-14	Head, Flight Systems Section	13,510
1	GS-14	Head, Propulsion Section	12,990
1	GS-14	Head, Chemical Rocket System Section A	13,510
1	GS-14	Head, Chemical Rocket System Section B	13,510
1	GS-14	Head, Hydrogen-Fluorine Systems Section	12,990
1	GS-14	Head, Hydrogen-Fluorine Thrust Chambers Section	13,510
1	GS-14	Head, Hydrogen-Oxygen Systems Section	13,510
1	GS-14	Head, Propulsion Aerodynamics Section B	13,510
1	GS-14	Head, Wind Tunnels Section	12,990
1	GS-14	Head, Engineering Section	12,990
1	GS-14	Head, Rocket Installations Section	13,510
1	GS-14	Head, Hydrogen-Fluorine Installations Section	12,990
9	GS-14	Aeronautical Research Scientists	111,970
117	All other GS Personnel		1,057,085
148			$1,480,810

NUCLEAR SYSTEMS DIVISION

1	Excepted	Chief, Division	$17,000
1	Excepted	Assistant Chief, Division	16,000
1	Excepted	Technical Consultant	15,500
1	Excepted	Chief, Applications Analysis Branch	15,500
1	GS-15	Assistant Chief, Division	14,705
1	GS-15	Chief, Propellant Systems and Controls Branch	15,030
1	GS-15	Chief, Power Generation Branch	15,030
1	GS-15	Chief, Fluid System Dynamics Branch	15,030
1	GS-15	Chief, Flight Operations Branch	15,030
1	GS-15	Chief, Engine and Shielding Branch	15,030
3	GS-15	Aeronautical Research Scientists	44,360
1	GS-15	Head, Shielding Section	14,705
1	GS-15	Head, Nuclear Engines Section	15,030
1	GS-15	Head, Propulsion Systems Section	14,705
1	GS-15	Head, Space Experiments Section	14,705
1	GS-14	Head, Systems Analysis Section	13,510
1	GS-14	Head, Controls Section	12,210
1	GS-14	Head, Power Systems Section	12,210
1	GS-14	Head, Facilities Section	13,510
1	GS-14	Head, Systems Analysis Section	13,510
1	GS-14	Head, Controls Section	12,730
1	GS-14	Head, Mechanical Problems Section	13,510
1	GS-14	Head, Flight Experiments Section	13,510
12	GS-14	Aeronautical Research Scientists	156,140
62	All other GS Personnel		569,745
99			$1,057,635

FLUID SYSTEM COMPONENTS DIVISION

1	Excepted	Chief, Division	$19,000
2	Excepted	Assistant Chiefs, Division	32,000
1	Excepted	Chief, Turbopump Branch	15,500
1	GS-15	Chief, Flow Physics Branch	14,380
1	GS-15	Chief, Research Installations Branch	15,030
1	GS-15	Chief, Propellant Transfer Processes Branch	15,030
1	GS-15	Head, Lubrication Section	15,030
1	GS-15	Head, Turbodrive Section	14,055
1	GS-15	Head, Pump Section	14,380
2	GS-15	Aeronautical Research Scientists	28,760
1	GS-14	Head, Flow Physics Section A	13,510
1	GS-14	Head, Flow Physics Section B	13,250
1	GS-14	Head, Flow Processes Performance Section	13,250
1	GS-14	Head, Flow Processes Analysis Section	12,730
1	GS-14	Head, Bearings Section	13,510
15	GS-14	Aeronautical Research Scientists	195,110
77	All other GS Personnel		713,365
109			$1,156,890

OFFICE OF ASSISTANT DIRECTOR

1	Excepted	Assistant Director	$18,500
1	All other GS Personnel		5,355
2			$23,855

ELECTROMAGNETIC PROPULSION DIVISION

1	Excepted	Chief, Division	$17,000
1	Excepted	Assistant Chief, Division	16,000
1	GS-15	Chief, Electrostatic Propulsion Branch	14,380
1	GS-15	Chief, Electromagnetics Branch	15,030
1	GS-15	Chief, Plasma Physics Branch	15,030
1	GS-15	Chief, Research Installations Branch	14,380
6	GS-15	Aeronautical Research Scientists	85,630
1	GS-14	Head, Electrostatic Propulsion Systems Section	12,470
1	GS-14	Head, Electrostatic Propulsion Section	12,470
1	GS-14	Head, Electrothermal Section	12,470
1	GS-14	Head, Space Environment Section	12,470
1	GS-14	Head, Magnetics Section	12,730
1	GS-14	Head, High-Temperature Plasma Section	13,510
1	GS-14	Head, Research Facilities Section	12,470
9	GS-14	Aeronautical Research Scientists	118,990
68	All other GS Personnel		595,845
92			$980,675

MATERIALS AND STRUCTURES DIVISION

1	Excepted	Chief, Division	$17,500
1	Excepted	Assistant Chief, Division	16,000
1	GS-15	Chief, Structures Branch	15,030
1	GS-15	Chief, Strength of Materials Branch	15,030
1	GS-15	Chief, Alloys and Composite Materials Branch	14,705
1	GS-15	Chief, Chemical Physics Branch	14,380
1	GS-15	Chief, Refractory Materials Branch	14,380
1	GS-15	Head, Ceramics and Coatings Section	14,055
1	GS-15	Head, Solid State Physics Section	14,055
1	GS-15	Head, Composite Materials Section	14,055
3	GS-15	Aeronautical Research Scientists	42,490
1	GS-14	Head, Power Plant Structures Section	13,510
1	GS-14	Head, Structure Protection Section	13,510
1	GS-14	Head, Alloys Section	13,510
1	GS-14	Head, Chemical and Metallurgical Laboratories Sec.	12,470
1	GS-14	Head, High Temperature Chemistry Section	12,470
1	GS-14	Head, Refractory Metals Section	13,510
1	GS-14	Head, Liquid Metals Section	12,730
13	GS-14	Aeronautical Research Scientists	167,570
95	All other GS Personnel		841,000
128			$1,291,960

INSTRUMENT AND COMPUTING RESEARCH DIVISION

1	Excepted	Chief, Division	$16,500
1	Excepted	Chief, Instrument Research Branch	15,500
1	GS-15	Assistant Chief, Division	15,030
1	GS-15	Chief, Mechanized Computation Analysis Branch	15,030
1	GS-15	Chief, Instrument Systems Research Branch	14,705
1	GS-15	Associate Chief, " " "	14,055
3	GS-15	Aeronautical Research Scientists	41,190
1	GS-14	Chief, Automatic Data Processing Branch	13,510
1	GS-14	Chief, Machine Computing Branch	13,510
1	GS-14	Chief, Data Systems Branch	12,730
1	GS-14	Aeronautical Research Scientist	12,470
1	GS-14	Head, Measurement Systems Components Section	13,510
1	GS-14	Head, Optics Section	12,210
1	GS-14	Head, Measurement Systems Components Section	13,510
1	GS-14	Head, Mechanized Computation and Analysis Section B	13,510
1	GS-14	Head, Instrument Research Section B	13,510
153	All other GS Personnel		1,194,540
73	All other Wage Board Personnel		423,438
246			$1,938,458

NUCLEAR REACTOR DIVISION

1	Excepted	Chief, Division	$17,500
1	GS-15	Chief, Propulsion Concepts Branch	15,030
1	GS-15	Chief, Heat Transfer Branch	15,030
1	GS-15	Chief, Radiation Physics Branch	13,730
1	GS-15	Chief, Reactor Physics Branch	15,030
1	GS-15	Chief, Reactor Experimental Projects Panel	15,030
4	GS-15	Aeronautical Research Scientists	59,245
1	GS-15	Head, Reactor Components Section	14,380
1	GS-14	Head, Concepts Analysis Section	13,250
1	GS-14	Head, Theoretical Physics Section	13,250
1	GS-14	Head, Nuclear Physics Section	12,000
1	GS-14	Head, Reactor Analysis Section	13,250
1	GS-14	Head, Experimental Reactor Physics Section	13,250
10	GS-14	Aeronautical Research Scientists	128,640
62	All other GS Personnel		550,595
88			$907,200

OFFICE OF TECHNICAL SERVICES

1	Excepted	Chief of Technical Services	$16,000
1	Excepted	Associate Chief of Technical Services	15,500
2	GS-14	Engineering Staff Assistants	27,540
10	All other GS Personnel		69,225
7	All other Wage Board Personnel		51,334
21			$179,599

PLANT SERVICES DIVISION

1	GS-14	Chief, Division	$12,470
42	All other GS Personnel		235,765
91	All other Wage Board Personnel		483,039
134			$731,294

TEST INSTALLATIONS DIVISION

1	WB-20	Chief, Division	$12,168
4	All other GS Personnel		20,710
310	All other Wage Board Personnel		2,104,499
315			$2,137,377

FACILITIES OPERATIONS DIVISION

1	GS-15	Chief, Division	$14,705
1	GS-14	Chief, Engineering and Dispatching Branch	12,730
21	All other GS Personnel		181,940
391	All other Wage Board Personnel		2,630,855
414			$2,840,230

FABRICATION DIVISION

1	GS-15	Chief, Division	$14,705
19	All other GS Personnel		148,685
165	All other Wage Board Personnel		1,201,681
185			$1,365,081

ENGINEERING DESIGN DIVISION

1	GS-15	Chief, Division	$15,030
1	GS-15	Assistant Chief, Division	15,030
1	GS-15	Chief, Electrical Engineering Branch	15,030
1	GS-14	Head, Research Electrical Engineering Section	12,730
1	GS-14	Head, Electrical Equipment Engineering Section	13,510
1	GS-14	Head, Equipment Engineering Section A	13,510
1	GS-14	Head, Equipment Engineering Section B	13,510
1	GS-14	Head, Equipment Engineering Section C	12,990
1	GS-14	Head, Machine Design Section A	13,510
1	GS-14	Head, Machine Design Section B	13,510
119	All other GS Personnel		991,625
2	All other Wage Board Personnel		7,946
131			$1,137,931

FACILITIES ENGINEERING DIVISION

1	Excepted	Chief, Division	$15,500
1	GS-15	Assistant Chief, Division	15,030
1	GS-15	Chief, Mechanical Design Branch	14,380
1	GS-14	Administrative Officer	13,250
1	GS-14	Chief, Electrical Design Branch	13,510
1	GS-14	Chief, Architectural-Structural Design Branch	13,510
1	GS-14	Chief, Construction Branch	12,470
1	GS-14	Head, Mechanical Design Section A	12,510
1	GS-14	Head, Mechanical Design Section B	12,990
1	GS-14	Head, Mechanical Design Section C	13,510
1	GS-14	Head, Electrical Design Section A	12,730
1	GS-14	Head, Electrical Design Section B	12,730
1	GS-14	Head, Architectural Design Section	12,510
1	GS-14	Mechanical Equipment Design Engineer	12,730
72	All other GS Personnel		582,700
86			$632,060

PLUM BROOK FACILITIES (SANDUSKY, OHIO)

1	GS-15	Chief, Reactor Facility	$14,705
1	GS-15	Chief, Technical and Administrative Services	15,030
1	GS-15	Chief, Reactor Operations Branch	14,380
1	GS-14	Chief, Construction Engineering	13,510
1	GS-14	Head, Project Engineering Section	12,730
63	All other GS Personnel		454,280
147	All other Wage Board Personnel		943,718
215			$1,468,353

OFFICE OF BUSINESS MANAGER

1	GS-15	Business Manager	$15,030
1	GS-15	Assistant Business Manager	14,705
1	All other GS Personnel		6,345
3			$36,080

STAFF ASSISTANTS

1	GS-14	Assistant Budget Officer	$12,730
13	All other GS Personnel		94,370
14			$107,100

PERSONNEL DIVISION

1	GS-14	Chief, Division	$12,470
34	All other GS Personnel		205,915
35			$218,385

ACCOUNTING AND AUDIT DIVISION

45	All other GS Personnel		$229,695
45			$229,695

ADMINISTRATIVE SERVICES DIVISION

13	All other GS Personnel		$67,150
2	All other Wage Board Personnel		8,632
15			$75,782

PROCUREMENT AND SUPPLY DIVISION

1	GS-14	Chief, Division	$12,470
68	All other GS Personnel		436,895
26	All other Wage Board Personnel		136,094
95			$585,459

TECHNICAL PUBLICATIONS DIVISION

57	All other GS Personnel		$356,570
21	All other Wage Board Personnel		115,086
78			$471,656

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
PROPOSED PERSONNEL STAFFING CHART
FISCAL YEAR 1962
FLIGHT RESEARCH CENTER

OFFICE OF THE DIRECTOR

1	Excepted Director	$13,500
1	Excepted Assistant Director	1[illegible],000
1	GS-15 ARS Adv Veh Proj Mgr	13,730
1	Other GS personnel	5,850
4		$55,080

RESEARCH DIVISION

1	Excepted Chief. Research Div	$ 16,000
1	Excepted Asst Chief. Res Div	15,500
1	Excepted Aero Res Scientist	15,500
[illegible]	GS-15 Supvr Aero Res Engr	[illegible]9,410
[illegible]	GS-15 Aero Res Engr	[illegible]3,760
[illegible]	GS-14 Supvr Aero Res Engr	[illegible]
5	GS-14 Aero Res Engr	[illegible]3,300
1	GS-14 Aero Engr	1[illegible],760
[illegible]	Other GS personnel	[illegible]
[illegible]		$217,14[illegible]

FLIGHT OPERATIONS DIVISION

2	Excepted Aero Res Pilots	$ 32,500
1	GS-15 Sup Aero Res Engr and Pilot	15,030
[illegible]	GS-15 Aero Res Engr and Pilot	28,760
1	GS-14 Aero Res Engr and Pilot	12,4[illegible]
[illegible]	GS-14 Supvr Flight Opns Engr	24,940
21	Other GS personnel	153,355
12[illegible]	Wage Board personnel	34[illegible],13[illegible]
1[illegible]1		$1,107,735

DATA SYSTEMS DIVISION

2	GS-15 Supvr Research Engr	$ 27,460
1	GS-14 Research Engr	12,210
70	Other GS personnel	474,641
98	Wage Board personnel	631,118
1[illegible]1		$1,145,429

ADMINISTRATIVE DIVISION

1	GS-14 Admistrative Mgt Officer	$ 12,210
45	Other GS personnel	26[illegible],39[illegible]
27	Wage Board personnel	162,13[illegible]
73		$441,[illegible]

NATIONAL AERONAUTICS AND SPACE ADMINIS

PROPOSED PERSONNEL STAFFING CHART
Fiscal Year 1962

GODDARD SPACE FLIGHT CENTER

OFFICE OF THE DIRECTOR

1	Director	20,000
1	Associate Director	19,000
1	GS-15—Assistant to the Director	14,380
13	Other GS Personnel	94,250
16		147,630

OFFICE OF THE ASSISTANT DIRECTOR FOR BUSINESS ADMINISTRATION

1	Assistant Director	15,750
1	GS-14 Management Analyst	12,470
1	GS-14 Patent Counsel	12,470
1	GS-14 Attorney-Advisor (General)	12,730
21	Other GS Personnel	152,250
25		205,670

BUDGET AND FINANCE DIVISION

1	GS-15 Financial Management Officer	14,055
1	GS-14 Assistant Financial Management Officer	12,470
1	GS-14 Budget Officer	12,210
60	Other GS Personnel	502,245
63		540,980

ORGANIZATION AND PERSONNEL DIVISION

1	GS-15 Personnel Officer	13,730
42	Other GS Personnel	304,500
43		318,230

PROCUREMENT AND SUPPLY DIVISION

1	GS-15 Procurement and Supply Officer	14,055
1	GS-14 Asst. Procurement and Supply Officer	12,730
148	Other GS Personnel	1,261,700
25	Wage Board Personnel	159,875
175		1,448,360

TECHNICAL INFORMATION DIVISION

34	Other GS Personnel	270,300
8	Wage Board Personnel	51,160
42		321,460

MANAGEMENT SERVICES DIVISION

1	GS-14 Security Officer	12,470
29	Other GS Personnel	210,250
12	Wage Board Personnel	76,740
42		299,460

OFFICE OF TECHNICAL SERVICES

1	Chief of Technical Services	16,000
3	Other GS Personnel	21,755
4		37,755

FACILITIES ENGINEERING DIVISION

1	Chief Facilities Engineering Division	15,500
1	GS-14 Construction Engineer	12,990
2	GS-14 Engineers	25,720
46	Other GS Personnel	365,700
52	Wage Board Personnel	332,540
102		752,450

TEST AND EVALUATION DIVISION

2	GS-15 Aero Research Engineers	28,435
2	GS-14 Mechanical Engineers	25,460
1	GS-14 Research Engineer	12,470
2	GS-14 Space and Aero Scientist	24,940
73	Other GS Personnel	580,350
20	Wage Board Personnel	127,900
100		799,555

FABRICATION DIVISION

1	GS-14 Research Engineer	12,990
21	Other GS Personnel	152,250
132	Wage Board Personnel	844,140
154		1,009,380

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

1	Assistant Director—Space Science Satellites	18,500
1	Space & Aero Scientist—Physics of Atmos.	15,000
3	Other GS Personnel	19,995
5		53,495

SPACE SCIENCES DIVISION

1	Chief, Space Sciences Division	16,500
1	Assistant Chief, Space Sciences Division	16,000
4	Space and Aero Scientist	60,500
8	GS-15 Space and Aero Scientist	110,140
2	GS-15 Instr. Research Engineer	29,410
5	GS-15 Aero Research Engineer	69,625
2	GS-15 Physicists	28,360
6	GS-14 Physicists	76,380
10	GS-14 Aero Research Engineer	128,070
12	GS-14 Space and Aero Scientist	146,780
6	GS-14 Instr. Research Engineer	78,720
149	Other GS Personnel	1,202,180
10	Wage Board Personnel	64,018
216		2,026,683

THEORETICAL DIVISION

1	Chief, Theoretical Division	17,000
1	Assistant Chief, Theoretical Division	15,000
1	Staff Scientist (Planetary)	16,000
2	GS-15 Physicist	27,785
2	GS-14 Space and Aero. Scientist	24,680
5	GS-14 Mathematicians	62,990
10	GS-14 Physicist	124,860
43	Other GS Personnel	341,850
65		630,165

SATELLITE APPLICATIONS

1	Chief, Satellite Applications
1	Asst. Chief, Sat. Appl. Syste
3	Space and Aeronautical Scie
12	GS-15 Aeronautical Research
10	GS-15 Space and Aeronautic
2	GS-15 Electronic Scientist
10	GS-14 Aeronautical Research
4	GS-14 Electronic Scientist
8	GS-14 Space and Aeronauti
5	GS-14 Instrumentation Resea
8	GS-14 Research Engineer
157	Other GS Personnel
221	

PAYLOAD SYST

1	Chief, Payload Systems Div
10	GS-15 Aeronautical Researc
5	GS-14 Aeronautical Researc
5	GS-14 Instrumentation Rese
1	GS-14 Physicist
2	GS-14 Engineer
118	Other GS Personnel
10	Wage Board Personnel
152	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED PERSONNEL STAFFING CHART
Fiscal Year 1962

GODDARD SPACE FLIGHT CENTER

OFFICE OF THE DIRECTOR

1	Director	20,000
1	Associate Director	19,000
1	GS-15 Assistant to the Director	14,380
13	Other GS Personnel	94,250
16		147,630

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

1	Assistant Director—Space Science Satellites	18,500
1	Space & Aero Scientist—Physics of Atmos.	15,000
3	Other GS Personnel	19,995
5		53,495

SPACE SCIENCES DIVISION

	ce Sciences Division	16,500
	Chief, Space Sciences Division	16,000
	Aero Scientist	60,500
	ce and Aero Scientist	110,140
	r. Research Engineer	29,410
	o Research Engineer	69,625
	sicists	28,360
	sicists	76,380
	o Research Engineer	128,070
	ce and Aero Scientist	146,780
	r. Research Engineer	78,720
	Personnel	1,202,180
	rd Personnel	64,018
		2,026,683

THEORETICAL DIVISION

	oretical Division	17,000
	Chief, Theoretical Division	15,000
	tist (Planetary)	16,000
	sicist	27,785
	ce and Aero. Scientist	24,680
	thematicians	62,990
	sicist	124,860
	Personnel	341,850
		630,165

SATELLITE APPLICATIONS SYSTEMS DIVISION

1	Chief, Satellite Applications Syst. Division	17,000
1	Asst. Chief, Sat. Appl. Systems Division	16,000
3	Space and Aeronautical Scientist	45,250
12	GS-15 Aeronautical Research Engineer	175,810
10	GS-15 Space and Aeronautical Scientist	138,925
2	GS-15 Electronic Scientist	28,110
10	GS-14 Aeronautical Research Engineers	126,000
4	GS-14 Electronic Scientist	51,180
8	GS-14 Space and Aeronautical Scientist	100,800
5	GS-14 Instrumentation Research Engineer	62,090
8	GS-14 Research Engineer	106,000
157	Other GS Personnel	1,271,725
221		2,138,890

PAYLOAD SYSTEMS DIVISION

1	Chief, Payload Systems Division	16,000
10	GS-15 Aeronautical Research Engineer	140,425
5	GS-14 Aeronautical Research Engineer	65,730
5	GS-14 Instrumentation Research Engineer	61,050
1	GS-14 Physicist	12,730
2	GS-14 Engineer	26,500
118	Other GS Personnel	920,075
10	Wage Board Personnel	63,957
152		1,306,467

OFFICE OF THE ASSISTANT DIRECTOR (TRACKING AND DATA SYSTEMS)

1	Assistant Director, Tracking & Data Systems	18,500
1	Staff Scientist, Data Systems Planning	15,000
1	GS-14 Mathematician VII	13,510
1	GS-14 Physicist	12,730
16	Other GS Personnel	116,025
20		175,765

TRACKING SYSTEMS DIVISION

1	Chief, Tracking Systems Division	15,750
1	Assistant Chief, Tracking Systems Division	15,250
1	GS-15 Space & Aeronautical Scientist	13,730
4	GS-15 Electronic Scientist	54,270
10	GS-14 Research Engineers	127,560
2	GS-14 Aeronautical Research Engineer	24,940
104	Other GS Personnel	826,800
123		1,078,300

DATA SYSTEMS DIVISION

1	Chief, Data Systems Division	16,500
1	Assistant Chief	15,000
1	Machine Programming Mathematician	15,000
3	GS-15 Space and Aero Scientist	41,515
2	GS-15 Engineers	28,110
2	GS-14 Mathematicians	24,680
5	GS-14 Engineers	62,090
145	Other GS Personnel	1,176,625
160		1,379,520

OPERATIONS DIVISION

2	GS-15 Engineers	28,110
4	GS-15 & Space & Aeronautical Scientist	56,220
2	GS-15 Electronic Scientist	28,110
4	GS-14 Research Engineer	51,700
8	GS-14 Electronic Scientist	101,840
4	GS-14 Space & Aeronautical Scientist	50,400
76	Other GS Personnel	604,200
100		920,580

OFFICE OF ASSISTANT DIRECTOR MANNED SATELLITES

1	Assistant Director, Manned Satellites	19,000
1	Associate Director (Research & Development)	18,500
1	Associate Director (Operation)	18,500
1	Special Assistant to the Director	16,500
1	Staff Scientist	15,500
1	GS-14 Aeronautical Research Engineer	12,730
1	GS-14 Space and Aeronautical Scientist	12,990
63	Other GS Personnel	500,700
70		614,420

BUSINESS MANAGEMENT AND TECHNICAL SERVICES

1	GS-15 Technical Assistant	13,730
1	GS-14 Budget Officer	12,730
1	GS-14 Contract Officer	12,990
1	GS-14 Personnel Officer	12,730
210	Other GS Personnel	1,654,565
214		1,706,745

LIFE SCIENCES DIVISION

1	GS-15 Chief, Aerospace Medicine	14,380
1	GS-15 Astronaut Training Officer	14,380
1	GS-14 Assistant Chief	12,730
1	GS-14 Astronaut Training Officer	12,730
29	Other GS Personnel	240,550
33		294,770

ENGINEERING DIVISION

1	Chief, Engineering Division	16,500
1	GS-15 Space and Aeronautical Scientist	14,055
1	GS-15 Space and Aeronautical Facility Engineer	14,380
1	GS-15 Aeronautical Research Engineer	14,055
4	GS-14 Instrumentation Research Engineer	51,700
48	Other GS Personnel	391,600
32	Wage Board Personnel	204,640
88		706,930

FLIGHT SYSTEMS DIVISION

1	Chief, Flight Systems Division	16,750
1	Assistant Chief	15,500
2	GS-15 Aeronautical Research Engineer	28,110
1	GS-14 Flight Systems Scientist	12,730
2	GS-14 Engineer	25,460
5	GS-14 Aeronautical Research Engineer	63,650
156	Other GS Personnel	1,251,355
168		1,413,555

PRE-FLIGHT OPERATION DIVISION

1	GS-15 Chief, Pre-Flight Operation	14,055
1	GS-15 Aeronautical Research Engineer	14,055
2	GS-14 Instrumentation Research Engineer	25,720
2	GS-14 Space and Aeronautical Scientist	25,720
4	GS-14 Research Engineer	50,400
36	Wage Board Personnel	229,241
90	Other GS Personnel	725,500
136		1,084,691

FLIGHT OPERATION DIVISION

1	Chief, Flight Operation Division	16,500
1	GS-15 Instrumentation Research Engineer	14,055
1	GS-14 Space and Aeronautical Scientist	12,730
2	GS-14 Research Engineer	28,320
12	Wage Board Personnel	77,784
114	Other GS Personnel	916,300
131		1,065,689

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Proposed personnel staffing chart
F. Y. 1962
WALLOPS STATION

OFFICE OF DIRECTOR

1	Excepted Director, Wallops Station	$16,500
3	All other GS personnel	27,715
4	TOTAL	$44,215

OFFICE OF RESIDENT CONSTRUCTION ENGINEER

1	GS-14 Supervisory Design & Construction Engineer	$12,730
7	All other GS personnel	72,925
8	TOTAL	$85,655

FLIGHT TEST DIVISION

1	GS-15 Chief of Division	$ 14,055
1	GS-14 Head, Range Engineering Branch	12,210
1	GS-14 Head, Vehicle Preparation & Launching Branch	12,210
1	GS-14 Head, Range Instrumentation Branch	12,210
1	GS-14 Aeronautical Instrumentation Engineer	12,210
1	GS-14 Range Safety Engineer	12,210
56	All other GS personnel	424,230
83	All other Wage Board personnel	541,539
145	TOTAL	$1,040,874

ADMINISTRATIVE SERVICES DIVISION

50	All other GS personnel	$280,625
3	All other Wage Board personnel	13,124
53	TOTAL	$293,749

TECHNICAL SERVICES DIVISION

7	All other GS personnel	$ 46,320
83	All other Wage Board personnel	502,999
90	TOTAL	$549,319

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED PERSONNEL STAFFING CHART

FISCAL YEAR 1962

GEORGE C. MARSHALL SPACE FLIGHT CENTER

P. I. O.

1	GS-14	C/Public Information Office	$ 12,210
14		Other GS Personnel	101,105
15			$113,315

RELIABILITY OFFICE

2	GS-15	Supervisory General Engineer	$ 29,410
1	GS-15	Supervisory Aero Research Engineer	14,380
1	GS-15	Physicist	13,510
3	GS-14	Supervisory Aero Research Engineer	18,190
1	GS-14	General Engineer	12,210
12		Other GS Personnel	[illegible]
20			$194,365

OFFICE OF THE DIRECTOR

1	Excep.	Director, Space Flight Center	$ 21,000
1	Excep.	Deputy Director for Research and Development	19,000
1	Excep.	Deputy Director for Business Administration	18,000
1	Excep.	Assoc. Deputy/Director for R&D	18,000
1	Excep.	Assoc. Deputy/Director for Administration	16,000
1	GS-15	Aero. Research Administrator	15,030
1	GS-15	Physical Science Administrator	13,730
13		Other GS Personnel	94,225
20			$214,985

CHIEF COUNSEL

1	GS-15	Attorney	$13,730
1	GS-14	Attorney - Adviser	12,470
6		Other GS Personnel	44,010
8			$70,210

PATENT COUNSEL

1	GS-14	Patent Attorney	$12,210
4		Other GS Personnel	28,890
5			$41,100

FINANCIAL MANAGEMENT

1	GS-15	Financial Management Officer	$ 14,380
1	GS-15	Deputy Financial Management Officer	14,055
1	GS-15	Budget Officer	13,730
1	GS-14	Supervisory Accountant	[illegible]
1	GS-14	Deputy Supervisory Accountant	12,470
1	GS-14	Deputy Budget Officer	12,470
1	GS-14	Supervisory Auditor	12,210
1	GS-14	Systems Accountant	12,210
111		Other GS Personnel	806,710
119			$911,965

MANAGEMENT SERVICES

1	GS-15	C/Management Services	$ 14,055
1	GS-15	Personnel Officer	14,055
2	GS-14	Phys. Science Admin.	24,680
[illegible]	[illegible]	Publication Officer	24,420
1	GS-14	Security Officer	12,470
220		Other GS Personnel	1,596,615
39		Wage Board Personnel	275,223
266			$1,961,518

PROCUREMENT AND CONTRACTS

1	Excep.	C/Procurement and Contracts	$ 15,000
4	GS-14	Supv. Procurement Analysts	49,360
146		Other GS Personnel	[illegible]
151			$1,148,235

TECHNICAL SERVICES

1	Excep.	C/Technical Services	$ 15,500
1	GS-15	D/Ch. Technical Services	13,730
[illegible]	[illegible]	Supervisory General Engineer	14,055
1	GS-14	Architect	12,470
1	GS-14	C/Plant Maintenance	12,730
1	GS-14	Supervisory Supply Officer	12,990
1	GS-14	Tech. Services Opns. Officer	12,470
1	GS-14	Industrial Engineer	12,730
1	GS-14	Program Management Asst.	12,470
292		Other GS Personnel	2,112,880
395		Wage Board Personnel	2,787,515
696			$5,019,540

OPERATIONS ANALYSIS

1	GS-15	Management Analyst	$ 14,380
1	GS-14	Management Analyst	12,730
1	GS-14	Digital Computer Systems Admin.	12,730
14		Other GS Personnel	101,785
17			$141,625

SATURN SYSTEMS OFFICE

1	Excep.	Director, Systems and Proj. R. Office	$ 17,500
1	GS-16	C/R&D Branch	15,515
1	GS-15	Supervisory General Engineer	14,380
1	GS-15	Supervisory Aero Engineer	15,030
5	GS-15	Aero Res. Engineer	69,950
1	GS-15	Aero Research Admin.	13,730
1	GS-15	Mechanical Engineer	13,730
7	GS-14	General Engineer	86,510
1	GS-14	Phys. Science Admin.	12,470
2	GS-14	Elect. Engineer	24,420
2	GS-14	Mechanical Engineer	24,420
52		Other GS Personnel	383,995
75			$691,650

AGENA, GENTAUR, AND SCOUT OFFICE

1	GS-18	Director, Systems Office	$ 18,500
1	GS-15	General Engineer	15,030
2	GS-15	Supervisory Research Engineer	28,760
3	GS-15	Aero Res. Admin.	41,190
2	GS-14	General Engineer	24,680
4	GS-14	Supv. Res. Engineer	49,880
1	GS-14	Supv. Aero Power Plant Res. Engineer	12,470
3	GS-14	Aero Research Engineer	36,630
2	GS-14	Supv. Aero Res. Engineer	25,460
1	GS-14	Equipment Specialist	12,730
3	GS-14	Aero Power Plant Engineer	36,630
94		Other GS Personnel	699,120
117			$1,001,080

WEAPONS SYSTEMS OFFICE

1	GS-15	Supervisory Aero Research Engineer	$15,030
2	GS-14	General Engineer (M)	25,460
1		Other GS Personnel	4,675
4			$45,165

FUTURE PROJECTS OFFICE

1	Excep	D/Project Res. Office	$ 16,250
1	GS-15	Supv. Aero Research Engineer	13,730
1	GS-15	Physicist	13,730
2	GS-14	Aero Research Engineer	24,940
15		Other GS Personnel	109,680
20			$178,330

TECHNICAL PROGRAM COORDINATION OFFICE

1	Excep.	C/Technical Program Coordination Office	$ 16,000
1	GS-15	Program Management Asst.	14,705
1	GS-15	General Engineer	14,380
1	GS-15	Supervisory Res. Engineer	14,055
2	GS-14	Program Management Asst.	24,940
1	GS-14	Industrial Eng.	12,210
1	GS-14	Mechanical Eng.	12,210
1	GS-14	Aero Res. Admin.	12,210
41		Other GS Personnel	300,495
50			$421,205

RESEARCH PROJECTS

1	Excep.	Director, R&D Division	$ 18,250
1	Excep.	D/Director, R&D Division	16,000
1	GS-16	C/R&D Branch	15,515
2	GS-15	Supervisory Aero Mat'l. Res. Engineer	29,735
3	GS-15	Phys. Science Admin.	42,615
1	GS-15	Supervisory Physicist	15,030
3	GS-15	Physicist	42,490
1	GS-15	Mathematician	13,730
2	GS-14	Aero Mat'ls. Res. Engineer	25,460
2	GS-14	Electronic Engineer	24,940
1	GS-14	Aero Res. Engineer	12,730
1	GS-14	Phys. Science Admin.	12,470
5	GS-14	Physicists	62,610
1	GS-14	Aero Res. Admin.	12,210
1	GS-14	Mathematician	12,210
44		Other GS Personnel	320,810
70			$676,805

COMPUTATION DIVISION

1	Excep.	Director, R&D Division	$ 18,000
1	Excep.	D/Director, R&D Division	15,500
1	Excep.	C/R&D Branch	15,500
1	GS-15	Supervisory Aero Research Engineer	14,705
1	GS-15	Phys. Science Admin.	14,055
3	GS-15	Mathematician	43,140
1	GS-15	Digital Computer Systems Admin.	14,380
1	GS-14	Program Management Asst.	12,730
1	GS-14	Digital Computer Systems Admin.	12,730
1	GS-14	Supervisory Electronic Eng.	12,990
2	GS-14	Supervisory Aero Res. Engineer	24,940
4	GS-14	Supervisory Prod. Specialist	50,400
1	GS-14	Phys. Science Admin.	12,730
4	GS-14	Mathematicians	63,150
1	GS-14	Shop Superintendent	12,730
103		Other GS Personnel	745,556
2		Wage Board Personnel	14,115
130			$1,097,331

GUIDANCE AND CONTROL DIVISION

1	Excep.	Director, R&D Division	$ 18,500
1	Excep.	D/Director, R&D Division	16,000
1	Excep.	Staff Scientist	15,500
3	Excep.	C/R&D Branch	48,000
1	GS-16	C/R&D Branch	15,255
12	GS-15	Supervisory Research Eng.	170,285
1	GS-15	Research Engineer	14,380
16	GS-15	Supv. Aero Res. Eng.	232,030
4	GS-15	Aero Res. Eng.	56,545
3	GS-15	Physical Science Admin.	41,840
1	GS-15	Physicist	13,730
3	GS-14	General Engineer	38,450
17	GS-14	Supv. Res. Engineer	213,550
3	GS-14	Research Engineers	37,670
1	GS-14	Supv. Electronic Engineer	12,730
14	GS-14	Supv. Aero Res. Eng.	183,940
6	GS-14	Aero Res. Eng.	75,080
2	GS-14	Physicists	24,680
1	GS-14	Chemical Engineer	12,210
481		Other GS Personnel	3,479,190
267		Wage Board Personnel	1,884,219
839			$6,603,784

TEST DIVISION

1	Excep.	Director, R&D Division	$ 18,000
1	Excep.	D/Director, R&D Division	16,000
1	Excep.	Staff Scientist	15,500
4	GS-15	Supervisory Res. Engineer	57,520
1	GS-15	Supervisory Aero Mat'l. Res. Engineer	14,705
1	GS-15	Supervisory Mech. Engineer	14,380
4	GS-15	Supervisory Aero Power Plant Res. Engineer	56,220
4	GS-15	Aero Power Plant Res. Engineer	57,845
5	GS-14	General Engineer	62,610
5	GS-14	Supervisory Research Engineers	62,350
1	GS-14	Research Engineer	12,730
6	GS-14	Supervisory Aero Power Plant Res. Eng.	75,600
1	GS-14	Industrial Engineer	12,990
1	GS-14	Aero Research Admin.	12,210
166		Other GS Personnel	1,203,585
440		Wage Board Personnel	3,105,080
642			$4,797,325

AEROBALLISTICS DIVISION

1	Excep.	Director, R&D Division	$ 18,500
1	Excep.	D/Director, R&D Division	16,000
2	Excep.	C/R&D Branch	31,000
1	GS-16	C/R&D Branch	15,515
1	GS-15	Supervisory Research Engineer	14,380
7	GS-15	Supervisory Mech. Engineer	101,960
1	GS-15	Aero Research Engineer	14,055
2	GS-15	Phys. Science Admin.	28,110
3	GS-15	Physicists	43,360
1	GS-15	Aero Res. Admin.	13,730
1	GS-15	Electronics Engineer	13,730
4	GS-14	Supv. Aero Res. Engineer	49,880
3	GS-14	Aero Res. Engineer	37,150
1	GS-14	Supv. Indust. Engineer	12,730
3	GS-14	Supv. Physicists	38,970
2	GS-14	Mathematician	24,940
1	GS-14	Electronic Engineer	12,210
1	GS-14	Chemical Engineer	12,210
1	GS-14	Mechanical Engineer	12,210
192		Other GS Personnel	1,395,750
25		Wage Board	176,425
255			$2,097,195

QUALITY DIVISION

1	Excep.	Director, R&D Division	$ 18,000
1	Excep.	C/R&D Branch	15,500
2	GS-15	General Engineer	29,085
1	GS-15	Supervisory Res. Engineer	14,380
2	GS-15	Research Engineer	29,085
1	GS-15	Supervisory Aero Mat'ls Engineer	15,030
1	GS-15	Supervisory Mech. Eng.	15,030
1	GS-15	Phys. Science Admin.	14,055
1	GS-15	Electrical Engineer	13,730
1	GS-15	Aero Research Admin.	13,730
1	GS-14	Supervisory General Engineer	37,670
1	GS-14	General Engineer	12,470
3	GS-14	Supervisory Research Engineer	37,930
1	GS-14	Research Engineer	12,730
3	GS-14	Supervisory Mech. Engineer	38,320
2	GS-14	Supervisory Electronic Engineer	24,940
1	GS-14	Supervisory Aero Res. Engineer	12,730
1	GS-14	Phys. Science Admin.	12,730
1	GS-14	Inspection Spec.	12,730
2	GS-14	Aero Material Research Engineer	24,420
1	GS-14	Electrical Engineer	12,210
272		Other GS Personnel	1,976,200
84		Wage Board Personnel	592,788
387			$2,982,843

FABRICATION AND ASSEMBLY ENGINEERING DIVISION

1	Excep.	Director, R&D Division	$ 18,000
1	Excep.	D/Director R&D Division	16,000
2	Excep.	C/R&D Branch	31,000
1	GS-15	Supv. General Engineer	15,030
2	GS-15	General Engineers	29,085
1	GS-15	Supv. Res. Engineer	14,380
1	GS-15	Supv. Mech. Engineer	14,380
2	GS-15	Supv. Production Specialists	28,760
1	GS-15	Physicist	13,730
1	GS-14	Supv. General Engineer	12,730
1	GS-14	General Engineer	12,990
3	GS-14	Supv. Research Engineer	38,210
2	GS-14	Research Engineer	24,940
3	GS-14	Supv. Aero Mat'l. Res. Engineer	37,670
1	GS-14	Aero Mat'l. Res. Engineer	12,730
3	GS-14	Supv. Mechanical Engineer	38,320
2	GS-14	Supv. Electronic Engineer	24,940
2	GS-14	Electronic Engineer	24,420
3	GS-14	Aero Res. Engineers	37,670
1	GS-14	Supv. Industrial Engineer	12,730
282		Other GS Personnel	2,038,970
531		Wage Board Personnel	3,751,515
847			$6,248,700

STRUCTURES AND MECHANICS DIVISION

1	Excep.	Director, R&D Division	$ 18,500
2	Excep.	D/Director, R&D Division	32,500
2	Excep.	C/R&D Branch	31,000
1	GS-16	C/R&D Branch	15,255
1	GS-15	Program Management Asst.	14,380
2	GS-15	Supv. Aero Mat'l Res. Engineer	29,735
2	GS-15	Supv. Mech. Engineer	29,410
2	GS-15	Mech. Engineer	28,110
7	GS-15	Supv. Aero Power Plant Res. Engineer	100,660
3	GS-15	Aero Power Plant Res. Engineer	42,490
12	GS-15	Supv. Aero Res. Engineer	174,510
2	GS-15	Aero Res. Engineer	28,760
1	GS-15	Phys. Science Admin.	14,055
1	GS-14	Program Management Asst.	12,470
1	GS-14	Supv. General Engineer	12,730
4	GS-14	General Engineer	49,880
6	GS-14	Supv. Research Engineer	74,820
4	GS-14	Supv. Aero Mat'l Res. Engineer	50,140
2	GS-14	Aero Mat'l Res. Engineer	24,940
9	GS-14	Supv. Aero Power Plant Res. Engineer	113,270
5	GS-14	Aero Power Plant Res. Engineer	63,150
27	GS-14	Supv. Aero Res. Engineer	329,410
6	GS-14	Aero Res. Engineer	75,080
1	GS-14	Industrial Engineer	12,990
1	GS-14	Metallurgist	12,210
1	GS-14	Mechanical Engineer	12,210
2	GS-14	Supv. Chemists	25,460
2	GS-14	Aero Res. Admin.	24,420
1	GS-14	Shop Superintendent	12,730
490		Other GS Personnel	3,271,309
160		Wage Board Personnel	1,126,332
721			$5,862,901

LAUNCH OPERATIONS DIRECTORATE

1	Excep.	Director, R&D Division	$ 16,500
1	Excep.	D/Director, R&D Division	17,000
3	Excep.	C/R&D Division	46,500
2	GS-15	General Engineer	29,085
11	GS-15	Supervisory Research Engineers	155,905
2	GS-15	Research Engineers	29,085
1	GS-15	Supervisory Aero Mat'l. Eng.	14,705
2	GS-15	Supervisory Aero Power Plant Res. Eng.	28,435
2	GS-15	Electronic Engineer	28,760
1	GS-15	Supervisory Aero Res. Engineer	14,705
3	GS-15	Aero Res. Engineer	42,490
2	GS-15	Supervisory Industrial Engineer	29,410
3	GS-15	Phys. Science Admin.	42,365
1	GS-15	Aero Power Plant Res. Engineer	13,730
1	GS-15	Aero Research Administrator	13,730
2	GS-14	Supervisory General Engineer	24,940
1	GS-14	General Engineer	12,730
8	GS-14	Supervisory Res. Engineer	100,540
3	GS-14	Research Engineer	37,670
1	GS-14	Supervisory Aero Mat'l. Res. Eng.	12,730
1	GS-14	Structural Engineer	12,730
4	GS-14	Aero Power Plant Res. Engineer	49,360
3	GS-14	Electronic Engineer	37,150
3	GS-14	Supervisory Aero Res. Engineer	38,190
11	GS-14	Aero Res. Engineer	138,730
1	GS-14	Supervisory Indust. Engineer	12,730
1	GS-14	Indust. Engineer	12,990
330		Other GS Personnel	2,253,200
101		Wage Board Personnel	712,757
486			$3,980,852

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED PERSONNEL STAFFING CHART
FISCAL YEAR 1962

WESTERN OPERATIONS OFFICE

OFFICE OF THE DIRECTOR

1	Excepted Director	$19,000
1	Excepted Deputy Director	15,500
2	Other GS Personnel	10,360
4		$44,860

CONTRACT MANAGEMENT DIVISION

1	GS-15 Procurement Officer	$13,730
1	GS-14 Contract Specialist	12,210
28	Other GS Personnel	227,555
30		$253,495

PUBLIC INFORMATION DIVISION

1	GS-15 Information Specialist	$13,730
1	GS-14 Educational Specialist	12,730
3	Other GS Personnel	18,670
5		$45,130

SECURITY DIVISION

3	Other GS Personnel	$20,470

TECHNICAL DIVISION

4	GS-15 Space and Aeronautical Scientist	$56,220
9	GS-14 Space and Aeronautical Scientist	113,235
1	GS-14 Aero Research Engineer	13,510
1	GS-14 Reliability Engineer	12,210
6	Other GS Personnel	40,270
21		$235,445

LEGAL DIVISION

1	GS-15 Chief Counsel	$14,055
1	GS-15 Patent Attorney	14,055
2	GS-14 Patent Attorney	24,680
2	Other GS Personnel	10,330
6		$63,120

FINANCIAL MANAGEMENT DIVISION

7	Other GS Personnel	$43,510

ADMINISTRATIVE SERVICES DIVISION

9	Other GS Personnel	$42,760

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED PERSONNEL STAFFING CHART
FISCAL YEAR 1962

AEC-NASA NUCLEAR OFFICE

1	GS-15	Administrative officer	$13,730
1	GS-15	Chief, space nuclear propulsion	13,730
1	GS-15	Deputy chief, space nuclear propulsion	13,730
1	GS-15	Turbo-pump specialist	13,730
1	GS-15	Rocket flow-system controls scientist	13,730
1	GS-15	Cryogenic flow-systems specialist	13,730
1	GS-15	Nozzle and heat transfer specialist	13,730
1	GS-15	Reliability analyst	13,730
1	GS-15	Test facilities engineer	13,730
1	GS-15	Contract and budget administrator	13,730
2	GS-14	Technical assistant	24,420
1	GS-14	Rocket systems engineer	12,210
1	GS-14	Facility engineer	12,210
1	GS-14	Administrative assistant	12,210
8	Other GS personnel		55,775
23			$254,125

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED PERSONNEL STAFFING CHART
FISCAL YEAR 1962

LIFE SCIENCE FACILITY

1	GS-15	Director, life science facility	$13,730
1	GS-15	Assistant director, flight medicine and biology	13,730
1	GS-15	Assistant director, space medicine and behavior sciences	13,730
1	GS-15	Assistant director, space biology	13,730
1	GS-15	Biologist	13,730
1	GS-15	Radiologist	13,730
3	GS-15	Scientist, flight medicine and biology	41,190
1	GS-15	Physiologist	13,730
1	GS-15	Chief, human factors division	13,730
1	GS-14	Microbiologist	12,210
1	GS-14	Biochemist	12,210
1	GS-14	Physiologist	12,210
2	GS-14	Radiologist	24,420
4	GS-14	Medical doctor	48,840
31	Other GS personnel		198,365
51			$459,285

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

21 TRAVEL AND TRANSPORTATION OF PERSONS

	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
NASA Headquarters	$597,066	$1,294,000	$1,368,000
Langley Center	415,318	555,000	643,000
Ames Center	130,487	144,000	160,000
Lewis Center	179,149	273,000	312,000
Flight Center	100,774	122,000	165,000
Goddard Center	1,221,494	1,902,500	2,960,000
Wallops Station	19,276	52,000	90,000
Marshall Center	36,813	1,663,500	2,550,000
Western Office	41,047	68,000	117,000
AEC-NASA Nuclear Office	---	---	5,000
Life Science Facility	---	---	25,000
Total	$2,741,424	$6,074,000	$8,395,000

Analysis by Types of Services

Direction and coordination of program activities at NASA installations	$435,140	$679,000	$863,000
Coordination of program activities with other Government agencies, contractors, and the scientific community	727,769	2,161,500	3,577,000
Travel of employees to launching sites and global tracking stations	788,756	1,660,000	2,236,000
Management of business activities	223,828	362,000	386,000
Meetings of NASA technical committees and working panels	148,094	366,000	411,000
Meetings of technical and scientific societies	124,553	248,000	363,000
Travel to initial duty stations	60,486	150,000	134,000
Temporary assignments and transfers	161,097	248,300	272,000
Travel to emergency relocation site	525	1,000	1,000
Reimbursement for local transportation and toll charges	28,748	39,200	54,000
Travel of consultants and lecturers	31,852	75,000	98,000
Hire of passenger-carrying vehicles	10,576	84,000	--- 1/
Total	$2,741,424	$6,074,000	$8,395,000

1/ Funded under Research and Development appropriation.

The limitation on the amount of fiscal year 1961 funds that may be used for travel purposes is imposing a severe handicap on the accomplishment of the agency's program objectives. A request for an increase in the appropriation language limitation in the amount of $500,000 is, therefore, being submitted for the consideration of the Congress. The appropriation of additional funds will not be required in connection with the increase in the limitation; savings resulting from lower requirements for electric power and from delays in filling vacancies will be adequate for this purpose. To provide a more realistic analysis of the fiscal year 1962 travel requirements, the amounts in the 1961 column at the start of this section have been adjusted to reflect current estimates of the total fiscal year 1961 requirements.

The estimates for the fiscal year 1962 represent an increase of $2,321,000 over the 1961 needs. Approximately 80 per cent of the increase is required for the direction and coordination of the agency program functions and for travel to launching sites and global tracking stations. A discussion of the major travel requirements by location follows:

NASA Headquarters

The budget estimates reflect an increase of $74,000 over current year requirements. Substantially all of the increase is required for effective management direction and supervision of the agency's expanding programs and for foreign travel involved in connection with the proposed International Conference on the Peaceful Uses of Outer Space. The NASA has been assigned the responsibility for planning, coordinating, and directing the United States participation in the proposed conference which will be held under the auspices of the United Nations.

Advanced Research Centers

Increased travel needs for the Langley, Ames, Lewis, and Flight Research Centers amount to $186,000 over the estimated requirements for the current year. Most of the increase requested for the research centers is required for contract monitoring and for liaison and technical supervision of the developmental projects in which these centers are involved. The cost and complexity of contracted items requires continuous and close monitoring of the contractors' performance to assure the development of a satisfactory product in time to meet program commitments and launch schedules.

Space Flight Centers

Requirements for the operation of the Goddard Center and the Wallops Station will require an increase of $1,057,500 and $38,000, respectively, over the estimated needs for the current fiscal year.

Approximately $740,000 of the increase for the Goddard Center is required for the travel of technicians to launch sites and global tracking stations. The planned launching schedule in both the manned and unmanned satellite areas during the fiscal year 1962 will require a significant increase in travel to these activities. For example, during the Mercury operational periods, it will be necessary to send scientific and medical personnel to each of the Mercury tracking stations so that they may be in constant contact with the astronaut. The establishment of new tracking stations in Alaska and in Europe for the communications satellites will significantly increase travel to these areas. The continual calibration and updating of equipment at existing worldwide tracking stations is also required. Additional funds are also required for contract monitoring by project management personnel to provide the essential technical supervision of contractors' performance on developmental projects.

The nominal increase requested for the Wallops Station is required for personnel temporarily detailed to other launching sites in connection with domestic and international programs.

Launch Vehicle Centers

The level of funding required for the Marshall Center reflects an increase of $886,500 over the estimated needs for the current fiscal year. The proposed level results primarily from the expanded scope of work assigned to the Marshall Center during the fiscal year 1961 in connection with development of the Agena-B and Centaur vehicles, and the F-1 and J-2 propulsion systems. The remote location of the Marshall Center from its major contractor operations, which are primarily on the West Coast, contributes significantly to the travel requirement. In addition, the nature of certain programs, which are conducted completely out-of-house, requires continuous travel of personnel to contractor plants. This is particularly significant in the developmental projects concerned with the Saturn propulsion system as well as with the upper stages of the Saturn vehicle.

The proposed launching schedule for the NASA during the fiscal year 1962 will require the intensive travel of technical personnel to the Atlantic and Pacific Missile Ranges to supervise launch operations and to provide essential logistic supporting services.

Western Operations Office

The requested increase of $49,000 for the budget year for the Western Operations Office is required to meet an increasing workload relating to the administration and monitoring of contracts assigned to this location by other NASA installations.

AEC-NASA Nuclear Propulsion Office and Life Science Facility

Travel estimates for operation of these activities represent initial funding in support of the assigned program functions.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

22 TRANSPORTATION OF THINGS

Analysis by Location	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
NASA Headquarters.....	$16,772	$43,000	$50,000
Langley Center.....	12,644	12,000	10,000
Ames Center.....	5,957	15,000	15,000
Lewis Center.....	19,677	25,000	25,000
Flight Center.....	13,908	3,000	20,000
Goddard Center.....	76,370	236,000	540,000
Wallops Station.....	1,271	10,000	5,000
Marshall Center.....	11,938	214,000	50,000
Western Office.....	6,997	10,000	20,000
AEC-NASA Nuclear Office.....	---	---	1,000
Life Science Facility.....	---	---	2,000
Total.....	$165,534	$568,000	$740,000

The estimates under this heading provide for the shipment of household goods and personal effects of employees recruited outside the immediate area of their initial duty stations, or transferred between NASA installations when such transfers are considered to be in the best interests of the Government. Expenses authorized under this classification have been instrumental in attracting and retaining qualified personnel in shortage categories. The major increase for the fiscal year 1962 is required for the additional staffing proposed for the Goddard Center.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

23 RENT, COMMUNICATIONS, AND UTILITIES

Analysis by Location	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
NASA Headquarters	$329,080	$436,000	$520,000
Langley Center	2,669,227	3,381,000	4,009,000
Ames Center	2,742,588	3,111,000	3,617,000
Lewis Center	2,604,468	2,726,000	3,233,000
Flight Center	111,612	198,000	290,000
Goddard Center	486,950	5,746,500	7,994,000
Wallops Station	134,139	369,300	405,000
Marshall Center	19,736	7,047,400	7,146,000
Western Office	61,842	116,200	125,000
AEC-NASA Nuclear Office	---	---	1,000
Life Science Facility	---	---	4,000
Total	$9,159,642	$23,131,400	$27,344,000

Analysis by Types of Services

Rent:			
Electronic equipment:			
Data reduction	$736,154	$4,705,550	$5,623,000
Analytical computations	1,505,952	8,058,562	10,636,000
Business operations	105,813	2,063,738	2,102,000
Buildings and land	68,897	409,050	501,000
Other rentals	6,916	14,500	55,000
	2,423,732	15,251,400	18,917,000
Communications:			
Local telephone and exchange service	220,320	655,900	676,000
Long-distance toll charges	315,751	720,050	823,000
Telegraph service	45,844	74,950	85,000
Postage	30	2,100	5,000
Penalty mail	120,000	170,000	185,000
	701,945	1,623,000	1,774,000
Utilities:			
Electric power	5,611,937	5,677,000	5,966,000
Other utilities	422,028	580,000	687,000
	6,033,965	6,257,000	6,653,000
Total	$9,159,642	$23,131,400	$27,344,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

23 RENT, COMMUNICATIONS, AND UTILITIES

	Rent					Communications					Utilities		
	Electronic equipment												
	Data reduction	Analytical computations	Business operations	Buildings and land	Other	Local service	Toll charges	Telegraph	Postage	Penalty mail	Electric power	Other utilities	Total
Fiscal Year 1960													
NASA Headquarters.....	---	---	---	$21,700	$2,207	$86,026	$76,079	$23,068	---	$120,000	---	---	$329,080
Langley Center.....	$354,541	$537,281	$42,112	---	---	15,792	61,423	7,616	---	---	$1,650,462	---	2,669,227
Ames Center.....	42,054	374,322	14,906	---	1,131	19,588	21,776	91	---	---	2,190,945	$77,775	2,742,588
Lewis Center.....	11,644	473,461	28,317	---	3,578	26,358	64,129	5,462	$30	---	1,660,426	331,063	2,604,468
Flight Center.....	78,105	---	---	---	---	---	12,958	155	---	---	10,804	9,590	111,612
Goddard Center.....	249,810	120,888	9,939	2,600	---	38,271	45,203	7,400	---	---	9,239	3,600	486,950
Wallops Station.....	---	---	---	342	---	21,519	20,398	1,819	---	---	90,061	---	134,139
Marshall Center.....	---	---	10,539	---	---	1,179	7,785	233	---	---	---	---	19,736
Western Office.....	---	---	---	44,255	---	11,587	6,000	---	---	---	---	---	61,842
Total.....	$736,154	$1,505,952	$105,813	$68,897	$6,916	$220,320	$315,751	$45,844	$30	$120,000	$5,611,937	$422,028	$9,159,642
Fiscal Year 1961													
NASA Headquarters.....	---	$40,000	---	$14,000	$10,000	$90,000	$87,000	$25,000	---	$170,000	---	---	$436,000
Langley Center.....	$722,000	908,400	$45,000	600	---	24,900	68,100	9,000	---	---	$1,603,000	---	3,381,000
Ames Center.....	156,000	577,000	25,500	---	1,500	25,000	24,800	200	---	---	2,176,000	$125,000	3,111,000
Lewis Center.....	28,000	536,000	30,000	---	3,000	25,000	63,400	5,500	$100	---	1,610,000	425,000	2,726,000
Flight Center.....	---	150,000	---	---	---	---	18,750	250	---	---	14,000	15,000	198,000
Goddard Center.....	3,540,250	1,713,000	100,000	3,250	---	110,000	162,000	26,000	2,000	---	75,000	15,000	5,746,500
Wallops Station.....	94,300	---	---	5,000	---	34,000	34,000	3,000	---	---	199,000	---	369,300
Marshall Center.....	165,000	4,134,162	1,863,238	300,000	---	339,000	240,000	6,000	---	---	---	---	7,047,400
Western Office.....	---	---	---	86,200	---	8,000	22,000	---	---	---	---	---	116,200
Total.....	$4,705,550	$8,058,562	$2,063,738	$409,050	$14,500	$655,900	$720,050	$74,950	$2,100	$170,000	$5,677,000	$580,000	$23,131,400
Fiscal Year 1962													
NASA Headquarters.....	---	$70,000	---	---	$50,000	$92,000	$95,000	$28,000	---	$185,000	---	---	$520,000
Langley Center.....	$880,000	1,242,000	$62,000	$1,000	---	27,200	69,100	8,700	---	---	$1,719,000	---	4,009,000
Ames Center.....	396,000	800,000	33,000	---	2,000	26,800	28,000	200	---	---	2,200,000	$131,000	3,617,000
Lewis Center.....	28,000	836,000	33,000	---	3,000	25,000	68,500	6,500	---	---	1,733,000	500,000	3,233,000
Flight Center.....	---	235,000	---	---	---	---	24,500	500	---	---	14,000	16,000	290,000
Goddard Center.....	4,025,000	3,250,000	100,000	105,000	---	120,000	219,000	30,000	$5,000	---	100,000	40,000	7,994,000
Wallops Station.....	120,000	---	---	5,000	---	37,000	39,000	4,000	---	---	200,000	---	405,000
Marshall Center.....	174,000	4,203,000	1,874,000	300,000	---	340,000	249,000	6,000	---	---	---	---	7,146,000
Western Office.....	---	---	---	90,000	---	8,000	27,000	---	---	---	---	---	125,000
AEC-NASA Nuclear Office...	---	---	---	---	---	---	900	100	---	---	---	---	1,000
Life Science Facility.....	---	---	---	---	---	---	3,000	1,000	---	---	---	---	4,000
Total.....	$5,623,000	$10,636,000	$2,102,000	$501,000	$55,000	$676,000	$823,000	$85,000	$5,000	$185,000	$5,966,000	$687,000	$27,344,000

A detailed analysis of requirements under this object classification for each NASA activity is presented on the preceding page. A discussion of major requirements follows:

Rent

Electronic equipment:

The increasing complexity of mathematical problems involved in studies and investigations in aerodynamics, space technology, and related theoretical fields requires the intensive utilization of electronic data reduction and computing equipment. Much of the planning and scheduling of future investigations depend on the capability of available equipment to provide usable data on current programs on a real-time basis. Significant advances have been made in the development of computing systems by industry in providing equipment with greater capacity at high-speed operation.

The rapid growth of the use of electronic computing equipment in the past few years parallels the national pattern of technological growth. Present computing systems are continually being replaced by more advanced types of equipment to meet the complex problems of the agency's program activities. The advancement in the development of modern computing equipment has been attended by considerable increases in unit costs. Accordingly, the funding level proposed for the fiscal year 1962 will reflect to some extent the increased costs applicable to the basic unit systems in addition to the costs incurred for multiple-shift operations. It is estimated that approximately 27 per cent of the total funding requested for the rental of electronic computing equipment will be required for 2nd- and 3rd-shift operations.

It is estimated that an increase of approximately $3,620,000 will be required for the rental of computing equipment for the budget year. The acceleration of program functions, together with increased activity in connection with the scheduled launchings for the Mercury and unmanned satellite programs account for the increased funding required for the budget year. A list of the electronic computing equipment proposed to be rented during the fiscal year 1962 is presented on the following two pages.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

RENTAL OF ELECTRONIC COMPUTING EQUIPMENT

	Number of units	Fiscal Year 1962 Funding			
		Prime shift	Second shift	Third shift	Total rental
NASA Headquarters:					
LBG-30.....	1	$40,000	---	---	$40,000
EAM.....	1	30,000	---	---	30,000
		70,000	---	---	70,000
Langley Center:					
IBM-650.....	2	220,404	$58,301	---	278,705
IBM-1401.....	4	325,038	63,480	---	388,518
IBM-7090.....	2	1,095,900	264,661	---	1,360,561
Miscellaneous..	-	156,216	---	---	156,216
		1,797,558	386,442	---	2,184,000
Ames Center:					
IBM-407.....	2	33,000	---	---	33,000
IBM-1401.....	1	77,040	---	---	77,040
IBM-7090.....	1	700,800	---	---	700,800
MH-800.....	1	318,948	---	---	318,948
Miscellaneous..	-	99,212	---	---	99,212
		1,229,000	---	---	1,229,600
Lewis Center:					
IBM-610.....	2	27,600	---	---	27,600
IBM-604.....	1	27,588	---	---	27,588
IBM-704.....	1	392,880	180,720	$94,500	668,100
IBM-1401.....	1	103,800	39,000	19,500	162,300
Miscellaneous..	-	11,412	---	---	11,412
		563,280	219,720	114,000	897,000
Flight Center:					
IBM-407.....	1	10,000	---	---	10,000
IBM-7090.....	1	213,000	---	---	213,000
Miscellaneous..	-	12,000	---	---	12,000
		235,000	---	---	235,000

RENTAL OF ELECTRONIC COMPUTING EQUIPMENT - CONTINUED

	Number of units	Fiscal Year 1962 Funding			
		Prime shift	Second shift	Third shift	Total rental
Goddard Center:					
IBM-709.....	1	$663,000	$112,000	---	$775,000
IBM-7090.....	4	3,752,000	1,500,000	$1,138,000	6,390,000
IBM-1401.....	1	100,000	---	---	100,000
LBG-30.....	6	110,000	---	---	110,000
		4,625,000	1,612,000	1,138,000	7,375,000
Wallops Station:					
IBM-650.....	1	14,000	---	---	14,000
EDPM.....	1	106,000	---	---	106,000
		120,000	---	---	120,000
Marshall Center:					
IBM-205.....	6	770,556	307,851	72,202	1,150,609
IBM-705.....	2	1,105,068	273,216	273,216	1,651,500
IBM-7090.....	2	2,099,388	604,640	---	2,704,028
EAM.....	1	127,692	---	---	127,692
Miscellaneous..	-	617,171	---	---	617,171
		4,719,875	1,185,707	345,418	6,251,000
Total.....		$13,359,713	$3,403,869	$1,597,418	$18,361,000

Buildings and land:

The Marshall Center is currently renting two buildings at an estimated cost of $300,000 to house a part of the current staff pending the completion of facilities authorized for construction in the fiscal year 1961. It is estimated that the rental space will be required through the fall of 1962 when an office building currently under construction will be ready for occupancy.

Interim requirements for storage and warehouse space will necessitate the rental of two buildings by the Goddard Center in the amount of $40,000. The rental of these buildings will be required through the spring of 1962. Rental space will also be required by the Goddard Center for use as a computing facility. The facility will be located in New York City and will be used for the solution of problems generated by theoretical studies undertaken in cooperation with staff members of the various universities in the area. It is estimated that $60,000 will be required for this purpose.

An amount of $90,000 will be required for the continued rental of an office building at Santa Monica, California, to house the staff of the Western Operations Office.

Funds in the amount of $11,000 are needed to cover land leases for tracking stations located on land owned by private interests.

Other rentals:

Estimates are included for the fiscal year 1962 to cover other rental requirements in the amount of $55,000. Approximately $40,000 will be required for the rental of exhibits and other equipment items in connection with the pending U. N. Conference on the Peaceful Uses of Outer Space. The balance of $15,000 will be needed to cover intermittent rentals of sundry office equipment.

Communications

The expanding program activity of the agency is a direct factor for the increased funding requested for communications for the fiscal year 1962. The completion of new research and developmental facilities and the proposed staff increases will require additional local telephone and exchange service. Substantially all of the funds requested in this category are for charges for instrument rentals, associated equipment, and switchgear. Included also are installation costs for the relocation of telephonic equipment necessitated by the constant reassignment of personnel in meeting fluctuating program priorities and the conversion of present equipment to direct dialing systems.

The amounts requested for long-distance toll charges comprise the largest portion of the increased funding level requested for communications. The execution of the agency's missions require constant communications with other Government agencies and the scientific community in coordinating programs of mutual interest. In addition, the monitoring of hardware and systems contracts make imperative the maintenance of the best possible communications with industrial contractors. In many instances the use of toll calls is the most economical manner of obtaining urgent information and transmitting urgent instructions to contractors. Long-distance telephonic communications are also involved in resolving technical difficulties in launch preparatory operations and in maintaining constant contact with global tracking stations during the immediate post-launch period.

Minor increases are requested for telegraphic, postage, and for penalty mailings in direct support of the program level proposed for the budget year.

Utilities

Electric power:

The major electric power requirements of the agency are involved in the operation of the Langley, Ames, and Lewis Research Centers. The gradual transition and reorientation from aeronautical programs to space-oriented programs will result in the partial utilization of certain major facilities with resultant lower power costs. On the other hand, the completion of the hypersonic continuous-flow facility at the Langley Center and the initial operation of the nuclear reactor and the rocket systems research facility at the Lewis Center Plum Brook site will result in increased electric power needs. Summary tables of the estimated power requirements of the Langley, Ames, and Lewis Centers are presented on the following pages.

Modest increases in electric power at the Goddard Center and the Wallops Station will be required to support the full-year operations of facilities being completed in the fiscal year 1961 and scheduled for completion in the budget year. The electric power requirements for the Marshall Center are funded by reimbursements to the Department of the Army under the Research and Development appropriation (Support of NASA Plant).

Other utilities:

In addition to space heating and routine water consumption, certain major facilities require enormous amounts of natural gas and water for experimental purposes and for facility cooling purposes. Significant in this area are the requirements for operation of the nuclear reactor and the rocket systems research facility at the Plum Brook site. It is estimated that an increase of approximately $100,000 will be required in the fiscal year 1962 to meet the over-all needs of the agency for natural gas and water.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

ELECTRIC POWER REQUIREMENTS, UTILIZATION, AND COST

(CALCULATIONS AS OF JANUARY, 1961)

Facility	Connected load to nearest megawatt			Hours of running time for month shown			Average percent of full connected load			Total consumption for month shown (M.W.H.)			Average monthly consumption (megawatt hours) and cost for year shown		
	June 1960	June 1961	June 1962	June 1960	June 1961	June 1962	June 1960	June 1961	June 1962	June 1960	June 1961	June 1962	F.Y. 1960	F.Y. 1961	F.Y. 1962
1. General services	20	20	20	720	720	720	20	20	21	2,800	2,900	3,000	1,900	2,000	2,200
2. 8-foot transonic pressure tunnel[a]	38	38	0	109	60	0	18	13	0	756	300	0	1,099	400	300
3. 16-foot transonic tunnel	53	53	53	30	14	19	50	40	30	789	300	300	806	450	400
4. 30- by 60- full-scale tunnel	8	8	8	31	30	35	12	13	18	29	30	50	18	30	50
5. Transonic dynamics tunnel	30	30	30	43	20	15	28	17	22	359	100	100	230	150	150
6. 7- by 10-foot tunnels (2)	2	14	14	54	40	20	8	36	36	9	200	100	26	100	140
7. 4-foot supersonic pressure tunnel	40	40	0	47	30	0	30	25	0	568	300	0	519	200	100
8. Gas dynamics laboratory	15	17	17	200	200	200	6	6	9	175	200	300	239	200	300
9. Internal flow laboratory	16	20	20	77	140	140	57	25	32	706	700	900	714	750	800
10. Hypersonic continuous-flow facility	--	36	36	--	50	64	--	33	52	--	600	1,200	--	150	1,000
11. Ultra-high-temperature materials facility	--	12	12	--	50	50	--	33	58	--	200	350	--	100	300
12. Air removal system[b]	--	30	30	--	20	20	--	100	100	--	600	600	--	200	400
13. Miscellaneous facilities	56	56	60	176	176	176	25	25	27	2,493	2,500	2,800	2,147	2,200	2,200
14. Unitary Plan tunnel	92	92	92	162	170	170	34	33	33	5,136	5,000	5,100	3,770	3,400	3,400
Totals	370	466	392							13,820	13,930	14,800	11,468	10,330	11,740
Total energy purchased for average month													11,468	10,330	11,740
Average base rate per megawatt hour													4.44	4.44	4.33
Average fuel adjustment charge per megawatt hour													2.50	2.50	2.60
Average total rate per megawatt hour													6.94	6.94	6.93
ENERGY COST FOR AVERAGE MONTH													$ 79,593	$ 71,683	$ 81,350

	Average on-peak monthly demand to nearest megawatt			Average off-peak monthly demand to nearest megawatt		
	F.Y. 1960	F.Y. 1961	F.Y. 1962	F.Y. 1960	F.Y. 1961	F.Y. 1962
Total demand	68	73	73	68	93	93
Free interruptible demand	-15	-20	-20	0	0	0
Free off-peak demand	0	0	0	-53	-53	-53
Billing demand	53	53	53	15	40	40
Average rate per megawatt	1,037	1,017	1,017	200	200	200
DEMAND COST FOR AVERAGE MONTH	$54,946	$53,900	$53,900	$3,000	$8,000	$8,000

AVERAGE MONTHLY POWER COST	$ 137,539	$ 133,583	$ 143,250
TOTAL ANNUAL COST OF ELECTRIC POWER	$1,650,462	$1,603,000	$1,719,000
AVERAGE OVERALL COST OF ELECTRIC POWER PER MEGAWATT HOUR PURCHASED	11.99	12.93	12.20

[a]Includes boundary-layer compressors which also power 2- by 2-foot high Mach number apparatus.

[b]Serves both 16-foot transonic tunnel and 7- by 10-foot tunnels.

AMES RESEARCH CENTER

FISCAL YEAR 1962 ESTIMATES

ELECTRIC POWER REQUIREMENTS, UTILIZATION, AND COST

(Calculations as of January 6, 1961)

	Connected load, to nearest megawatt			Hours of running time for month shown			Av. percent of full connected load			Total consumption for month shown (megawatt hours)			Av. monthly consumption (megawatt hours) and cost for year shown		
	Feb. 1960	Feb. 1961	Feb. 1962	Feb. 1960	Feb. 1961	Feb. 1962	Feb. 1960	Feb. 1961	Feb. 1962	Feb. 1960	Feb. 1961	Feb. 1962	F.Y. 1960	F.Y. 1961	F.Y. 1962
1. General services	13	14	16	696	672	672	22	21	20	1,952	2,000	2,100	1,897	1,950	2,000
2. 7- by 10-foot tunnels (2)	3	3	3	37	30	30	6	8	8	7	7	7	6	6	7
3. 14-foot transonic tunnel	109	109	109	7	8	8	60	57	57	458	500	500	699	600	500
4. 12-foot pressure tunnel	11	11	11	65	65	60	22	22	23	160	160	150	196	225	250
5. 12-foot tunnel compressor No. 1	4	4	4	47	50	50	102	100	95	192	200	190	199	220	250
6. 12-foot tunnel compressor No. 2	4	4	4	75	75	75	94	95	93	283	285	280	379	400	450
7. 40- by 80-foot tunnel	30	30	30	37	35	35	10	11	10	107	120	110	174	175	175
8. 1- by 3-foot supersonic tunnel	19	19	19	42	45	45	20	19	19	158	160	160	237	300	300
9. 6- by 6-foot supersonic tunnel	52	52	52	32	35	35	40	38	26	660	700	660	862	900	1,000
10. Motor-generator sets	9	9	9	168	160	160	4	4	4	55	60	60	76	76	75
11. Unitary Plan tunnel	194	194	194	235	235	225	48	48	48	22,080	22,000	21,000	15,223	14,495	12,735
12. 3.5-foot hypersonic tunnel	---	10	10	---	5	8	---	24	19	---	12	15	12	48	50
13. 12-inch hypersonic helium tunnel	---	1	1	---	50	70	---	10	10	---	5	7	---	5	8
14. Mass transfer cooling and aerodynamics facility	---	---	20	---	---	10	---	---	25	---	---	50	---	---	200
Total	448	460	482							26,112	26,209	25,289			
Total energy purchased for average month													19,960	19,400	18,000
(Bureau of Reclamation)													(12,468)	(14,400)	(13,000)
(Pacific Gas and Electric Co.)													(7,492)	(5,000)	(5,000)
Average rate per megawatt hour													4.43	4.22	4.37
(Bureau of Reclamation)													(3.37)	(3.53)	(3.67)
(Pacific Gas and Electric Co.)													(6.20)	(6.20)	(6.20)
ENERGY COST FOR AVERAGE MONTH													88,484	81,800	78,645
(Bureau of Reclamation)													(42,036)	(50,800)	(47,645)
(Pacific Gas and Electric Co.)													(46,448)	(31,000)	(31,000)

	Av. on-peak or firm demand to nearest megawatt						Av. off-peak or non-firm demand to nearest megawatt					
	F.Y. 1960		F.Y. 1961		F.Y. 1962		F.Y. 1960	F.Y. 1961	F.Y. 1962			
	Bur. of Recl.	P.G.& E.	Bur. of Recl.	P.G.& E.	Bur. of Recl.	P.G.& E.	P.G.& E.	P.G.& E.	P.G.& E.			
Metered demand	50	86	62	78	66	76	9	28	34			
Billing demand	50	86	62	78	66	76	9	28	34			
Average rate per megawatt	750	683	750	683	750	683	158	158	158			
DEMAND COST	(37,500)	(58,810)	(46,500)	(53,270)	(49,875)	(57,923)						
TOTAL DEMAND COST FOR AVERAGE MONTH	96,282[1]		99,770		101,798		1,363	4,410	5,362	97,645	104,180	107,160
GROSS AVERAGE MONTHLY POWER COST										186,129	185,980	185,805
Power factor adjustment										-1,492	-1,240	-1,230
Discount for relief of substation costs										-3,975	-4,862	-4,870
"Wheeling" charge										+1,917	+1,455	+3,625
NET AVERAGE MONTHLY POWER COST										182,579	181,333	183,330
TOTAL ANNUAL COST OF ELECTRIC POWER										2,190,945	2,176,000	2,200,000
AVERAGE OVER-ALL COST OF ELECTRIC POWER PER MEGAWATT HOUR PURCHASED										9.15	9.35	10.19

[1] Adjusted for interruption to service

LEWIS RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

ELECTRIC POWER REQUIREMENTS, UTILIZATION, AND COST

	Connected load to nearest megawatt			Hours of running time for month shown			Av. percent of full connected load			Total consumption for month shown (M.W.H.)			Av. monthly consumption (M.W.H.) and cost for year shown		
	June 1960	June 1961	June 1962	June 1960	June 1961	June 1962	June 1960	June 1961	June 1962	June 1960	June 1961	June 1962	F.Y. 1960	F.Y. 1961	F.Y. 1962
1. General services	46	46	53(1)	720	720	720	9	14	14	2,902	4,500	4,500	4,000	4,500	4,500
2. Engine research building	57	57	57	182	200	200	16	18	18	1,615	2,000	2,000	1,900	2,000	2,000
3. Altitude tunnel, duct laboratory, 3-ft. supersonic tunnel, and icing research tunnel	50	50	50	33	30	30	8	7	7	139	100	100	119	100	100
4. 8-by 6-foot supersonic tunnel	77	77	77	38	30	30	73	65	65	2,137	1,500	1,500	1,900	1,500	1,500
5. Unitary Plan tunnel	198	198	198	105	70	70	37	36	36	7,637	5,000	5,000	6,420	4,000	4,000
6. Propulsion systems laboratory	141	141	141	175	200	190	10	11	11	2,590	3,100	2,900	2,200	2,400	3,000
Totals	569	569	576							17,020	16,200	16,000			
Total energy purchased for average month													16,539	14,500	15,100
Average base rate per megawatt hour													5.56	5.35	5.45
Average fuel adjustment per megawatt hour													-.13	-.13	-.13
Average total rate per megawatt hour													5.43	5.22	5.32
ENERGY COST FOR AVERAGE MONTH													89,867	75,733	80,285

	Av. on-peak monthly demand to nearest megawatt				Av. off-peak monthly demand to nearest megawatt					
	July Jan. 1959-1960	Feb. June 1960-1960	F.Y. 1961	F.Y. 1962	F.Y. 1960	F.Y. 1961	F.Y. 1962			
Total metered demand	24	24	24	24	210	210	210			
Reactive billing demand	.49	-	-	-	-	-	-			
Free off-peak demand	-	-	-	-	210	210	210			
	24.49	24	24	24	0	0	0			
Rate per MW (firm)	1,971	1,963	1,963	1,963	150	150	150			
Rate per MKVA (reactive)	380	380	380	380	-	-	-			
DEMAND COST FOR AVERAGE MONTH	47,495	47,120	47,120	47,120	0	0	0	47,338	47,120	47,120
GROSS AVERAGE MONTHLY POWER COST								137,205	122,853	127,405
Discount 3 percent								-4,116	-3,686	-3,822
NET AVERAGE MONTHLY POWER COST								133,089	119,167	123,583
TOTAL ANNUAL COST OF ELECTRIC POWER								1,597,072	1,430,000	1,483,000
AVERAGE OVERALL COST OF POWER PER MEGAWATT HOUR PURCHASED								8.05	8.22	8.18

(1) Begin operation of energy conversion laboratory in December, 1961; begin operation of ion and plasma jet facility in December, 1961; and begin operation of basic materials research laboratory in December, 1961.

LEWIS RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

ELECTRIC POWER REQUIREMENTS, UTILIZATION, AND COST

Sandusky, Ohio	Connected load to nearest megawatt			Hours of running time for month shown			Av. percent of full connected load			Total consumption for month shown (M.W.H.)			Av. monthly consumption (M.W.H.) and cost for year shown		
	June 1960	June 1961	June 1962	June 1960	June 1961	June 1962	June 1960	June 1961	June 1962	June 1960	June 1961	June 1962	F.Y. 1960	F.Y. 1961	F.Y. 1962
1. Component research facility for nuclear propulsion.....	13	13	13	- (1)	480	480	-	24	24	247	1,500	1,500	232	950	1,500
2. General services.....	4.15	4.15	4.15	720	720	720	8	12	12	234	350	350	123	296	350
Totals.....	17.15	17.15	17.15							481	1,850	1,850			
Total energy purchased for average month.....													355	1,246	1,850
Average base rate per megawatt hour.....													8.54	7.22	6.99
Average fuel adjustment per megawatt hour.....													.21	.21	.21
Average total rate per megawatt hour.....													8.75	7.43	7.20
ENERGY COST FOR AVERAGE MONTH.....													3,106	9,264	13,325

	Av. on-peak monthly demand to nearest megawatt		
	F.Y. 1960	F.Y. 1961	F.Y. 1962
Total metered demand.....	1.488	4.34	5.8
Rate per megawatt.....	1,461	1,322	1,294

DEMAND COST FOR AVERAGE MONTH.....	2,174	5,736	7,508
AVERAGE MONTHLY POWER COST.....	5,280	15,000	20,833
TOTAL ANNUAL COST OF ELECTRIC POWER.....	63,354	180,000	250,000
AVERAGE OVERALL COST OF POWER PER MEGAWATT HOUR PURCHASED.....	14.87	12.04	11.26

(1) Facility construction almost complete. Equipment being checked out and pre-criticality tests being conducted. Initial operation scheduled for December, 1960.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

24 PRINTING AND REPRODUCTION

Analysis by Location	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
NASA Headquarters	$223,710	$345,000	$616,000
Langley Center	28,045	26,000	26,000
Ames Center	3,567	15,000	15,000
Lewis Center	5,306	10,000	10,000
Flight Center	1,735	2,000	5,000
Goddard Center	803	25,000	40,000
Wallops Station	1,552	5,000	10,000
Marshall Center	---	388,000	275,000
Western Office	---	---	3,000
Total	$264,718	$816,000	$1,000,000

Analysis by Types of Printing			
Scientific and technical reports	$107,136	$248,000	$260,000
Special reports and brochures	51,978	231,300	287,100
Administrative semi-annual reports	---	10,000	10,000
Recruiting booklets	18,229	22,100	30,400
Printed forms and letterheads	25,910	121,200	109,500
Photographs (still)	---	30,050	30,100
Microfilming	---	54,800	150,000
Binding of periodicals and miscellaneous printing	61,465	98,550	122,900
Total	$264,718	$816,000	$1,000,000

NASA printing funds are utilized primarily for the printing of scientific and technical reports primarily for industrial contractors, other Government agencies, and the scientific community at large; for the preparation and publication of special reports and brochures for release to the general public and educational institutions; and for the microfilming of technical reports.

The scientific and technical reports printed by the NASA contain data on newly acquired knowledge on the scientific aspects of the agency's research and development programs. Certain of the reports are carefully selected and evaluated as permanent reference documents and constitute official public reports on the agency's operations. The reports are widely used by the military air organizations, the aircraft industry, the air transport industry, contractors engaged in the agency's propulsion development activities, other Government agencies, and educational institutions. A limited distribution is also made to selected public libraries throughout the country.

Public demand for material on the program content, objectives, and accomplishments of the NASA continues to increase. In carrying out the mission of the National Aeronautics and Space Act of 1958, the NASA has developed an active program in the dissemination of information to the public. Considerable interest in this area has also been expressed by educators at the state and local levels in requesting material for classroom discussions and for stimulating the interest of the student bodies on the advancement opportunities in the field of science. The funding level proposed for this purpose in the fiscal year 1962 budget represents an extension of our current program in the light of the increasing interest and demand by the public for NASA publications.

It is important that the technical reports received from other Government agencies and industry are circulated to the interested organizational segments and field installations of the NASA. With the use of microfilms the more important documents are distributed rapidly and economically.

Modest increases in other printing areas are required to support the level of program activity proposed for the budget year.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

25 SECURITY INVESTIGATIONS

	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
NASA Headquarters.....	$496,960	$1,248,000	$1,115,000

Security investigations of NASA personnel are conducted by the Civil Service Commission on a reimbursable basis. The investigations are required by Executive Order 10450 and by security procedures and standards established pursuant to the National Aeronautics and Space Act of 1958.

Requirements for the budget year are approximately $135,000 under the estimated needs for the current year as a result of scheduled reductions in the backlog of investigations required for personnel currently employed. Of the 3,185 investigations estimated for the fiscal year 1962, approximately 1,000 will be allocated to further reduce the backlog. The balance will be used to meet personnel turnover requirements and to provide the necessary investigations for the additional employees requested for the budget year.

Funding requirements for the fiscal year 1962 are based on a unit cost of $350 per investigation.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

42 INSURANCE CLAIMS AND INDEMNITIES

	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
NASA Headquarters.....	$118,761	$57,000	$110,000
Analysis by Types of Claims and Indemnities			
Tort claims.....	$18,761	$7,000	$10,000
Awards.....	100,000	50,000	100,000
Total.....	$118,761	$57,000	$110,000

The estimates under this head provide for the payment of accidental damage claims to property resulting from the conduct of NASA 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.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

CONSTRUCTION OF FACILITIES

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CF1-1	Langley Research Center (Hampton, Virginia)
CF2-1	Ames Research Center (Moffett Field, California)
CF3-1	Lewis Research Center (Cleveland, Ohio)
CF4-1	Goddard Space Flight Center (Greenbelt, Maryland)
CF5-1	Wallops Station (Wallops Island, Virginia)
CF6-1	Jet Propulsion Laboratory (Pasadena, California)
CF7-1	Marshall Space Flight Center (Huntsville, Alabama)
CF8-1	Atlantic Missile Range (Cape Canaveral, Florida)
CF9-1	Pacific Missile Range (Point Arguello, California)
CF10-1	Various Locations
CF11-1	Advanced Facility Planning and Design

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

SUMMARY OF CONSTRUCTION PROGRAMS

Page No.		Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
CF1-1	Langley Research Center.....	$4,535,000	$11,957,000	$3,980,000
CF2-1	Ames Research Center.....	6,305,000	980,000	5,680,000
CF3-1	Lewis Research Center.....	6,910,000	9,100,000	3,590,000
	Flight Research Center.....	1,775,000	---	---
CF4-1	Goddard Space Flight Center..	14,070,000	9,500,000	9,212,000
CF5-1	Wallops Station.....	---	4,000,000	6,313,000
CF6-1	Jet Propulsion Laboratory....	7,755,000	8,516,000	3,642,000
CF7-1	Marshall Space Flight Center.	---	26,750,000	12,891,000
CF8-1	Atlantic Missile Range.....	5,200,500	26,184,000	49,583,000
CF9-1	Pacific Missile Range.....	450,000	---	998,000
CF10-1	Various Locations.....	52,624,500	29,338,000	18,186,000
CF11-1	Advanced Facility Planning and Design.....	---	---	5,000,000
	Total.....	$99,625,000	$126,325,000	$119,075,000
	Transferred from Research and Development appropriation.....	-15,000,000	-3,538,000	---
	Total appropriation.....	$84,625,000	$122,787,000	$119,075,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

CONSTRUCTION OF FACILITIES - 1962 PROGRAM

SUMMARY AND INDEX

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CF1-1	LANGLEY RESEARCH CENTER (Hampton, Virginia).....		$3,980,000
CF1-3	Equipment for magnetoplasmadynamics research.....	$2,500,000	
CF1-7	High-vacuum space structures facility.....	1,480,000	
CF2-1	AMES RESEARCH CENTER (Moffett Field, California).....		5,680,000
CF2-3	Hypervelocity free flight facility.....	4,880,000	
CF2-8	Modifications to the flight operations laboratory.....	800,000	
CF3-1	LEWIS RESEARCH CENTER (Cleveland, Ohio).....		3,590,000
CF3-3	Hydrogen heat transfer facility.....	2,550,000	
CF3-6	Modifications to a space environment tank.	1,040,000	
CF4-1	GODDARD SPACE FLIGHT CENTER (Greenbelt, Maryland).....		9,212,000
CF4-3	Environmental testing laboratory.....	7,287,000	
CF4-8	Advanced data processing equipment.....	1,150,000	
CF4-11	Isolation laboratory.....	775,000	
CF5-1	WALLOPS STATION (Wallops Island, Virginia).....		6,313,000
CF5-3	Advanced tracking systems.....	4,845,000	
CF5-6	Dynamic balancing facility.....	843,000	
CF5-9	Modifications to range safety systems.....	225,000	
CF5-12	Rocket storage area.....	400,000	
CF6-1	JET PROPULSION LABORATORY (Pasadena, California).....		3,642,000
CF6-3	Physical sciences laboratory.....	1,285,000	
CF6-7	Addition to vehicle assembly building.....	610,000	
CF6-10	Modification of structural test laboratory	262,000	
CF6-13	Materials research laboratory.....	515,000	
CF6-16	Utilities.....	735,000	
CF6-17	Microwave antenna range.....	235,000	

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CF7-1	MARSHALL SPACE FLIGHT FACILITY (Huntsville, Alabama).....		$12,891,000
CF7-3	Extension to engineering building.....	$510,000	
CF7-6	Extension of primary utilities.....	420,000	
CF7-8	Expansion of blockhouse.....	2,500,000	
CF7-11	Liquid hydrogen facility.....	1,700,000	
CF7-14	High-vacuum test facility.....	701,000	
CF7-18	Technical services facility.....	757,000	
CF7-21	Load test annex.....	1,703,000	
CF7-24	Lox storage for power plant test stand....	600,000	
CF7-27	Acceleration of the Saturn static test facility.....	4,000,000	
CF8-1	ATLANTIC MISSILE RANGE (Cape Canaveral, Florida).....		49,583,000
CF8-3	Completion of Saturn launch complex No. 37	10,961,000	
CF8-14	Central shop and maintenance facility.....	743,000	
CF8-17	Spacecraft facility.....	844,000	
CF8-20	Extension of assembly building.....	1,035,000	
CF8-22	Liquid hydrogen system for Saturn launch complex No. 34.....	2,800,000	
CF8-25	Modifications to Saturn launch complex No. 34.....	2,800,000	
CF8-29	Saturn barge No. 2.....	600,000	
CF8-32	Modifications to launch complex No. 36....	18,800,000	
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CF10-1	VARIOUS LOCATIONS.....		18,186,000
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CF10-2	Minitrack network.....	6,260,000	
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CF10-17	Facilities for F-1 engine program.....	425,000	
CF10-19	Facilities for 200-K engine program.....	750,000	
CF10-21	Sounding rocket facilities.....	500,000	
CF10-22	Damage repair and special construction....	750,000	
CF11-1	ADVANCED FACILITY PLANNING AND DESIGN.....		5,000,000
	TOTAL PROGRAM.....		$119,075,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

CONSTRUCTION OF FACILITIES - 1962 PROGRAM

LANGLEY RESEARCH CENTER

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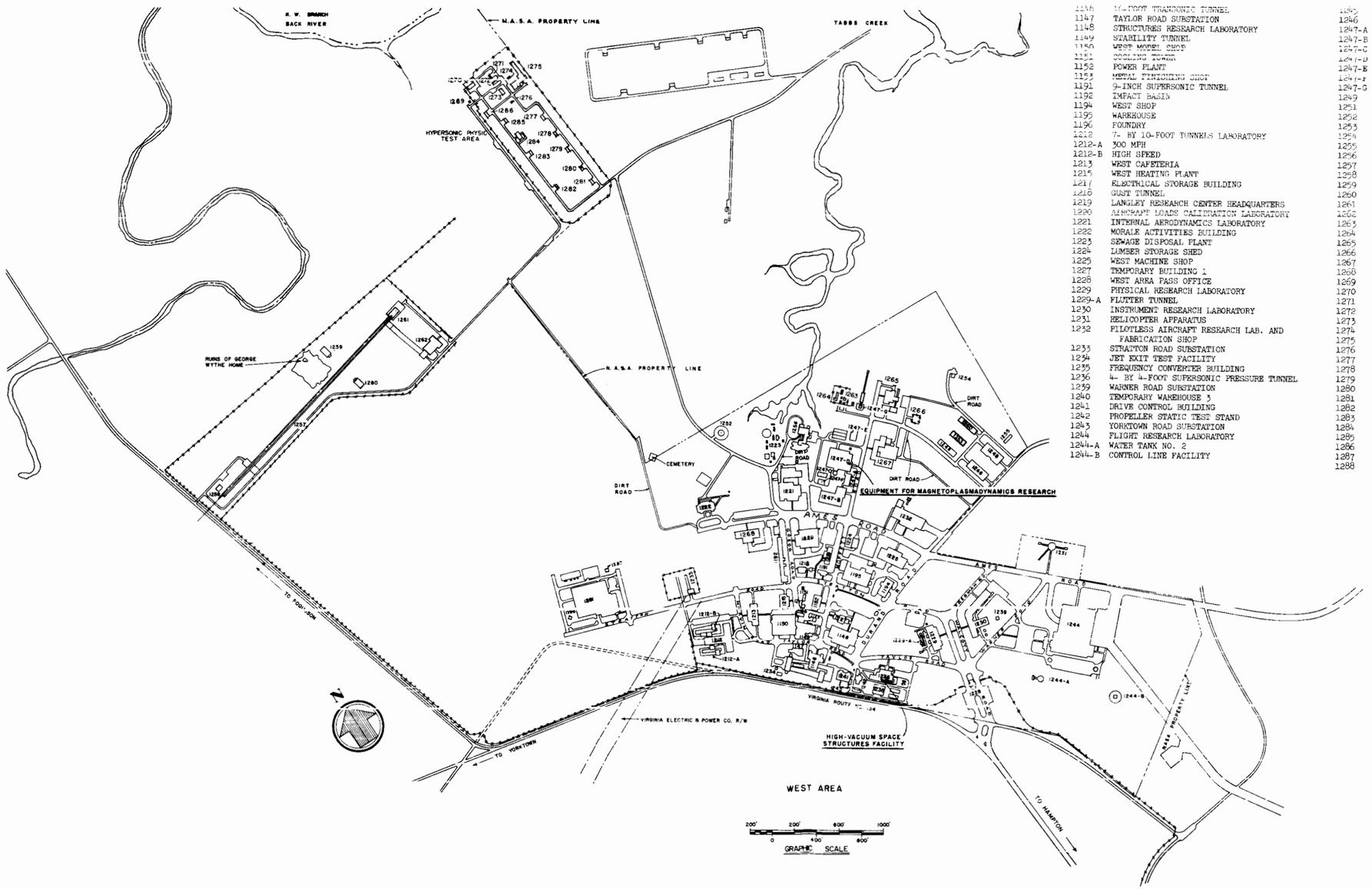
CF1-3	Equipment for magnetoplasmadynamics research.	$2,500,000
CF1-7	High-vacuum space structures facility.....	1,480,000
	TOTAL.....	$3,980,000

LANGLEY RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

LOCATION PLAN



1146	16-FOOT TRANSONIC TUNNEL
1147	TAYLOR ROAD SUBSTATION
1148	STRUCTURES RESEARCH LABORATORY
1149	STABILITY TUNNEL
1150	WEST MODEL SHOP
1151	COOLING TOWER
1152	POWER PLANT
1153	METAL FINISHING SHOP
1191	9-INCH SUPERSONIC TUNNEL
1192	IMPACT BASIN
1194	WEST SHOP
1195	WAREHOUSE
1196	FOUNDRY
1212	7- BY 10-FOOT TUNNELS LABORATORY
1212-A	300 MPH
1212-B	HIGH SPEED
1213	WEST CAFETERIA
1215	WEST HEATING PLANT
1217	ELECTRICAL STORAGE BUILDING
1218	GUST TUNNEL
1219	LANGLEY RESEARCH CENTER HEADQUARTERS
1220	AIRCRAFT LOADS CALIBRATION LABORATORY
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	PHYSICAL RESEARCH LABORATORY
1229-A	FLUTTER TUNNEL
1230	INSTRUMENT RESEARCH LABORATORY
1231	HELICOPTER APPARATUS
1232	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	WARNER ROAD SUBSTATION
1240	TEMPORARY WAREHOUSE 3
1241	DRIVE CONTROL BUILDING
1242	PROPELLER STATIC TEST STAND
1243	YORKTOWN ROAD SUBSTATION
1244	FLIGHT RESEARCH LABORATORY
1244-A	WATER TANK NO. 2
1244-B	CONTROL LINE FACILITY
1245	TEMPORARY WAREHOUSE 1
1246	TEMPORARY WAREHOUSE 2
1247-A	GAS DYNAMICS LABORATORY CENTER
1247-B	GAS DYNAMICS LABORATORY, WEST WING
1247-C	GAS DYNAMICS COOLING TOWER
1247-D	GAS DYNAMICS LABORATORY, EAST WING
1247-E	GAS DYNAMICS 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
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 15 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 BLDG.
1287	41-FOOT VACUUM SPHERE SHOP
1288	SOLAR ENERGY COLLECTOR

LANGLEY RESEARCH CENTER

FISCAL YEAR 1962 ESTIMATES

EQUIPMENT FOR MAGNETOPLASMADYNAMICS RESEARCH

DESCRIPTION:

This project will consist of the purchase and installation of power sources, laboratory equipment, and instrumentation needed for continuing and expanding fundamental research in magnetoplasmadynamics including the creation of plasmas, acceleration of plasmas, interaction of plasmas with magnetic fields, and collision of plasmas with each other. The following equipment will be purchased and located in existing and converted laboratory space in the former gas dynamics laboratory building:

1. Electrical energy storage bank (capacitors) for creation and acceleration of plasmas.

2. Six-phase a-c silicon rectified to d-c power source for steady flow d-c plasma accelerator and for small arc jets (plasma sources) used in basic studies.

3. Laboratory-scale microwave equipment for plasma velocity measurements, determination of plasma characteristics, and studies of radio transmission through ionized layers.

4. High-power microwave equipment for generating and guiding microwaves for use in acceleration of plasmas by means of radiation pressure.

5. Fractional microsecond Kerr cell and framing camera for observing plasma motions and interactions with magnetic fields.

6. Vacuum pumps, piping, and filters to remove alkali metal seeding elements from plasma flows dumping into vacuum tank.

7. General laboratory instrumentation (vacuum gages, oscilloscopes, electrical instruments, etc.).

8. Special instrumentation for fundamental plasma-dynamics studies including ion and electron accelerators, mass spectrograph, and high-field-strength electromagnets.

9. Specially constructed channel for steady flow d-c plasma accelerator.

10. Specially fabricated cyanogen burner as plasma source for magnetohydrodynamic experiments.

11. Special stainless-steel vacuum cylinder for plasma-dynamics studies.

12. A 60-foot, spherical vacuum reservoir to be used as a receiver for most of the flowing-plasma studies will be installed adjacent to the magnetoplasmadynamics laboratory spaces in the former gas dynamics laboratory. A sketch of the proposed facility is shown on the following page.

JUSTIFICATION:

"Magnetoplasmadynamics" is that branch of science dealing with the motion of an electrically conducting gas (a plasma) in the presence of magnetic or electric fields. The results of research on magnetoplasmadynamics and on plasma physics have potentially important applications in long-distance space communications, ultra-high velocity wind tunnels for re-entry research, and propulsion and power generation. The science is, however, still in its infancy and it is clear that a great deal of fundamental research, particularly experimental research, needs to be accomplished. The fundamental research is concerned with the acceleration of plasmas to extremely high velocities by the use of electric and magnetic fields, the interaction of plasmas with high energy microwaves, and the use of strong magnetic fields to manipulate and control ionized gases which are too hot to be handled by other means.

Some specific examples of promising ideas which may lead to future applications follow:

1. New ideas for the confinement and manipulation of plasmas.

2. New concept for the acceleration of plasmas by the use of radiation pressure from microwaves. Plasma velocities of the order of millions of miles per hour appear possible from analysis and small-scale experiments, but very high-power microwave sources are needed for attainment of the high velocities. Result of this research has application to all devices using high-velocity plasmas, for example, the colliding plasma transmitter.

3. New concepts and methods for the conversion of electrical energy to plasma motion and, conversely, the conversion of plasma motion to electricity.

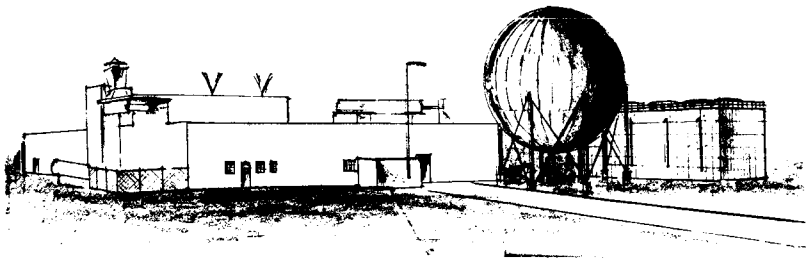
4. Acceleration of relatively dense plasmas to very high speeds with application to the hypervelocity research facility problem.

5. Production of very intense electromagnetic radiation in the microwave spectrum by collision of high-speed plasmas. The results of research on this phenomena may have application, for example, to an extremely high-power transmitter for communication over great distances in space. Also, results of the research may lead to a better understanding of the production of radio waves from collision of very large plasma clouds in outer space.

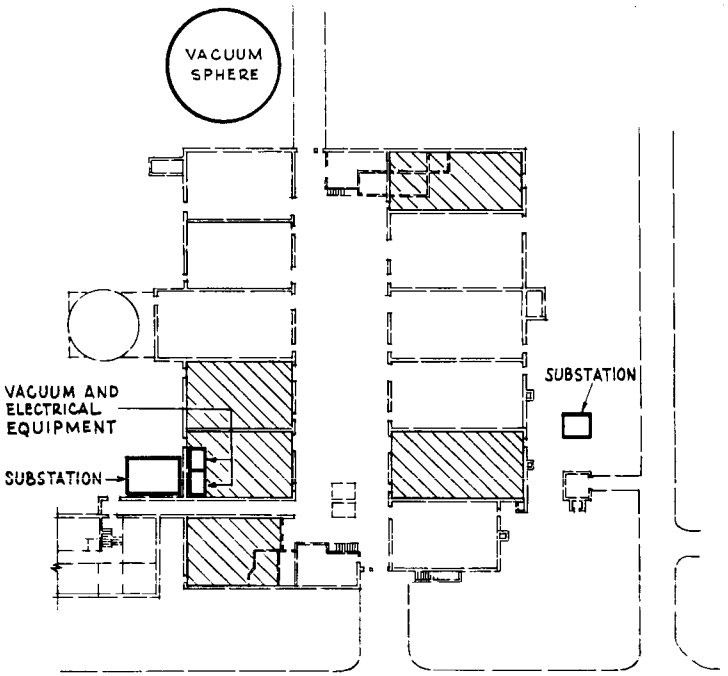
The equipment requested in this project is necessary to permit research in these areas to be effectively prosecuted.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

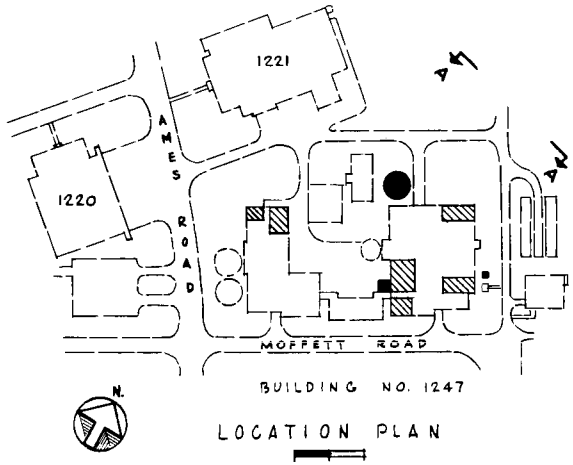
EQUIPMENT FOR MAGNETOPLASMADYNAMICS RESEARCH



VIEW A-A



BUILDING NO. 1247 B
FIRST FLOOR PLAN
0 10 30 60 FT.
MOFFETT ROAD



BUILDING NO. 1247
LOCATION PLAN
0 75 150 FT.

LEGEND
EXISTING CONSTRUCTION
NEW CONSTRUCTION
AREAS ASSIGNED TO PLASMA PHYSICS

COST ESTIMATE:

Foundations	$14,000
Vacuum system, burner, and piping	326,100
Electric power supply and equipment	1,740,300
Electric power distribution	55,000
Instrumentation	325,000
Design and engineering services	29,600
Total estimated cost	$2,500,000

CONSTRUCTION SCHEDULE:

Total estimated completion time	18 months

LANGLEY RESEARCH CENTER

FISCAL YEAR 1962 ESTIMATES

HIGH-VACUUM SPACE STRUCTURES FACILITY

DESCRIPTION:

This project proposes the construction of a vacuum research facility to be located in the laboratory building of the present 4-foot supersonic tunnel. The facility will include a 4- by 6-foot vacuum chamber capable of attaining a vacuum of 10^{-8} mm Hg, the necessary pumping equipment, and equipment for model preparation and examination. Only relatively minor modifications to the existing building will be required. A sketch of the proposed construction is presented on the following page.

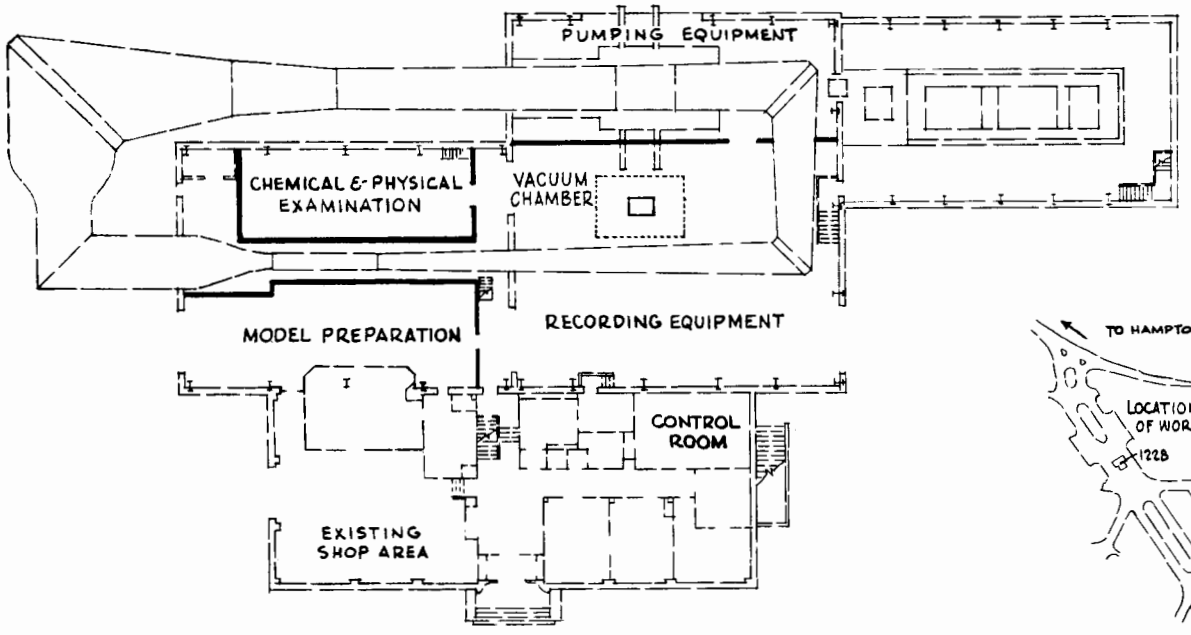
JUSTIFICATION:

One of the major problems involved in the development of space structures is that the environment in which they must operate reliably is a very hard vacuum. Certain laboratory studies of space structures will have to be conducted in a hard vacuum in order to deal realistically with the problems involved. Of particular interest are the effects of the vacuum, which acts on the surface of the structure, and on those structural properties that are known to be sensitive to the condition of the surface, for example, on fatigue life, creep strength, and crack propagation. Of particular concern is the fact that in the hard vacuum of space adsorbed gases are lost and normal oxide coatings which exist are also lost and not reformed. Such little evidence as exists tends to indicate that formation of oxides on the surface exert a strengthening effect while the adsorbed gases exert a weakening effect. What the net effect will be in space is a matter of experimentation, and only through tests in a vacuum system that will eliminate adsorbed gases and oxides can a knowledge of the safe stress level be determined. It must be emphasized that these particular aspects of structural design, fatigue, creep, and crack propagation have not been reduced to the point at which reliance on knowledge of basic material properties, stress analysis, and operating experience can be incorporated into an analytical procedure for safe design. Reliance on full-scale testing of actual structure or on as large a scale as possible of structural components is still necessary.

It is Langley Center's mission to study these structural problems. At present, the facilities required to investigate these effects on even small structural components are not available. The vacuum facility as proposed in this project will be suitable for research studies on structural components of spacecraft and on the application of anticipated loads to the components. The need for data on the design stress levels required for space structures is paramount.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

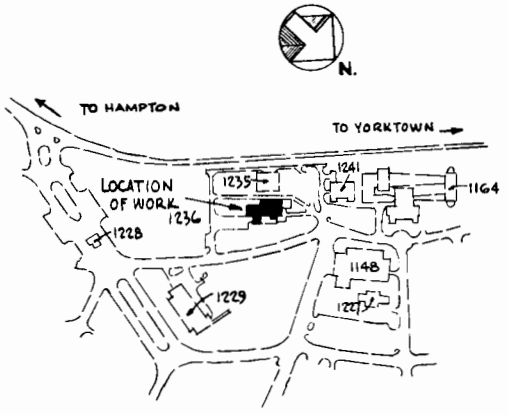
HIGH-VACUUM SPACE STRUCTURES FACILITY



BUILDING NO. 1236

FIRST FLOOR PLAN

0 20 40 FT.



LOCATION PLAN

0 200 400 FT.

LEGEND
EXISTING CONSTRUCTION
NEW CONSTRUCTION

COST ESTIMATE:

Vacuum chamber, pumps, and control equipment.....	$567,620
Instrumentation.....	496,000
Electrical installation.....	223,000
Building modifications.....	31,640
Humidity control, equipment, and utility provisions...	108,685
Design and engineering services.....	53,055
Total estimated cost....	$1,480,000

CONSTRUCTION SCHEDULE:

Total estimated completion time.....	15 months

LANGLEY RESEARCH CENTER

FISCAL YEAR 1962 ESTIMATES

EQUIPMENT FOR MAGNETOPLASMADYNAMICS RESEARCH

DESCRIPTION:

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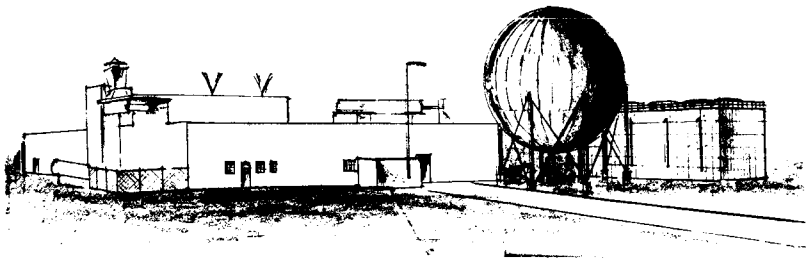
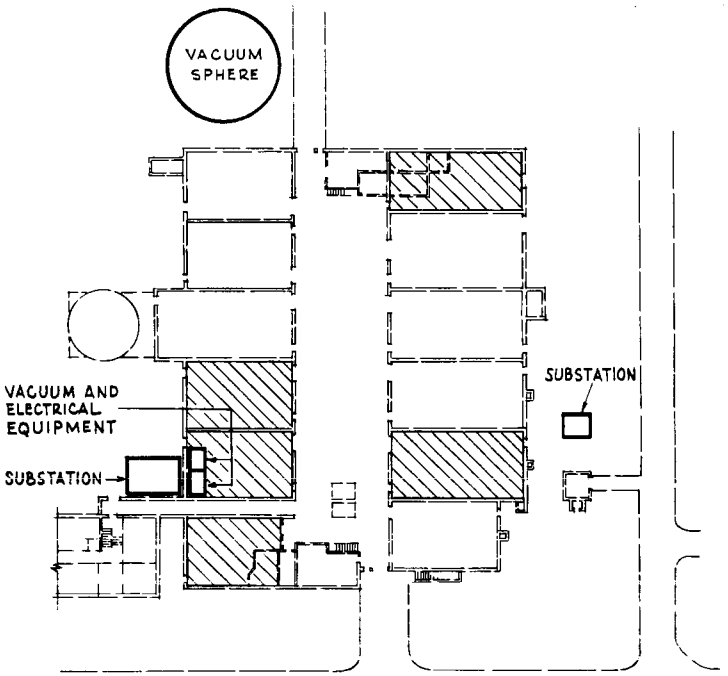
LANGLEY RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

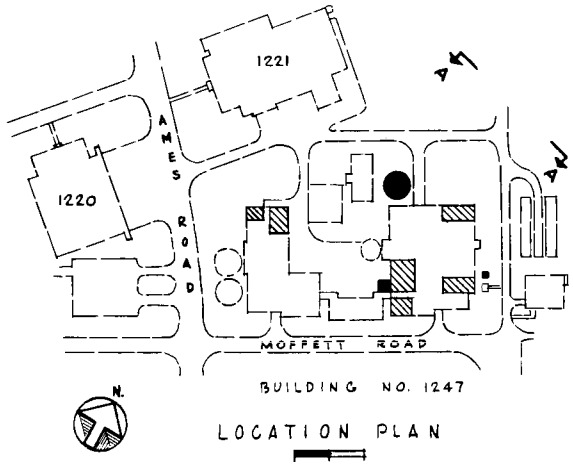
EQUIPMENT FOR MAGNETOPLASMADYNAMICS RESEARCH



VIEW A-A



BUILDING NO. 1247 B
FIRST FLOOR PLAN
0 10 30 60 FT.
MOFFETT ROAD



BUILDING NO. 1247
LOCATION PLAN
0 75 150 FT.

LEGEND
EXISTING CONSTRUCTION
NEW CONSTRUCTION
AREAS ASSIGNED TO PLASMA PHYSICS

COST ESTIMATE:

Foundations	$14,000
Vacuum system, burner, and piping	326,100
Electric power supply and equipment	1,740,300
Electric power distribution	55,000
Instrumentation	325,000
Design and engineering services	29,600
Total estimated cost	$2,500,000

CONSTRUCTION SCHEDULE:

Total estimated completion time	18 months

LANGLEY RESEARCH CENTER

FISCAL YEAR 1962 ESTIMATES

HIGH-VACUUM SPACE STRUCTURES FACILITY

DESCRIPTION:

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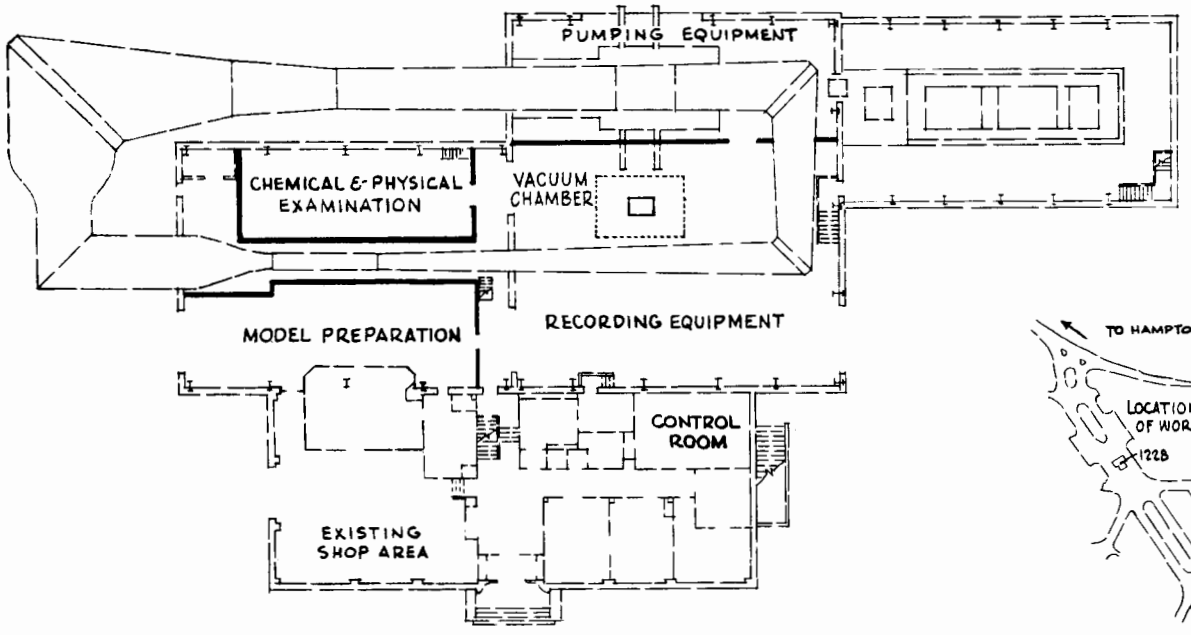
LANGLEY RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

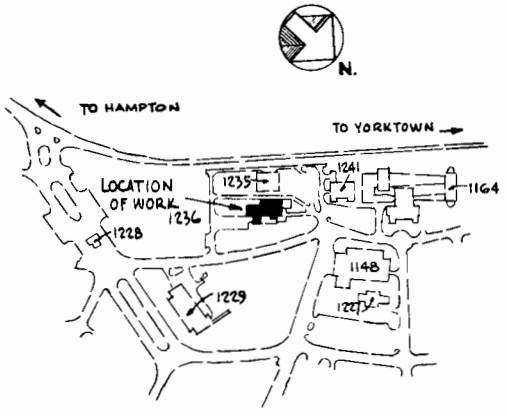
HIGH-VACUUM SPACE STRUCTURES FACILITY



BUILDING NO. 1236

FIRST FLOOR PLAN

0 20 40 FT.



LOCATION PLAN

0 200 400 FT.

LEGEND
EXISTING CONSTRUCTION
NEW CONSTRUCTION

COST ESTIMATE:

Vacuum chamber, pumps, and control equipment.....	$567,620
Instrumentation.....	496,000
Electrical installation.....	223,000
Building modifications.....	31,640
Humidity control, equipment, and utility provisions...	108,685
Design and engineering services.....	53,055
Total estimated cost....	$1,480,000

CONSTRUCTION SCHEDULE:

Total estimated completion time.....	15 months

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

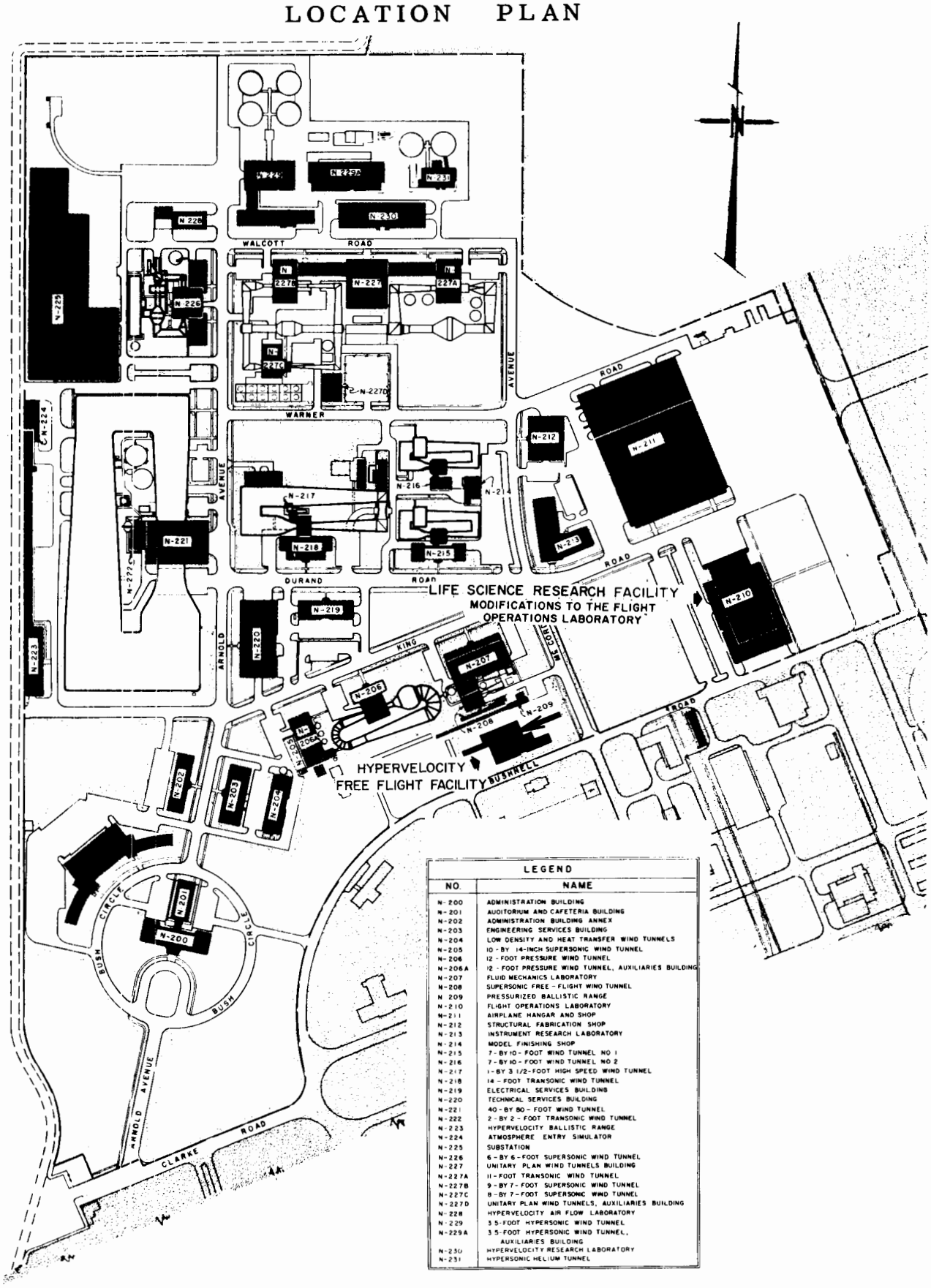
CONSTRUCTION OF FACILITIES - 1962 PROGRAM

AMES RESEARCH CENTER

Page No.		
CF2-2	Location plan	
CF2-3	Hypervelocity free flight facility.....	$4,880,000
CF2-8	Modifications to the flight operations laboratory.....	800,000
	TOTAL.....	$5,680,000

AMES RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

LOCATION PLAN



LEGEND	
NO.	NAME
N-200	ADMINISTRATION BUILDING
N-201	AUDITORIUM AND CAFETERIA BUILDING
N-202	ADMINISTRATION BUILDING ANNEX
N-203	ENGINEERING SERVICES BUILDING
N-204	LOW DENSITY AND 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	FLIGHT OPERATIONS 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

AMES RESEARCH CENTER

FISCAL YEAR 1962 ESTIMATES

HYPERVELOCITY FREE FLIGHT FACILITY

DESCRIPTION

The countercurrent motion of a test model launched from a gun and a short-duration high-speed gas stream generated in a wind tunnel will be used to produce test conditions representative of flight in planetary atmospheres at speeds of 15,000 to 40,000 ft/sec or higher. The flight will take place in a test section instrumented to provide the following information on either small-scale research models or models of space vehicles: gaseous radiant heating; ionization and consequent interference with radio transmission to and from the vehicle; magnetogasdynamic aspects of flow; effects of dissociation of the atmospheric fluid and nonequilibrium thermodynamic state of the fluid on the flow configuration, particularly on the heating, overall forces, and moments acting on the model; and other related problems associated with extreme flight speeds. The principal components and location of the facility are shown in the sketch on the following page.

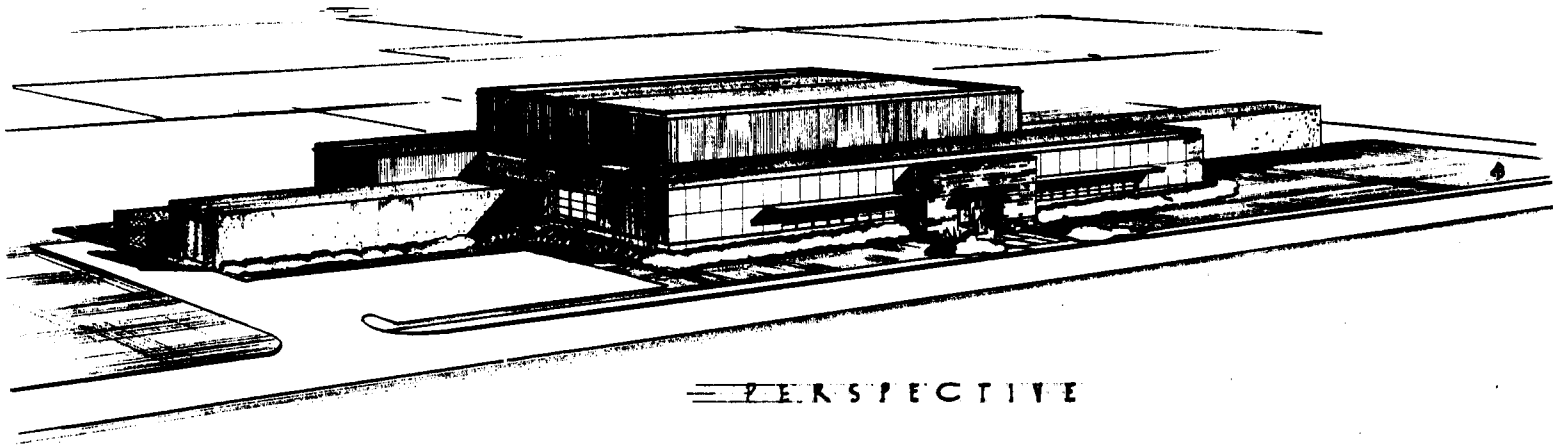
The model will be launched from a light-gas gun and the countercurrent air stream will be provided by a shock-tube wind tunnel. Light-gas guns and shock tunnels developed at Ames Research Center have produced speeds of 25,000 and 15,000 ft/sec, respectively, so that maximum test speeds of at least 40,000 ft/sec are assured. Methods for improving both components seem sufficiently promising that test speeds approaching 50,000 ft/sec should be attainable by the time the facility is built.

To provide the required range of test conditions, the facility will be equipped with several guns and test section nozzles. The guns will range in size up to 37 mm. Three test-section nozzles will be provided to generate airspeeds of about 6,000 to 15,000 ft/sec and three additional nozzles will be provided to permit testing in gases other than air. Thus, with the choice of model size, launching speed, energy level, and speed and composition of the gas, the proposed facility will provide an extremely wide range of test conditions. For example, in air, test speeds of 15,000 to at least 40,000 ft/sec, Reynolds number of 50,000 to 5×10^6, and, even more important, enthalpies up to full-scale values will be achieved.

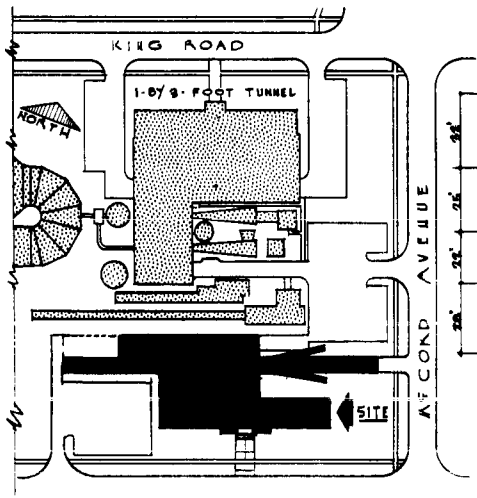
The test section will be approximately 4 feet square and 75 feet long and will be equipped with 15 two-view shadowgraph stations to record the flow configuration and trajectory data from which the forces and moments acting on the model are calculated. It will be further instrumented with sensing equipment to measure the quantity and spectrum of radiant energy in the disturbed flow field.

AMES RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

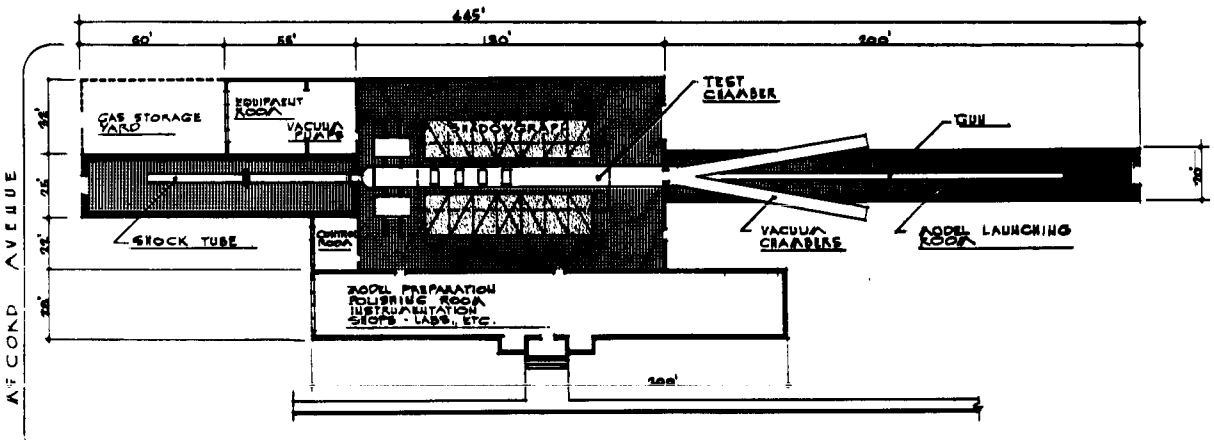
HYPERVELOCITY FREE FLIGHT FACILITY



PERSPECTIVE



PLOT PLAN



FLOOR PLAN

SCALE IN FEET
0 20 40

In addition to the foregoing primary components, the facility will include the required vacuum chambers, vacuum pumps, compressors, and gas reservoirs. A building will be provided as shown on the sketch to enclose the test section, to provide an explosion-safe enclosure for the launching guns and shock tube, and to provide space for model preparation and instrumentation.

JUSTIFICATION:

To accomplish vehicle recovery on Earth after orbiting the Moon or nearby planets such as Venus and Mars, or the landing of space vehicles on these planets, will require the solution of a number of technical problems, some of which are at present only vaguely understood. In the area of aerodynamics, the problems of atmosphere entry at speeds from those of near-Earth satellites to those in excess of the Earth's escape speed are severe. The general problem is one of arriving at a configuration that will withstand the radiant and convective aerodynamic heating, be statically and dynamically stable and controllable, and have the most advantageous values of lift and drag for the selected mission and trajectory. The solution of many problems in these categories depends upon laboratory research, not only in air at speeds up to 50,000 ft/sec, but also in gases representative of the atmospheres of other planets.

Existing facilities (firing ranges and shock tunnels) suitable for obtaining information on these problems are limited to speeds of about 15,000 or 20,000 ft/sec. Data are urgently needed in the gap from 20,000 to 50,000 ft/sec, for it is in this range that the thermal effects (dissociation, ionization, radiation, etc.) become important and determine the character of the gas surrounding the space vehicle. For example, at the entry speeds of IRBM and ICBM, radiant heating is relatively small and the heating problem is dominated by convective heating; however, as speeds are increased, radiant heating rapidly becomes important so that at speeds well below 50,000 ft/sec it becomes the dominant factor. There is also evidence that radiation may become important at lower speeds for gases typical of the atmospheres of other planets.

No single piece of ground-based equipment is capable of simulating all of the conditions (Mach number, Reynolds number, temperature) encountered by vehicles reentering the atmosphere from lunar or planetary flight with model size and flow durations that would permit detailed flow field, pressure and heat transfer measurements. Helium tunnels, for example, are particularly useful in the simulation of Mach numbers and Reynolds numbers with model sizes and flow durations sufficient to permit detailed study and direct measurements; they do not, however, duplicate thermal, or "real gas", effects which become of great importance at reentry speeds. Hypersonic free-flight facilities, on the other hand, correctly duplicate the effects of dissociation, ionization, and recombination on heat transfer rates and flow fields, and, in addition, permit the observation of model motions and the ionized flow field under actual flight conditions. This information, used in conjunction with more de-

tailed measurements from other ground facilities, will permit understanding and thus prediction of the behavior of actual space vehicles in flight.

The proposed facility will be designed to provide the required real-gas and free-flight information at speeds up to at least 40,000 ft/sec. It is similar in operating principle to, but highly advanced beyond, the supersonic free-flight wind tunnel which has been highly useful in providing information applicable to the design of the ICBM and reentry satellite vehicles, particularly Mercury, and which has been pushed to its practical limits.

The feasibility of achieving the speeds required in this facility is assured by recent advances in gun and shock tunnel performance, combined with successful achievement, in a small pilot facility, of the required time coordination between the gun and the shock tunnel.

The facility described herein will help make possible the rational design of manned satellites, vehicles returning from the moon and other planets, and space vehicles for entering the atmospheres of other planets. The information will be obtained at the correct speed of the full-scale vehicle and with other conditions closely simulating the environment to which the full-scale vehicles will be subjected. No existing facilities satisfy this need.

COST ESTIMATE:

Tunnel structure			$1,640,000
Test section		$595,000	
Nozzles		285,000	
Diffuser		195,000	
Vacuum system		285,000	
Support system		190,000	
Shadowgraph		90,000	
Shock tubes			785,000
Equipment			665,000
Vacuum pump		185,000	
High pressure compressors		190,000	
Launching guns		250,000	
Gun handling equipment		40,000	
Instrumentation			1,045,000
Facility control instrumentation		285,000	
Data taking instrumentation		760,000	
Pressure measuring equipment	$95,000		
Velocity/time instruments	480,000		
Photographic systems	185,000		

Building (22,000 square feet at $23.40 per square foot)	$515,000
Cranes	65,000
Utilities and paving	85,000
Design and engineering services	80,000
Total estimated cost	$4,880,000

CONSTRUCTION SCHEDULE:

Total estimated completion time	24 months

AMES RESEARCH CENTER

FISCAL YEAR 1962 ESTIMATES

LIFE SCIENCE RESEARCH FACILITY

MODIFICATIONS TO THE FLIGHT OPERATIONS LABORATORY

DESCRIPTION:

This project proposes the modification and equipment of part of the flight operations laboratory at the Ames Research Center for use as a Life Science Research Facility.

The space under consideration is located on the second floor of the flight operations laboratory and consists of approximately 3,600 square feet of relatively open area. The major portion of the area will be used for research on the design and development of flight payloads and on the biotechnological aspects of manned space flight, human control of remote vehicle systems, space crew selection and training, cabins and personal equipment for advanced aircraft, public health, and ground crew safety.

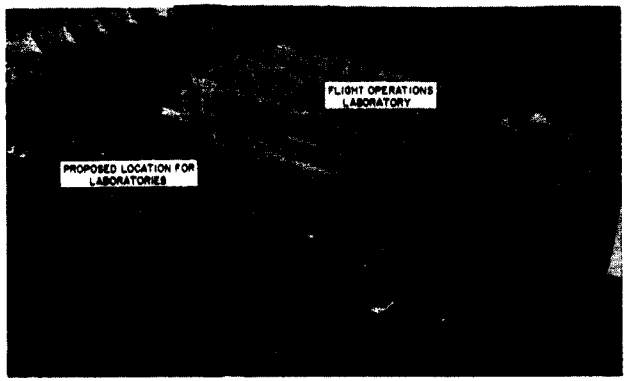
The proposed modifications are shown in the sketch on the following page.

JUSTIFICATIONS:

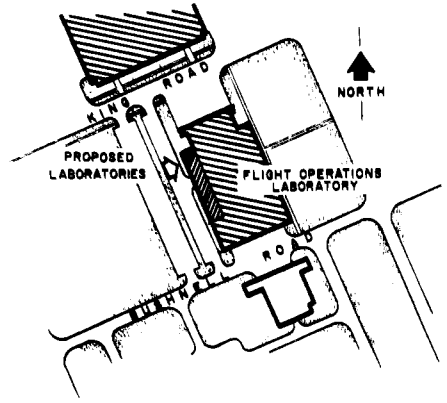
The establishment of a Life Science Research Facility is an essential step to appraise and supplement in terms of the needs of the NASA missions, the diversified bioastronautical activities of the various military, industrial, and university laboratories in this country. It is anticipated that the facility will provide the Office of Life Science Programs with the necessary and immediately available scientific advice to insure a sound over-all program and to aid in the evaluation of the major work and research projects outside of its intramural activities. It is in the framework of this concept that a Life Science Research Facility is urgently needed to accomplish the necessary biomedical participation with the NASA physical science and engineering components. Although it is planned to have the major part of the program conducted through grants and contracts, individuals with sufficient stature and full-time interest in space research are indispensable in securing the necessary degree of integration of life science and engineering data within NASA. The Life Science Research Facility will provide a means for acquiring and maintaining the necessary internal competence for over-all management and program cognizance.

AMES RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

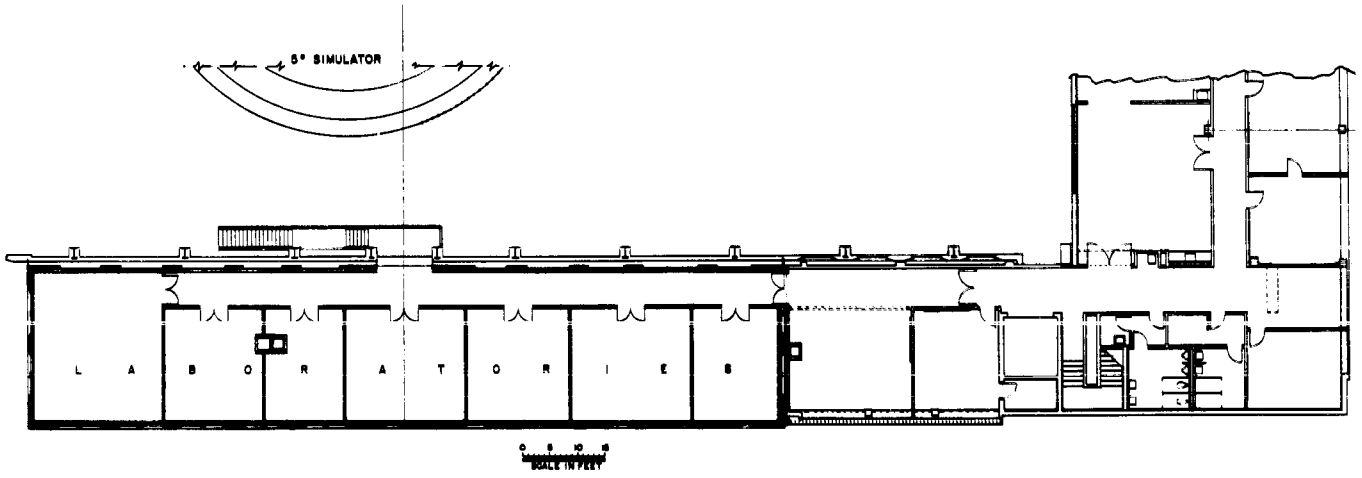
LIFE SCIENCE RESEARCH FACILITY
MODIFICATIONS TO THE FLIGHT OPERATIONS LABORATORY



PERSPECTIVE



PLOT PLAN



FLOOR PLAN

COST ESTIMATE:

Building modification (3,600 square feet @ $28.00 per square foot).....		$101,000
Structural and interior modifications, and sound control.....	$46,000	
Air conditioning and heating.....	35,000	
Electrical power and plumbing connections.....	20,000	
Research equipment.....		600,000
Human integration research equipment..	100,000	
Control system research equipment.....	100,000	
Life support research equipment.....	200,000	
Mock-ups and simulators.....	200,000	
Special building equipment.....		99,000
Exhauster systems.....	12,000	
Safety equipment.....	12,000	
Special laboratory gas and liquid distribution and handling systems....	15,000	
Special grounding, shielding, and instrumentation.....	60,000	
Total estimated cost...		$800,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 10 months

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

CONSTRUCTION OF FACILITIES - 1962 PROGRAM

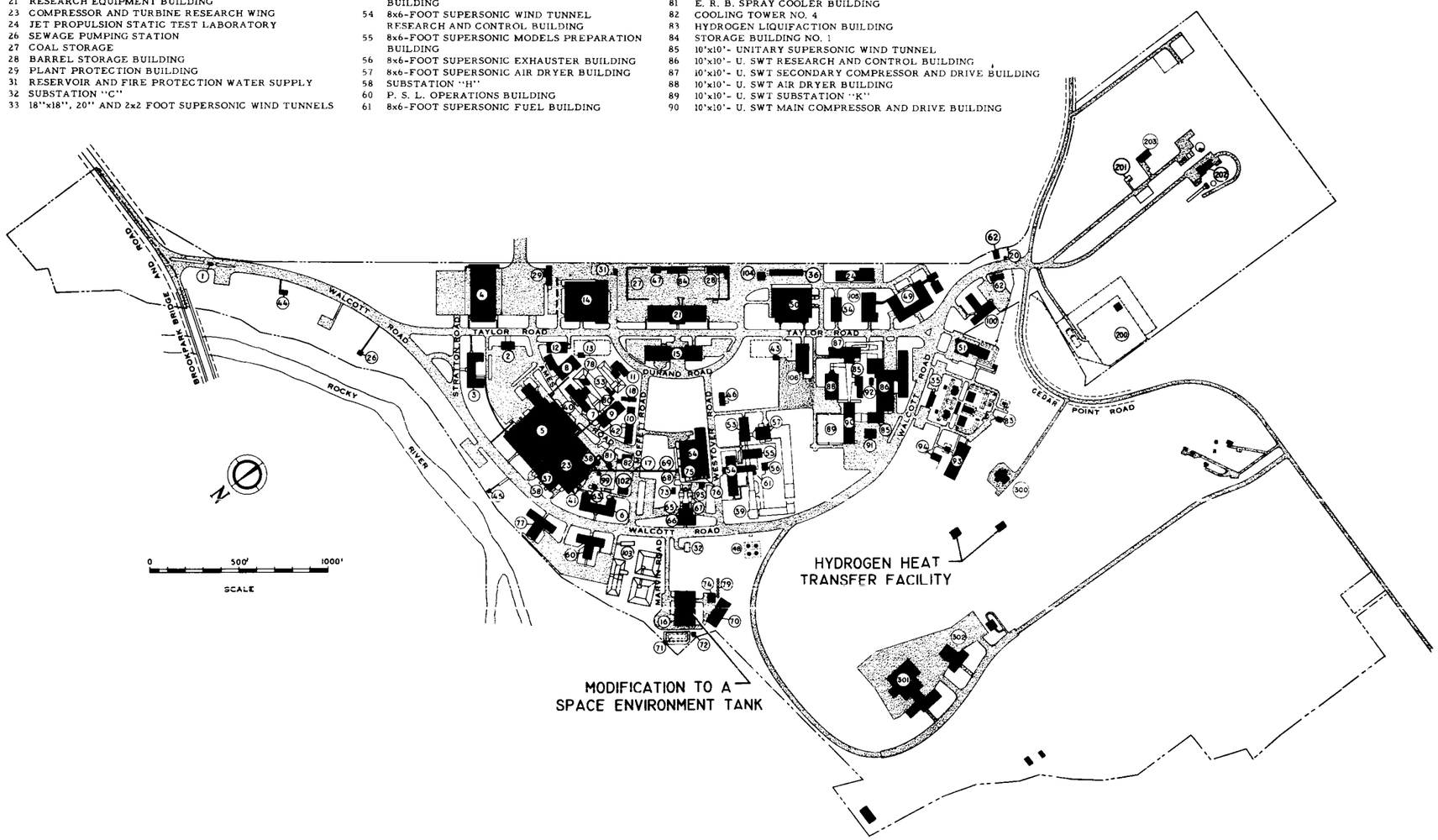
LEWIS RESEARCH CENTER

Page No.		
CF3-2	Location plan	
CF3-3	Hydrogen heat transfer facility.....	$2,550,000
CF3-6	Modifications to a space environment tank....	1,040,000
	TOTAL.....	$3,590,000

LEWIS RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES
LOCATION PLAN

STRUCTURE

1 GATE HOUSE (MAIN)
2 ADMINISTRATIVE SERVICES BUILDING
3 ADMINISTRATION BUILDING
4 FLIGHT RESEARCH BUILDING
5 ENGINE RESEARCH BUILDING
6 FUELS AND LUBRICANTS BUILDING
7 ALTITUDE WIND TUNNEL
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 GATE HOUSE
21 RESEARCH EQUIPMENT BUILDING
23 COMPRESSOR AND TURBINE RESEARCH WING
24 JET PROPULSION STATIC TEST 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", 20" AND 2x2 FOOT SUPERSONIC WIND TUNNELS
34 FUEL SYSTEMS AND CONTROLS LABORATORY
35 ROCKET LABORATORY
36 TEMPO "A"
37 EXHAUSTER EQUIPMENT WING
38 WEST WING EXTENSION
39 8x6-FOOT SUPERSONIC WIND TUNNEL
40 SUBSTATION "D"
41 SUBSTATION "F"
42 SUBSTATION "E"
43 SUBSTATION "G"
44 GAS METER HOUSE
45 JET PROPULSION FUELS LABORATORY
46 COOLING TOWER NO. 2
47 TRUNNION STORAGE BUILDING
48 FUEL STORAGE TANKS
49 MATERIALS AND STRESSES BUILDING
50 FABRICATION SHOP
51 HIGH ENERGY FUELS LABORATORY NO. 1
53 8x6-FOOT SUPERSONIC DRIVE EQUIPMENT BUILDING
54 8x6-FOOT SUPERSONIC WIND TUNNEL RESEARCH AND CONTROL BUILDING
55 8x6-FOOT SUPERSONIC MODELS PREPARATION BUILDING
56 8x6-FOOT SUPERSONIC EXHAUSTER BUILDING
57 8x6-FOOT SUPERSONIC AIR DRYER BUILDING
58 SUBSTATION "H"
60 P. S. L. OPERATIONS BUILDING
61 8x6-FOOT SUPERSONIC FUEL BUILDING
62 CONSTRUCTION OPERATIONS BUILDING
63 HIGH TEMPERATURE VAPORIZER BUILDING
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. MODERNIZATION PUMP HOUSE
79 P. S. L. COOLING WATER DEAERATORS
80 A. W. T. REFRIGERATION TURBINE BUILDING
81 E. R. B. SPRAY COOLER BUILDING
82 COOLING TOWER NO. 4
83 HYDROGEN LIQUIFACTION BUILDING
84 STORAGE BUILDING NO. 1
85 10'x10'- UNITARY SUPERSONIC WIND TUNNEL
86 10'x10'- U. SWT RESEARCH AND CONTROL BUILDING
87 10'x10'- U. SWT SECONDARY COMPRESSOR AND DRIVE BUILDING
88 10'x10'- U. SWT AIR DRYER BUILDING
89 10'x10'- U. SWT SUBSTATION "K"
90 10'x10'- U. SWT MAIN COMPRESSOR AND DRIVE BUILDING
91 10'x10'- U. SWT LOW PRESSURE FUEL PUMPING STATION
92 10'x10'- U. SWT HIGH PRESSURE FUEL PUMPING BUILDING
93 10'x10'- U. SWT COOLING TOWER NO. 5
94 10'x10'- U. SWT COOLING TOWER WATER PUMPING BUILDING
95 P. S. L. DESICCANT AIR DRYER
99 E. R. B. COMBUSTION AIR HEATER FACILITY
100 ROCKET ENGINE RESEARCH OPERATIONS BUILDING
102 HIGH ENERGY FUELS LABORATORY NO. 2
103 INDUSTRIAL WASTE TREATMENT BASINS
104 STORAGE BUILDING NO. 2
105 MATERIALS PROCESSING LABORATORY
106 BASIC MATERIALS LABORATORY (AUTHORIZED)
200 SUBSTATION "A"
201 SUBSTATION "L"
202 ROCKET ENGINE FACILITY
203 FRACTURE MECHANICS LABORATORY
300 ROCKET COMBUSTION LABORATORY
301 ION AND PLASMA JET FACILITY (UNDER CONSTRUCTION)
302 ENERGY CONVERSION LABORATORY (AUTHORIZED)



LEWIS RESEARCH CENTER

FISCAL YEAR 1962 ESTIMATES

HYDROGEN HEAT TRANSFER FACILITY

DESCRIPTION:

The facility proposed in this project is required for basic heat transfer studies utilizing hydrogen at very low (46°R or 46°F above absolute zero) and very high temperatures (up to 5000°R). It will consist of a 25 megawatt electric heater, a heat reservoir (pebble-bed type), and associated fluid storage and flow systems connected to a test section of 3-inch maximum throat diameter, wherein the research studies will be conducted. In order to keep the cost to a minimum and still obtain useful flow and temperature conditions, operation will be intermittent, thereby reducing the size of the electric heater required. Maximum heat flux levels comparable to those calculated for nuclear rocket nozzles (25 BTU/in^2/sec) will be attained in the simulated rocket nozzle test section.

The electric heater will serve a dual function: It will be used to heat the pebble-bed reservoir to a temperature of 4000°R over a period of hours at a low hydrogen flow rate; by means of a suitable valving arrangement, it will then be used to boost the temperature of the hydrogen as it emerges from the pebble-bed reservoir to 5000°R for short periods of time (one minute at the design flow conditions of 5 lbs/sec). Provision will also be made for continuous hydrogen flow at temperatures up to 4500°R at low flow rates and lower heat flux levels. The facility will be located at the Lewis Research Center since the quantities of hydrogen required (300-500 lbs) will not present a severe safety problem.

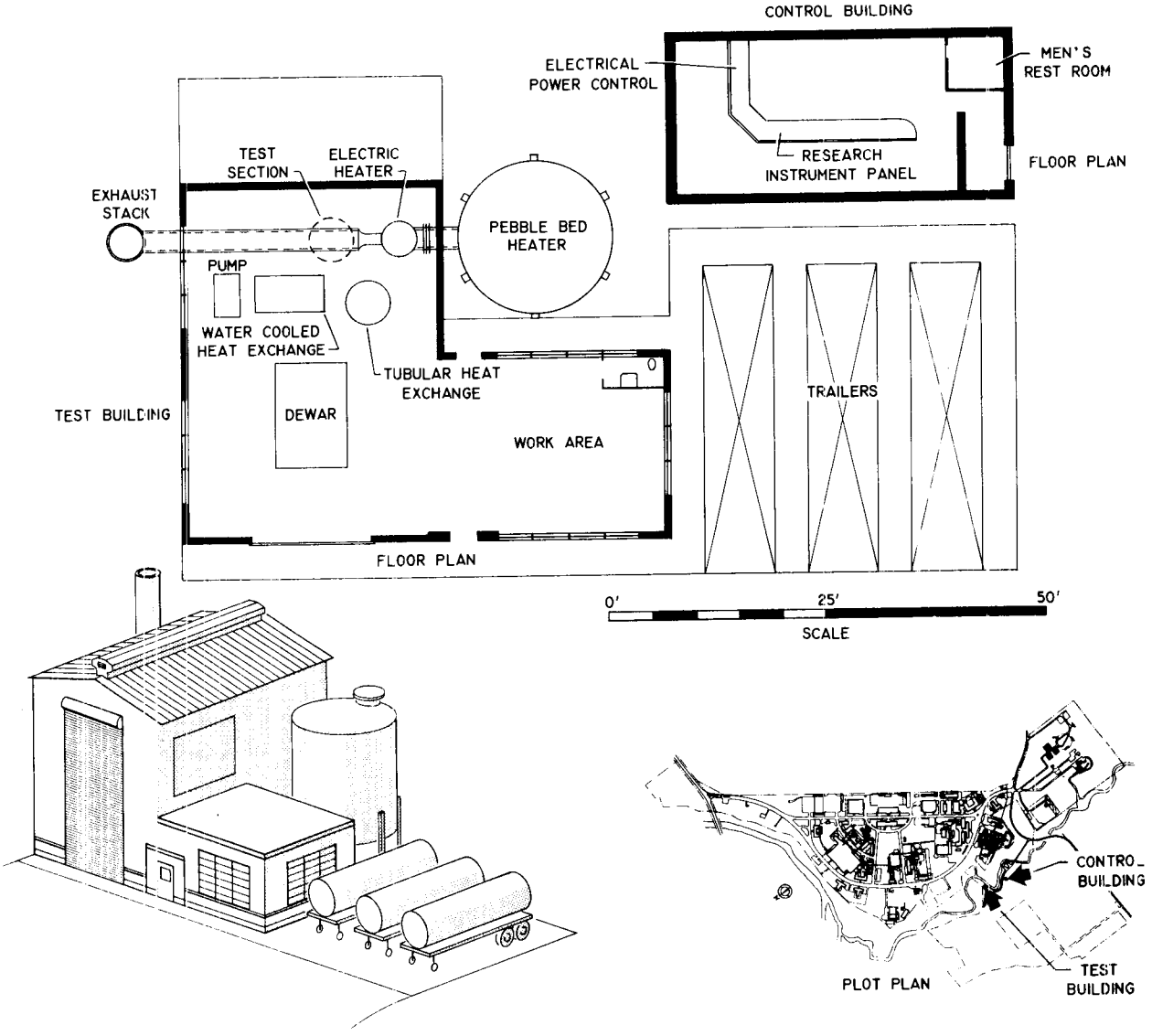
A sketch of the proposed facility is shown on the following page.

JUSTIFICATION:

Exhaust nozzles for nuclear rockets will be required to operate with hydrogen gas heated to temperatures in the range of 5000°R. The present state-of-the-art does not permit delineation of the heat transfer relationships required for the development of optimum flight type exhaust nozzles under these conditions. In order to understand and define nozzle cooling problems, it will be necessary to determine experimentally the heat transfer

LEWIS RESEARCH CENTER
FISCAL YEAR 1962 ESTIMATES

HYDROGEN HEAT TRANSFER FACILITY



characteristics of the hydrogen gas under the temperature and expanding flow conditions anticipated; and the heat transfer characteristics of the liquid hydrogen used for internal cooling, at the uniquely high ratios of nozzle wall to coolant temperature.

Full-scale tests of nuclear rocket nozzles would be desirable, except that the cost and complexity of such a test facility appears prohibitive. The facility proposed in this project will permit the scale-model evaluation of a majority of the heat transfer problems expected at the smallest feasible size. The inherent nature of this type of facility is such as to readily permit future expansion of flows, temperature, and pressure as the technology and requirements advance.

As the state-of-the-art develops, many more uses for high temperature flow systems are expected to appear, all requiring basic research in the areas of fluid mechanics and flow processes. The proposed facility will not be limited to applications for the nuclear rocket, but will provide a wide range of capability for fundamental high temperature studies of interest to electrical propulsion systems.

COST ESTIMATE:

Electrical power supply.....	$990,000
25 megawatt electric heater.....	165,000
Pebble-bed heat exchanger.....	350,000
Tubular heat exchanger.....	250,000
Fluid systems, including trailers and dewars..	370,000
Test sections.....	100,000
Test building (1,830 square feet @ $19.40 per square foot).....	35,500
Control building (800 square feet @ $14.00 per square foot).....	11,200
Site preparation and extension of utilities...	103,300
Design and engineering services.....	175,000
Total estimated cost....	$2,550,000

CONSTRUCTION SCHEDULE:

Total estimated completion time.....	18 months

LEWIS RESEARCH CENTER

FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO A SPACE ENVIRONMENT TANK

DESCRIPTION:

An environment chamber to simulate the temperature, pressure, and solar radiation of space is currently under construction. The test volume will be six feet in diameter by nine feet high. The walls will be cooled to 4°K (4°C above absolute zero), and pressures of 10^{-10} mm Hg or lower are expected. An arc light source will simulate solar radiation. The present liquid helium system will permit operation of the facility for a test run of 3 hours every 75 hours. The 75-hour period is required to accumulate enough liquid helium, at the rate of 100 liters per hour, to operate for 3 hours. With the solar radiation source off, 36 hours of continuous running will be permitted at 4°K.

This project proposes an increase in system capacity by adding three major pieces of equipment to the present helium system:

1. An additional 100 liter per hour helium liquefier to double the liquefaction rate. This liquefier would be installed in parallel with the present 100 liter per hour liquefier.

2. A closed cycle gaseous helium refrigerator system capable of removing 1000 watts of heat at 20°K. This refrigerator will be used for tank cool-down, thus conserving liquid helium, and to operate the facility when 20°K temperatures are required.

3. An additional storage system to double the helium storage capacity, a 7000 liter liquid helium dewar, and a gas storage container.

JUSTIFICATION:

Research in materials requires a facility for simulating space conditions. The space environment tank currently being constructed for propulsion research problems will also be suitable for materials research if operating times are increased by additions to the liquid helium system. The facility represents a major portion of the total helium liquefication capacity available at the Lewis Center, and will be frequently called upon to supply liquid helium for several "bell jar" type test devices now contemplated. These devices,

which will be used for fundamental studies, will reduce the vacuum capabilities of the main test chamber. The proposed increase in helium capacity will permit longer operating periods, will improve research results by reducing error due to non-equilibrium conditions, and will permit some investigations which might otherwise be impossible.

The modified facility will provide a means with which it will be possible to solve some of the material problems that are encountered by flight in space for extended times. Emphasis will be on determining which materials or combinations of materials have a useful lifetime in space sufficient so that they can be used with confidence for space applications in manned space vehicles. Some materials evaporate at ordinary temperatures in a hard vacuum, and at sufficiently high temperatures all materials will evaporate and disappear into space. Thus, the materials problems connected with radiation-cooling systems of space ship power plants and with parts of the heat collector system of solar power plants, for example, are serious and will be studied. Other materials problems that arise due to the vacuum environment include the increase in friction between moving parts and the potentially disastrous leakage from the vacuum through the vacuum seals. Assemblies of seals and anti-friction devices will be studied.

Long running times for materials research are particularly important. This requirement results partly from the low rate of approach toward equilibrium conditions at extreme vacuums with environmental and model temperatures near absolute zero. The deterioration of materials through evaporation and solar radiation may not become apparent if long exposures are prohibited. The modifications proposed in this project will allow a substantial increase in running time. For example, at 4°K with solar radiation, 11 hours of continuous research will be permitted every 50 hours, as opposed to 3 hours every 75 hours. A different mode of operation will permit 5.5 hours each 24-hour period. Continuous operation will be permitted either with solar radiation at 20°K or without solar radiation at 4°K.

COST ESTIMATE:

Helium liquefier	$310,000
Gaseous helium refrigerator	250,000
Liquid nitrogen storage	40,000
Installation	135,000
Extension of utilities	40,000
Building alterations	50,000
Piping and controls	100,000
Liquid helium storage	40,000
Gas storage container	30,000
Design and engineering services	45,000
Total estimated cost	$1,040,000

CONSTRUCTION SCHEDULE:

Total estimated completion time	15 months

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

CONSTRUCTION OF FACILITIES - 1962 PROGRAM

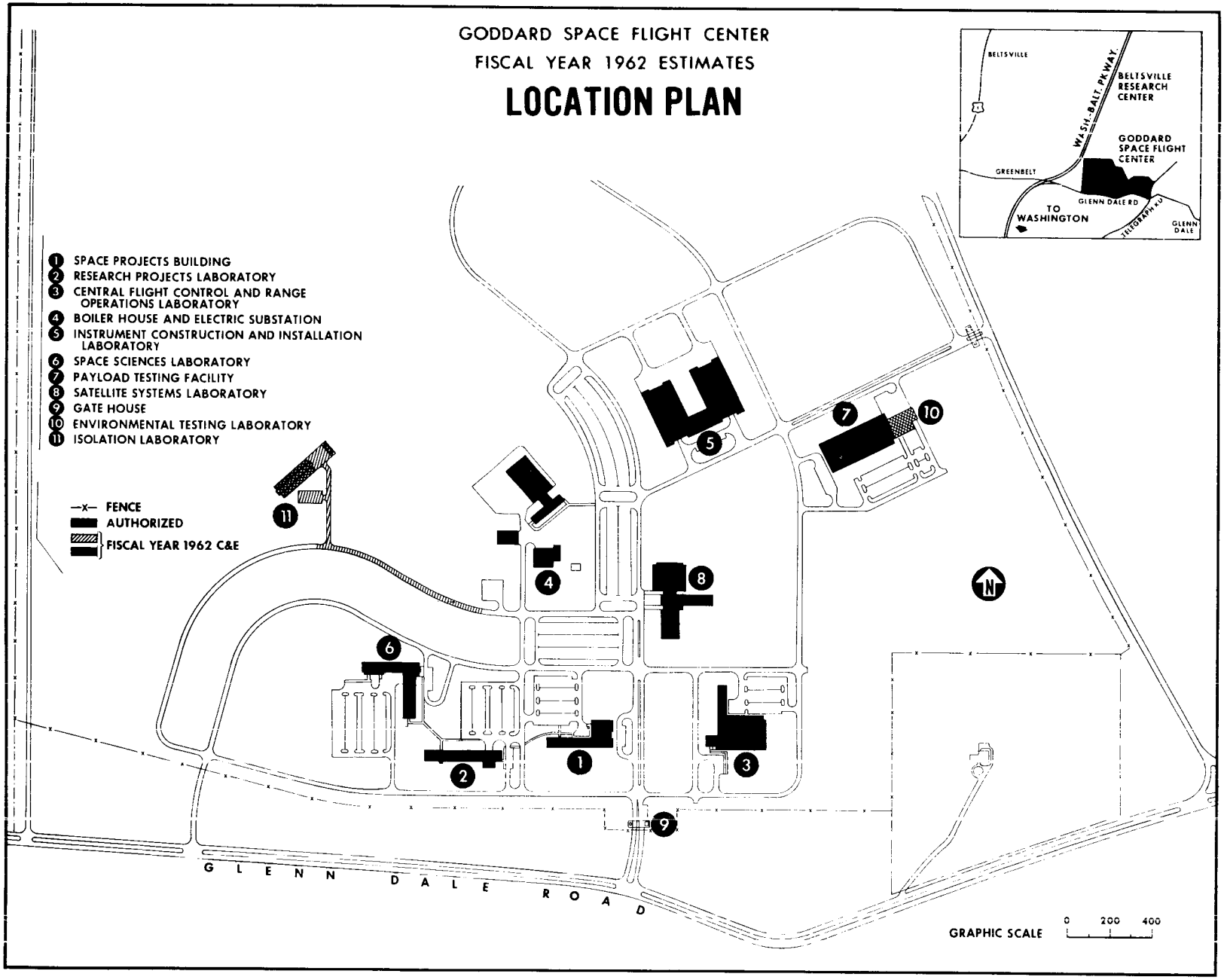
GODDARD SPACE FLIGHT CENTER

Page No.		
CF4-2	Location plan	
CF4-3	Environmental testing laboratory.....	$7,287,000
CF4-8	Advanced data processing equipment.....	1,150,000
CF4-11	Isolation laboratory.....	775,000
	TOTAL.....	$9,212,000

GODDARD SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

LOCATION PLAN



GODDARD SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

ENVIRONMENTAL TESTING LABORATORY

DESCRIPTION:

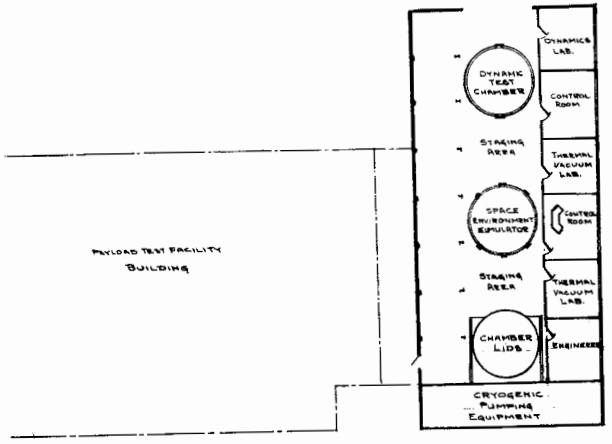
This project will provide the required building, facilities, and research equipment for the final checkout test of large spacecraft typical of the family launched by the Agena and Centaur vehicles, such as the Orbiting Geophysical Observatory and the Orbiting Astronomical Observatory. In the space environment with solar paddles extended, the maximum dimension of such spacecraft may be in the range of 20-25 feet with weights that may range from 4 to 8 thousand pounds. The project includes a dynamic test chamber in which the mechanical effects of the atmosphere will be eliminated, and a space environment simulator which will provide the effect of solar radiation and the coldness of outer space in combination with the vacuum environment. The building structure will provide space for spacecraft checkout and monitoring equipment and will also house the two vacuum chambers. The project will provide approximately 20,000 square feet of usable area. A sketch of the proposed laboratory is shown on the following page.

The dynamic test chamber will consist of a vacuum vessel 35 feet in diameter and 52 feet long from which the atmosphere can be exhausted to a degree sufficient to effectively eliminate the mechanical resistance of the air to large or rapid motions. Testing within the chamber will treat those facets of the spacecraft performance in which air resistance is of importance. Examples of such cases are dynamic balancing, spin-up tests, solar paddle erection, and vibration tests. Another type of testing which will be conducted in this chamber involves the checkout of control systems which employ gas jets for correction of spacecraft orientation. These tests require the reduced pressure both for elimination of air drag and for proper simulation of the operating environment of the jet nozzles. The contamination of the chamber caused by such tests precludes the use of the space environment simulator for this work. The chamber will be made of stainless steel and will be a duplicate in mechanical design of the space environment simulator described below. If required by future program needs, it can be readily modified to produce space vacuum. Spacecraft will be placed in the chamber by removing the complete top of the vessel, by means of an overhead crane used commonly with the space simulator. This will permit careful handling and expeditious testing. The vacuum pumping system will consist of mechanical pumps capable of reducing the pressure to approximately 1 mm Hg.

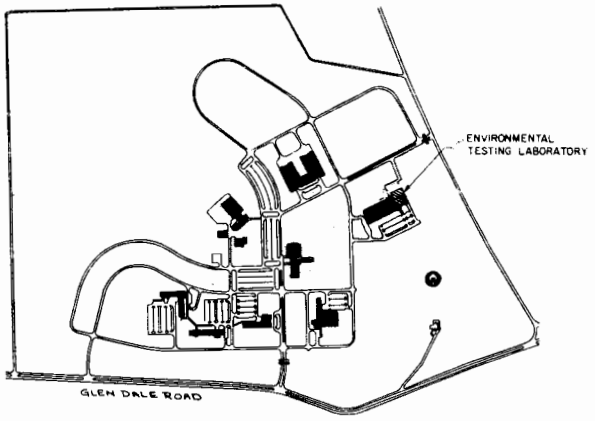
GODDARD SPACE FLIGHT CENTER

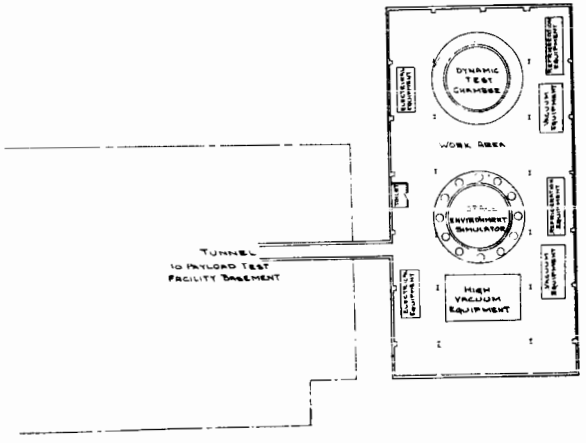
FISCAL YEAR 1962 ESTIMATES

ENVIRONMENTAL TESTING LABORATORY

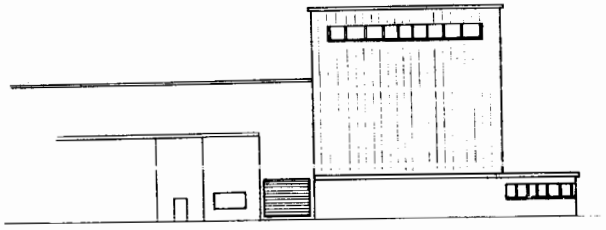


1ST FLOOR





BASEMENT



ELEVATION

GRAPHIC SCALE 0 25 50

The space environment simulator will be a large vacuum chamber of stainless steel approximately 35 feet in diameter and 52 feet long with a free working volume 30 feet in diameter and 40 feet long. Stainless steel is used for the chamber because of its low "out-gassing" properties, i.e., stainless steel releases a minimum amount of gas to add to the load on the vacuum system thereby reducing the amount of pumping capacity required to achieve space conditions in a reasonable time. Current vacuum technology requires a multi-stage pumping system to achieve a pressure density within the space environment simulator which will simulate that of outer space. The best available pumping system will be employed and will consist of mechanical blowers, diffusion pumps, and cryogenic walls. The mechanical blower will remove the bulk of the air mass; after the gas density is thus lowered, the diffusion pumps can continue the removal of the low density gas molecules. Finally, the cryogenic panels in which liquid nitrogen or helium can be circulated will freeze out most of the few remaining molecules. The system should produce a pressure of 1×10^{-8} mm Hg when in full operation. The actual pressure in the vessel will be dependent on the out-gassing properties of the spacecraft. The vessel will be provided with a source of simulated solar radiation and curtain walls chilled to approximately 80°K (-193°C) by means of liquid nitrogen. The projected utilization of the chamber indicates that after an initial charge of liquid nitrogen is purchased, it will be economical to reliquify it after it passes through the walls and changes to a gaseous state. Accordingly, a reliquifier has been included in this project. This will permit determining the validity of temperature predictions and of thermal gradients which might exist within the spacecraft in orbit. It will also be possible to control the curtain wall temperatures in the range of -65°C to +100°C for application in tests where solar simulation is not required or desirable. Operation of the space environment simulator will be controlled and monitored from a centralized location. Spacecraft will be placed in the chamber interior by removing the complete top of the vessel. This will permit careful handling of the spacecraft and the rapid erection time required for expeditious testing. An air lock will be provided to permit a space-suited man to enter the chamber and make minor adjustments to the spacecraft.

JUSTIFICATION:

The philosophy of ground environmental testing of spacecraft can be defined as an effort to reduce or eliminate the margin of error. Ignorance factors in design which may result in the malfunction of components or complete spacecraft are not tolerable from an economic or from a scientific point of view. The cost of firing a single launch vehicle such as an Agena or Centaur is approximately equal to the cost of the proposed environmental testing laboratory. Since spacecraft costs often approximate launch vehicle costs, the discovery of potential failings in one spacecraft in ground tests would more than recover the cost of the facility.

Tests of individual components and sub-assemblies of spacecraft eliminate many potential failings. However, when the integration of the system is complete, the interactions of the elements are so complex that prediction of performance under the dynamic conditions of propulsion and the thermal and vacuum conditions of orbital flight cannot be made on an analytical basis. Tests of the actual spacecraft intended for flight are therefore required. Similarly, environments which occur in combination during the life of the spacecraft have unpredictable interactions. The proposed facility is intended to produce such combined environments in as realistic a manner as feasible.

The dynamic test chamber will provide for test of mechanical actions which normally occur under vacuum conditions and which would be improperly simulated if tests were carried out under ground-atmospheric conditions. An example is the erection of solar paddles. If the paddles are permitted to unfold at sea level pressure, the air resistance will so slow the action that the structural strength of the stopping and latching mechanisms will not be fully tested. Similarly, balancing with solar paddles extended gives unreal results if conducted in air. Air can also act as a damping medium for vibrations of light structures with large surfaces.

Since a major portion of the spacecraft life is spent in space vacuum, high reliability can be enhanced by ground testing in this environment prior to launching. Some of the principal space environment factors are the coldness of outer space, solar and earth radiation, vacuum of space, ionization radiation, meteoritic impacts and zero gravity. Technological limitations currently preclude realistic simulation of the last three factors. The other factors are chiefly concerned with the thermal cycles, heat balance and temperature extremes experienced by the spacecraft. These effects are critical in the spacecraft design. While scientific theory and analytical procedures permit design calculations, the many simplifying assumptions must be verified by the test of the final spacecraft which is a most complex structure. It is often necessary to control the temperature within a few degrees centigrade for the proper operation of scientific instruments and experiments aboard the spacecraft. This may be achieved by regulating the heat balance among the solar and earth radiation received by the spacecraft, and the radiation of its own heat, generated from the on-board power sources, to outer space. The complexity of this problem with large spacecraft is so great that experimental verification must be made under test conditions simulating outer space. Failure to do so could negate the entire mission. An entire spacecraft can be evaluated and any interface problems between different experiments arising from space operation can be determined and resolved.

The construction of the environmental testing laboratory is required to meet flight unit acceptance tests on the Orbiting Astronomical Observatory, Oribiting Geophysical Observatory, and Nimbus class spacecraft

during late calendar year 1962 and 1963. The urgent need for the vacuum chambers has dictated completion of the detailed engineering design drawings and specifications for the facility under the Administrator's emergency authorization during the fiscal year 1961.

COST ESTIMATE:

Building construction (1,000,000 cubic feet at $1.15 per cubic foot)		$1,152,000
Dynamic test chamber		1,300,000
Vacuum chamber	$650,000	
Mechanical vacuum pumps	100,000	
Instrumentation and controls	225,000	
Dynamic balance and spin equipment	325,000	
Space environment simulator		4,435,000
Vacuum chamber	650,000	
Vacuum system	540,000	
Heat transfer system	430,000	
Instrumentation	450,000	
Solar simulator	975,000	
Nitrogen reliquifier	850,000	
Facility extensions	230,000	
Data handling system	250,000	
Field testing	60,000	
Utility installations and site development		400,000
Extensions to roadways and utilities	50,000	
Additions to central power plant, heating, and cooling equipment	350,000	
Total estimated cost		$7,287,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 16 months

GODDARD SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

ADVANCED DATA PROCESSING EQUIPMENT

DESCRIPTION:

Additional advanced data processing equipment is required to expand the capability of existing facilities to meet the data reduction requirements resulting from the increased number of satellite experiments to be carried out in the polar orbiting geophysical observatory, the eccentric oribiting geophysical observatory, the orbiting astronomical observatory, and the Nimbus projects. These experiments will all be characterized by high resolution and data transfer rates. The wide-band telemetry systems planned for the satellites will be coordinated with the advanced data processing facilities in order to expedite data handling. The normal flow of experimental data will be as follows: recordings received from the field will be reproduced for analog and/or digital editing as appropriate; edited tape recordings will be converted to computer tapes or analog displays; digital computer tapes will be processed by computer; and digital computer output tapes will be tabulated by high-speed printer or processed through digital plotters.

The following types of data processing equipment will be added to existing facilities:

Magnetic tape reproducers and recorders: Tape playback and recording units will be used to make duplicate tapes when required, to play back the field recorded data to the data conversion units, and to record the outputs of the data conversion units. Standard bandwidth and wide band units are included. The standard bandwidth devices will be similar to those used in the field stations. The 1.0 megacycle wide band units will be of a type developed for specialized instrumentation applications. The 4.5 megacycles wide band unit will be similar to those developed for television tape recording.

Data conversion equipment: Three sets of data conversion equipment will be provided, each set consisting basically of electronic units used to convert data coded by the satellite telemetry system to data formats acceptable to the central data processing computers. The playback from the magnetic tape units will be edited by electronic "logic" units in accordance with programmed instructions to select significant data for processing. The selected data will then be converted to computer code (again in accordance with programmed instructions), coordinated with timing codes derived from the original tape, and fed to the output tape recorder. Diagnostic test units will be built into these complex conversion systems to provide for quick isolation and repair of component failures.

Data printing and plotting equipment: Two digital plotters will be provided to accept digital information either directly from the computer or from computer tapes and will record experimental results in graphic form. A high-speed printer that will print at about one thousand lines per minute from tapes prepared by a computer will also be procured.

JUSTIFICATION:

As satellite spacecraft increase in size and weight carrying capability, it becomes possible to include more experiments in each unit. The experiments also are changing in nature, with the trend being toward wide band, high resolution data. To provide adequate data handling capabilities, the telemetry systems proposed for the new, larger satellites use digital techniques. As some experiments require good time resolution and others can be accommodated with slow-speed switching, it becomes necessary to make provision for flexible assignment of the channel capacity of the telemeter. This flexibility must be matched in the ground data conversion equipment.

The equipment on hand will be reworked or modified whenever possible, but the increase in work load and the changing requirements make it necessary to procure new equipment specifically designed and developed to handle the large variety of incoming data most expeditiously. Rapid conversion of the large amount of processed data collected from the satellite projects to numbers or graphs which the experimenters can use in their final reports can be accomplished only through use of electronic or electromechanical instruments designed for this purpose.

Magnetic tape reproducers and recorders are required for several functions in data processing procedures, the most important of which is the playback of telemetered data recorded in the field. Standard bandwidth units are required to handle ordinary recordings and to convert to electrical signal inputs for the data conversion systems. Standard units will also be required in conjunction with the wide band systems for the development of processing procedures which will compress the playback time by playback on a high-speed reproducer of tapes originally recorded at low speed; for editing of tapes before initiating final conversion; and for playback for analog processing of limited quantities of the data. The tape units with wide band capabilities will be used to provide the data processing group with equipment for the development of operational processing equipment for the very wide band telemeters now being planned for the observatory class of satellites. Time compression techniques for high-speed processing will be investigated.

The newer satellites will be using advanced telemetry systems which are more directly adaptable to automatic data processing with digital machines and provide greater flexibility in meeting channel assignment requirements. Three data converters will be required to convert the data from these advanced telemetry systems into a form suitable for final data processing by large scale digital computing machines. The number of

satellites which will require simultaneous data processing makes it necessary to plan for three sets of conversion equipment. The individual sets will be flexible enough for a change over to accommodate the different satellite telemetry formats. It will be more economical to transfer telemeter data first to the conversion unit and then to the digital computer than to tie up the central computer with a single data processing requirement. The conversion equipment also permits the introduction of an editing process, which will eliminate noisy or useless data from the machine processing sequence.

In almost all cases the tabular results of the data reduction process must be plotted on charts or graphs for interpretation by the experimenters. Manual plotting of this tabular data is time consuming and expensive. The plotters to be provided will speed the interpretation of large volumes of data by providing charts or graphs directly from the computer tapes without manual intervention. The high-speed printer is required to handle the large volume of data which will be collected from future satellites. The only printing equipment presently available is a conventional line printer, and it is currently being used to capacity.

COST ESTIMATE:

Data conversion equipment (three systems including test instrumentation and spares).....		$350,000
Magnetic tape reproducers and recorders.....		300,000
Standard bandwidths - six units.....	$100,000	
1.0 megacycle bandwith - two units.....	120,000	
4.5 megacycle bandwidth - one unit.....	80,000	
Data printing and plotting equipment.....		500,000
Digital plotters - two units.....	200,000	
High-speed printer - one unit.....	300,000	
Total estimated cost.....		$1,150,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 10 months

GODDARD SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

ISOLATION LABORATORY

DESCRIPTION:

This project proposes the construction and instrumentation of a laboratory to study, develop, and evaluate equipment and techniques in the following areas:

1. Jet-type controls for orientation and stabilization of spacecraft.

2. Evaluation and qualification tests of low thrust level rockets for orbit trimming, inflight course correction, retro firing, and landing manuevers.

3. Separation techniques for mechanical and electrical interfaces between spacecraft and launch vehicle, spacecraft to "piggy-back" payloads, and for canisters suitable for containing inflatable payloads applicable to passive communications satellites; and for the release and erection of structures such as booms and accessories.

The laboratory, as indicated in the sketch on the following page, will be constructed in an isolated location separated from the major office type buildings at the Goddard Center. The structure will be provided with strong walls between test areas but with etched glass blow-out windows to accommodate test component failures without hazardous pressure build-up within the rooms.

Remote test pads will be designed to test the small rocket motors being developed for orbit-trimming and course correction. These devices must necessarily be small in order not to interact adversely with the spacecraft or launch vehicles. The adjacent control room will provide, in addition to the test control function, space for data recording equipment. Rapid response data recording equipment and other special support and research equipment will be provided as indicated in the cost breakdown.

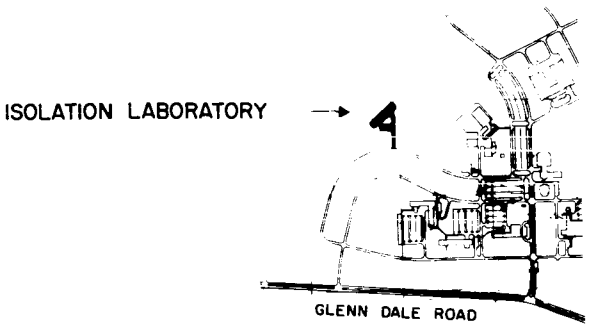
JUSTIFICATION:

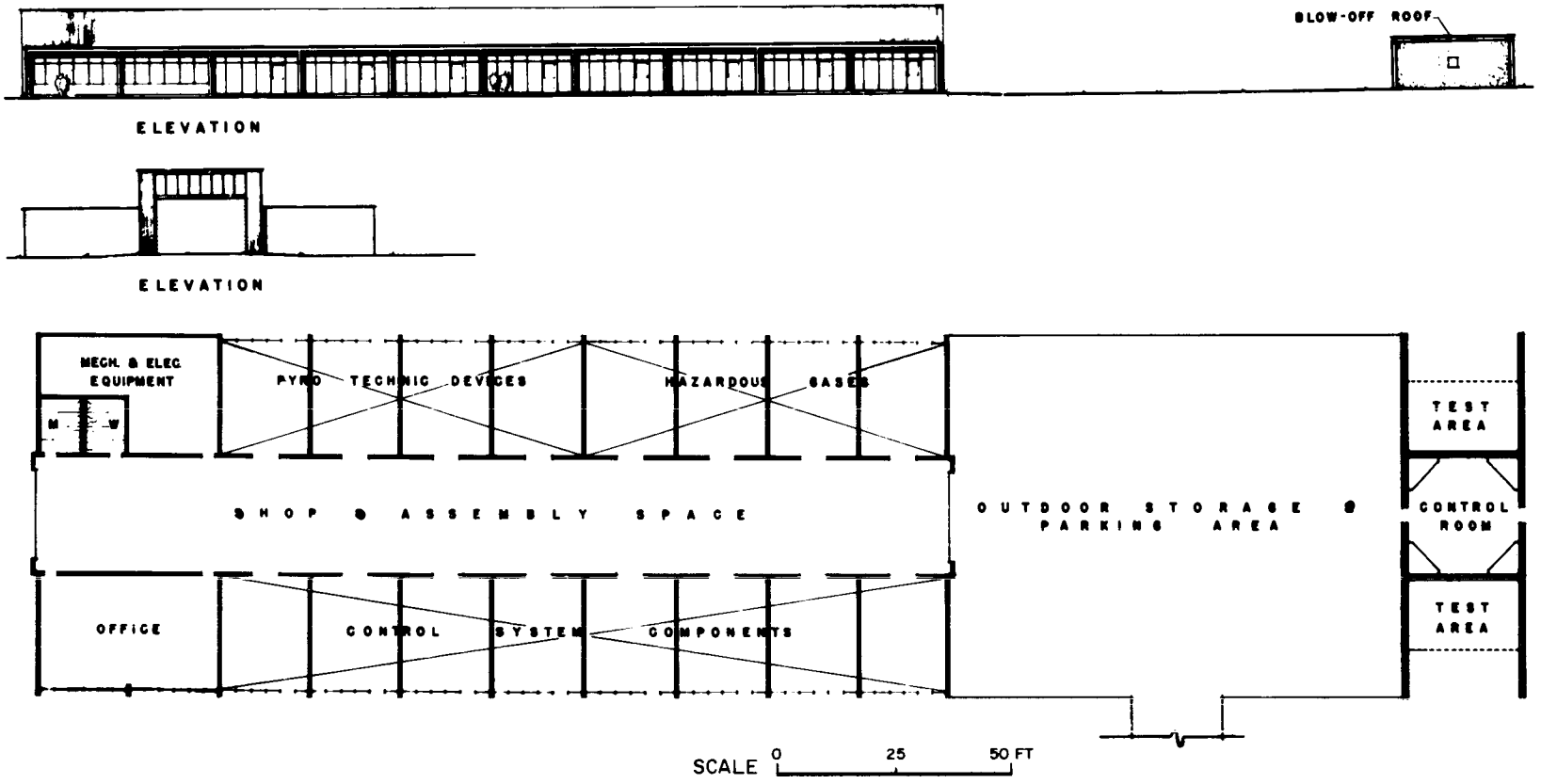
This laboratory is needed to provide a base for the study and evaluation of equipment and techniques required to fulfill NASA space missions scheduled during the period 1963-1970 and beyond, such as the geophysical, meteorological, and communication satellites and space observatories. These missions involve such rigorous performance requirements and external environments that many new concepts and unique components and systems undoubtedly will be needed.

GODDARD SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

ISOLATION LABORATORY





The development of flight-weight control systems for precise attitude orientation, orbit trimming, and midcourse correction requires the investigation and development of a wide variety of configurations utilizing different fabrication techniques, materials and propellants. These systems will consist of storage vessels, pressure and temperature regulators, valves, actuators, and thrust nozzles for cold gas, liquid, and combustible propellants. In addition to the facilities for both static and dynamic evaluation, component and system assembly and checkout areas are required. Because of volume limitations, gaseous propellants will be stored at pressures up to 6,000 psi. The investigation of such high pressure flight systems which are designed near the stress limitations of the materials will be hazardous and will require a remote test site. Similar problems arise in the investigation of high pressure liquid systems using such propellants as water vapor. In the area of the development and proof testing of small thrust systems for orbit trimming and midcourse correction, various hazardous propellants will be investigated. The compatibility between the propellants and pressure vessel for long periods of time indicates investigations both from an operational and environmental viewpoint.

The evaluation of precise separation and accurate control concepts and systems and the attainment of the requisite reliability requires a facility at the Goddard Center where extensive and intensive performance testing of components and systems can be conducted and determination of their mutual interactions can be made. The use of pyrotechnic devices, squibs, explosive bolts, cable cutters, etc., are probable approaches to separation and release functions which must be investigated in remote areas.

COST ESTIMATE:

Building (200 by 75 feet; 15,000 square feet at $20.00 per square foot)		$300,000
Test pads and instrumentation		25,000
Utility connections and site development		150,000
Research equipment		250,000
High-speed motion picture cameras	$12,000	
Closed loop television systems	9,000	
Leak detection equipment	13,000	
Pneumatic test stand and gas booster	40,000	
Hydraulic test stand and supply	16,000	
Dynamic test fixtures	45,000	
Function generators, tuning systems and response analysis equipment	25,000	
Flow, pressure, temperature, and thrust sensors	15,000	
Recording oscillograph	40,000	
Instrumentation for control and recording room	35,000	

Design and engineering services.....	$50,000
Total estimated cost.....	$775,000

CONSTRUCTION SCHEDULE:

Total estimated completion time.....	24 months

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

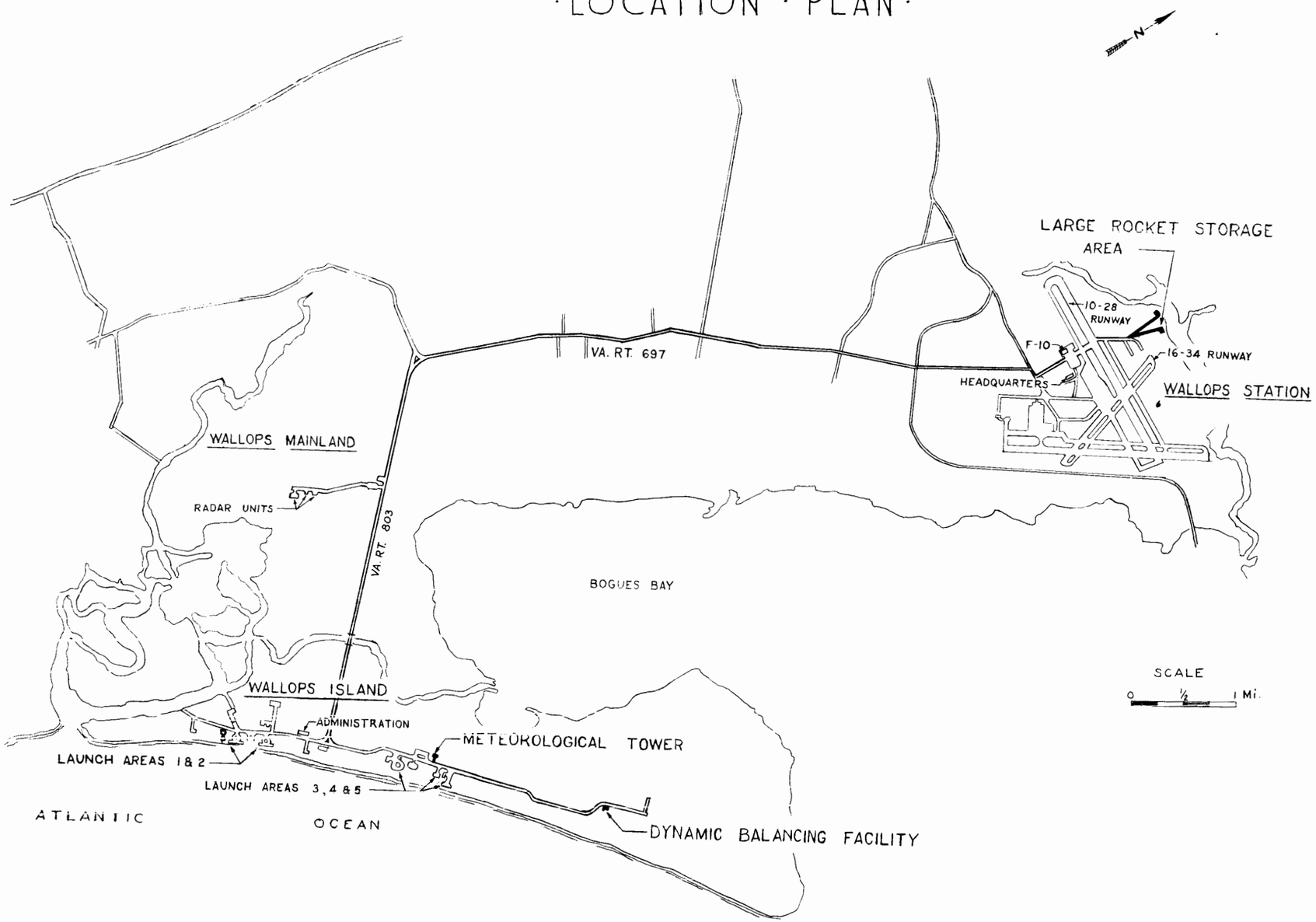
CONSTRUCTION OF FACILITIES - 1962 PROGRAM

WALLOPS STATION

Page No.		
CF5-2	Location plan	
CF5-3	Advanced tracking systems.....	$4,845,000
CF5-6	Dynamic balancing facility.....	843,000
CF5-9	Modifications to range safety systems.....	225,000
CF5-12	Rocket storage area.....	400,000
	TOTAL.....	$6,313,000

WALLOPS STATION
FISCAL YEAR 1962 ESTIMATES

· LOCATION · PLAN ·



WALLOPS STATION

FISCAL YEAR 1962 ESTIMATES

ADVANCED TRACKING SYSTEMS

DESCRIPTION:

It is proposed to provide increased tracking facility capabilities for the Wallops Station to include near real-time data display. The improvements will be accomplished by augmenting the existing tracking systems as follows:

1. Provide acquisition computers for use with the Wallops AN/FPS-16 and the Mod II radar tracking systems. Use of these computers will permit acquiring of orbital and ballistic targets from digital data supplied by other organizations such as Goddard Space Flight Center.

2. Modify the AN/FPS-16 and the Mod II radars to provide greater range capability. These modifications will include increases in the receiver sensitivity and the installation of extended range tracking units.

3. Provide digitalization and data transmission capability for the precision trajectory determination system to obtain near real time position and velocity data. The precision trajectory determination system which is being provided in the fiscal year 1961 budget is not capable of providing near real-time.

4. Provide a high power pulse doppler radar system to operate in conjunction with the precision trajectory determination system to obtain range rate passively, that is, without the use of special vehicle borne beacons.

JUSTIFICATION:

Improved tracking capability is required to increase the reliability, performance, precision, and range of the existing tracking systems. With the advent of long-range rocket systems to be launched from the Wallops Station, it is required that the trajectory parameters be accurately determined in real-time for guidance and control purposes. Another prime requirement for the above systems is to feed data to real-time range safety displays needed for determining whether a vehicle is on course or errant.

The Wallops Station is frequently required to track vehicles either in orbit or being injected into orbit after launching from the Atlantic Missile Range. To acquire targets of these types it is necessary that the Wallops radar trackers have the capability of accepting trajectory

and orbital data determined from remote tracking systems. This data will then be processed by acquisition computers from which the radar pointing data will be derived. At present, there are no means of providing near real-time pointing data for the FPS-16 and Mod II radar systems installed at the Wallops Station. The addition of the acquisition computers will provide this capability and enable the station to provide satellite tracking when required.

The existing AN/FPS-16 and Mod II radars have limited range tracking capability. For example, the FPS-16 has a range unit which mechanically is capable of tracking unambiguously to 500 miles, and a system sensitivity such that it can track reflection from a target the size of a Vanguard 21" satellite to a range of approximately 55 miles. With the advent of long range rocket systems such as Scout and its successor to be launched from the Wallops Station, additional tracking range capability is required to follow vehicle borne beacons beyond 500 miles. This will be accomplished by the addition of a range unit capable of tracking unambiguously to 5000 miles. For the smaller research type vehicles (i.e. the size of a Vanguard 21" satellite for example) having severe payload weight restrictions, it is necessary to improve the radar system sensitivity in order to increase the skin track range (i.e. tracking by reflected energy) since these vehicles have no beacons. The system sensitivity will be improved by the addition of a parametric amplifier to increase the skin track range by approximately 60% for the FPS-16 and 50% for the Mod II radars. The modifications of these two radars by the addition of parametric amplifiers to improve the system sensitivity and the replacement of the range unit with others having greater unambiguous distance measuring capability is required for the planned vehicles such as Scout, Javelin, and Trail Blazer to be launched from the Wallops Station. The proposed modifications to the radar tracker will improve both the skin and beacon track capability of the existing radars.

The precision trajectory determination system which is being provided in the fiscal year 1961 budget is not capable of providing near real-time position and velocity data. Future trajectory control and the current range safety requirements of research vehicles including those launched by the Scout boosters require near real-time determination of precise position and velocity data. Near real-time accurate position and velocity data must be obtained while the vehicle is under propulsion since this is the only time when corrective or abort action can be taken to effect control desired. The control desired can be of several types. For example, in the case of certain re-entry tests specific aerodynamic conditions must be obtained to satisfy the experiment (i.e. the relationship of the dynamic and static pressures must follow predetermined patterns which therefore requires command control based on near real-time data). The digitalization and data links are therefore required for command control of stage firing which will obtain the conditions needed for the experiment or in similar manner for vehicle abort in case of an errant flight.

Payload weight restrictions imposed on many vehicles launched from the Wallops Station dictate that accurate trajectory data be obtained

passively also in near real-time. The precision trajectory determination system which obtains this data in an active mode must therefore be augmented by a high power pulse doppler radar system which will determine accurately the range rate of a vehicle in a passive mode. The FPS-16, when modified as described above, will provide in near real-time and passively, accurate range. However, to obtain range rate of adequate accuracy, the pulse doppler system which determines range rate accurately in near real-time and in a passive mode, will be installed adjacent to the precision trajectory determination system. It will consist of a high power transmitter, antenna, and receiving system which will be integrated into the precision trajectory determination system.

COST ESTIMATE:

Building modifications		$100,000
Acquisition computer		75,000
Modifications to trackers		690,000
Pulse doppler system		2,800,000
Digital data link		500,000
Interface electronic equipment		200,000
Support and test equipment		480,000
Collimation tower and beacon	$80,000	
Interstation data connections	150,000	
System integration services	250,000	
Total estimated cost		$4,845,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 22 months

WALLOPS STATION

FISCAL YEAR 1962 ESTIMATES

DYNAMIC BALANCING FACILITY

DESCRIPTION:

This project provides for the construction of a facility for balancing and aligning rocket motors and rocket vehicles. The project includes a building with the necessary protective devices required for working with live propulsion systems. The remote control room of the facility will be bomb-proof and the entire building will be fire and explosion proof. The equipment for the project includes a balancing rig, drive system, overhead crane, and related instrumentation. The equipment will allow components as well as assembled units to be balanced to reveal any deficiencies in the payload under typical flight conditions so that any necessary corrections can be made prior to launching. A sketch of the proposed facility is presented on the following page.

JUSTIFICATION:

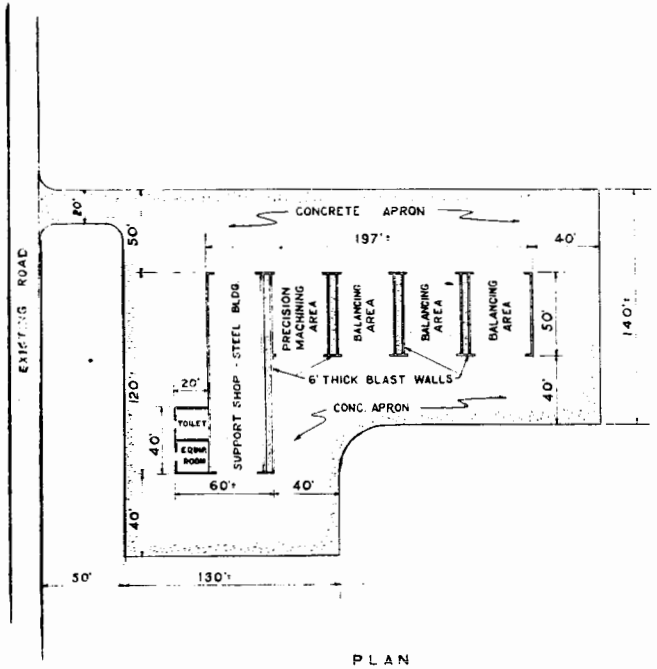
A dynamic balancing facility is urgently needed to improve the reliability of all rocket vehicles and, in particular, to improve the reliability of those vehicles which must be spin-stabilized. The proposed facility will provide a means for accurately determining the alignment and the dynamic and static balance of large rocket vehicles such as the D-58 and the Scout which must be stabilized in flight either by spinning or by a control system. The small balancing rig and area currently available are capable of handling vehicles of only 8 feet or less in length; current and planned programs require rocket configurations up to 32 feet in length to be balanced and spun prior to flight. Several separate units are required to cover the full range of current and proposed rocket combinations. For example, the D-58 vehicle requires that all three upper stages be balanced as an integral unit. The first stage of Scout and other first stages such as Sergeant require balancing on special rigs, not suitable for other uses. At present, only static balancing is practicable for large rockets.

COST ESTIMATE:

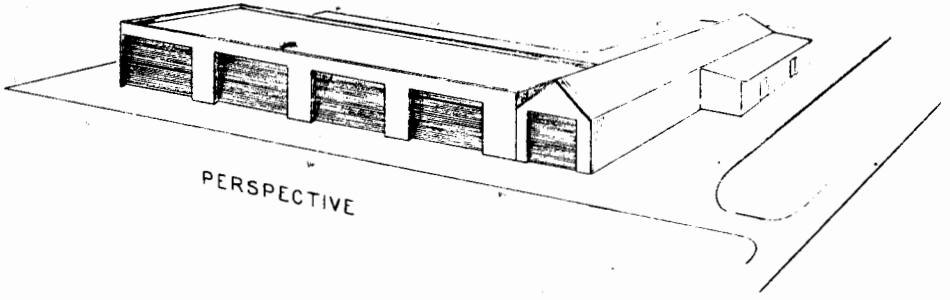
Site preparation.....	$29,000
Building (L shape, 24 feet high, 160 by 50 feet and 120 by 30 feet sections; 11,600 square feet @ $37.00 per square foot).....	429,000

WALLOPS STATION
FISCAL YEAR 1962 ESTIMATES

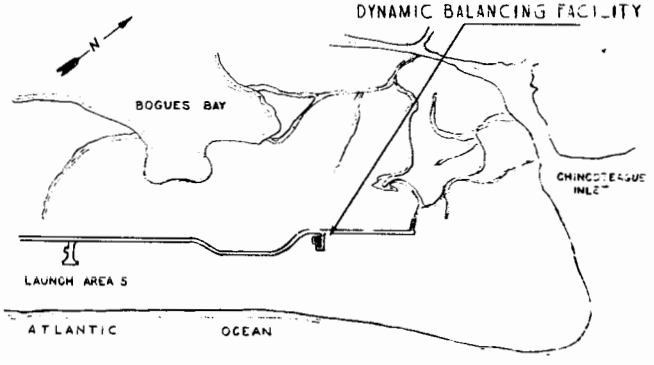
DYNAMIC·BALANCING·FACILITY·



PLAN
DYNAMIC BALANCING FACILITY
SCALE 1" = 30'



PERSPECTIVE



LOCATION PLAN

0 0.5 1.0 MILE

Utilities		$110,000
Electrical power connections	$40,000	
Roads and aprons	50,000	
Water connections	20,000	
Balancing equipment		170,000
Instrumentation		71,000
Design and engineering services		34,000
Total estimated cost		$843,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 18 months

WALLOPS STATION

FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO RANGE SAFETY SYSTEMS

DESCRIPTION:

This project will provide the following additional equipment necessary for range safety:

1. A real-time (no time delay) telemetry display to permit specific onboard instrumentation during flight to be monitored from the ground.

2. A 300-foot meteorological tower at the north launch areas for wind measurements prior to launching to assure proper wind corrections at launch to obtain required trajectories. The location of the proposed tower is indicated in the sketch on the following page.

JUSTIFICATION:

To insure range safety, and at the same time avoid destroying vehicles unnecessarily, it is essential that the Wallops Station be equipped to record and display such vehicle parameters as attitude (pointing) and rates of change of attitude as they are being measured by onboard instrumentation in real-time. The present system of real-time telemetry read-out is not adequate in capacity, range, or precision to meet the requirements of the range due to the increased numbers of launching areas at Wallops, to the stepped up launch schedule, and to the increased range of vehicles being launched. The real-time telemetry display being requested in this project will overcome these deficiencies in conjunction with the advanced tracking systems also being requested for the fiscal year 1962.

Studies of wind profiles conducted in the past year have disclosed that a separate meteorological tower is required at the North end as well as at the South end of Wallops Island. At the present time a meteorological service is provided under contract with the Weather Bureau for the South end; the contract will be extended to cover the North end.

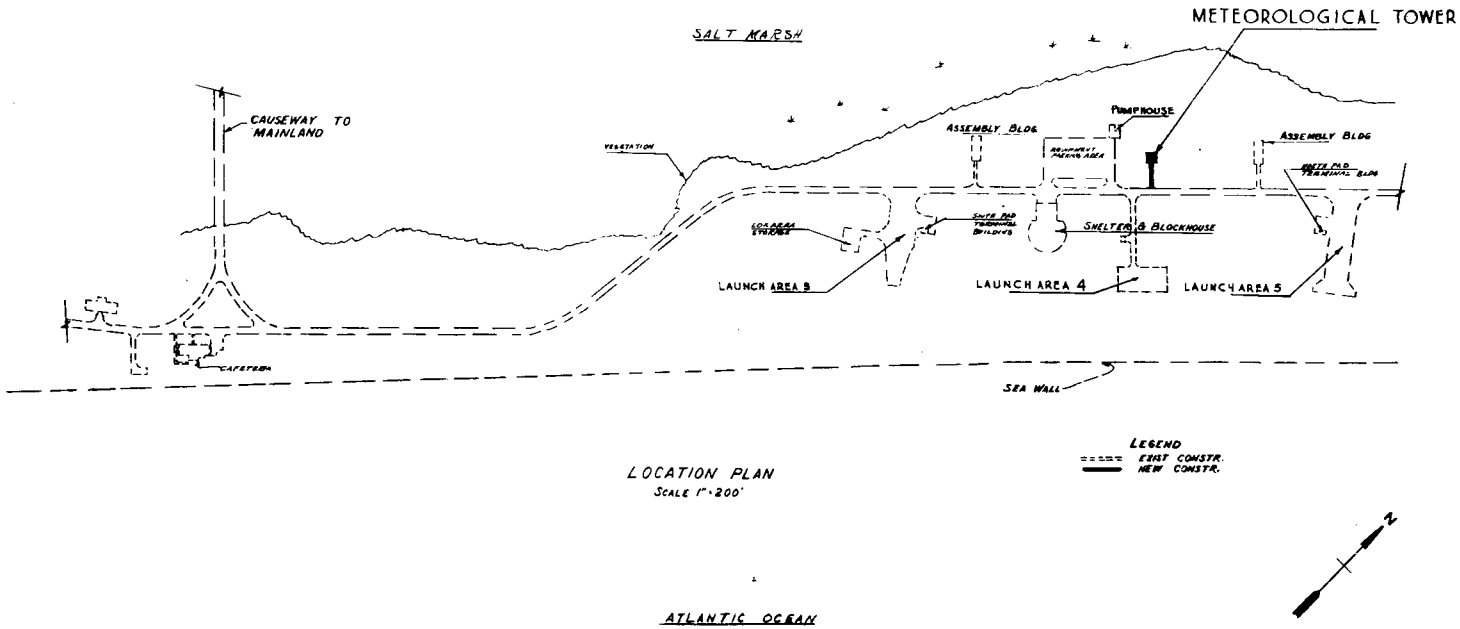
COST ESTIMATE:

Site preparation.....	$2,000
Modifications to existing buildings.....	23,000
Real-time telemetry equipment.....	50,000

WALLOPS STATION
FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO RANGE SAFETY SYSTEMS

METEOROLOGICAL TOWER



LOCATION PLAN
SCALE 1" = 200'

CF 5-10

Meteorological tower.....	$50,000
Instrumentation.....	100,000
Total estimated cost...	$225,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 12 months

WALLOPS STATION

FISCAL YEAR 1962 ESTIMATES

ROCKET STORAGE AREA

DESCRIPTION:

This project will provide storage capacity for large solid-fuel rocket motors and boosters. Two buildings are required. They will be constructed of prefabricated sections with cinder-block side walls and with a minimum of utilities. Both buildings will require heating and temperature control equipment. The buildings will be located at Chincoteague, far from populated areas, and will be separated for safety. A sketch of the proposed construction is presented on the following page.

JUSTIFICATION:

Sufficient storage space is not presently available for large rocket motors necessitating the use of outdoor storage in some cases. None of the buildings at Chincoteague are suitable for the storage of rockets nor are they suitable for modification for this purpose. Large rocket motors require buildings with large entrances for easy maneuvering and accessibility. Storage requirements are such that the motors must be maintained within specified temperature limits. Temperature control protects the solid fuel gram from cracking which might cause dangerous burning conditions. Existing structures do not meet necessary safety requirements. About 100 rockets will be stored in each building, including Algol or Scout motors, Honest John boosters, Nike boosters, and Lance motors. The weights of explosives in these motors range from 700 to 20,000 pounds; in size, they range up to 35 feet in length and up to 110 inches in diameter.

COST ESTIMATE:

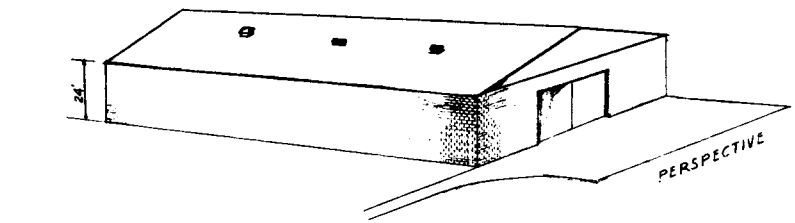
Storage buildings (Two @ $200,000 each).....		$400,000
Site preparation.....	$15,000	
Building (150 by 80 by 24 feet high; 12,000 square feet @ $11.70 per square foot)	140,000	
Roadways and apron.....	20,000	
Utility connections.....	25,000	
Total estimated cost...		$400,000

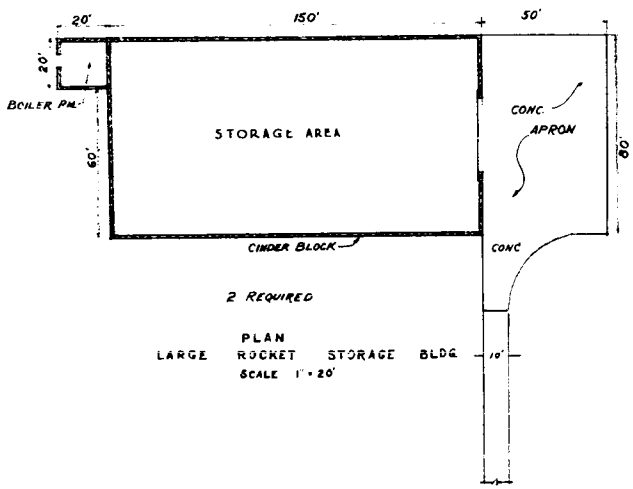
CONSTRUCTION SCHEDULE:

Total estimated completion time..... 7 months

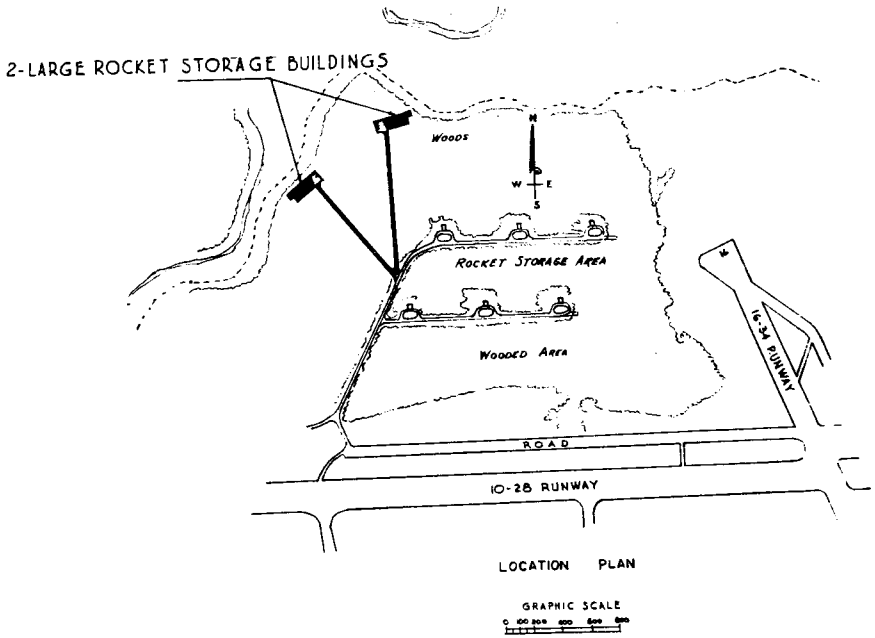
WALLOPS STATION
FISCAL YEAR 1962 ESTIMATES

ROCKET STORAGE AREA





PLAN
LARGE ROCKET STORAGE BLDG
SCALE 1" = 20'



LOCATION PLAN

CF5-13

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

CONSTRUCTION OF FACILITIES - 1962 PROGRAM

JET PROPULSION LABORATORY

Page No.		
CF6-2	Location plan	
CF6-3	Physical sciences laboratory.....	$1,285,000
CF6-7	Addition to vehicle assembly building.....	610,000
CF6-10	Modification of structural test laboratory...	262,000
CF6-13	Materials research laboratory.....	515,000
CF6-16	Utilities.....	735,000
CF6-17	Microwave antenna range.....	235,000
	TOTAL.....	$3,642,000

JET PROPULSION LABORATORY
FISCAL YEAR 1962 ESTIMATES

LOCATION PLAN

PROPOSED FACILITIES LEGEND FISCAL YEAR 1962

LEGEND NO.	ITEM	KEY	ZONE
A-1	PHYSICAL SCIENCES LABORATORY	E-10	I
A-2	ADDITION TO VEHICLE ASSEMBLY BUILDING	A-7	I
A-3	MODIFICATION OF STRUCTURAL TEST LABORATORY	F-11	I
A-4	MATERIALS RESEARCH LABORATORY	A-9	IV
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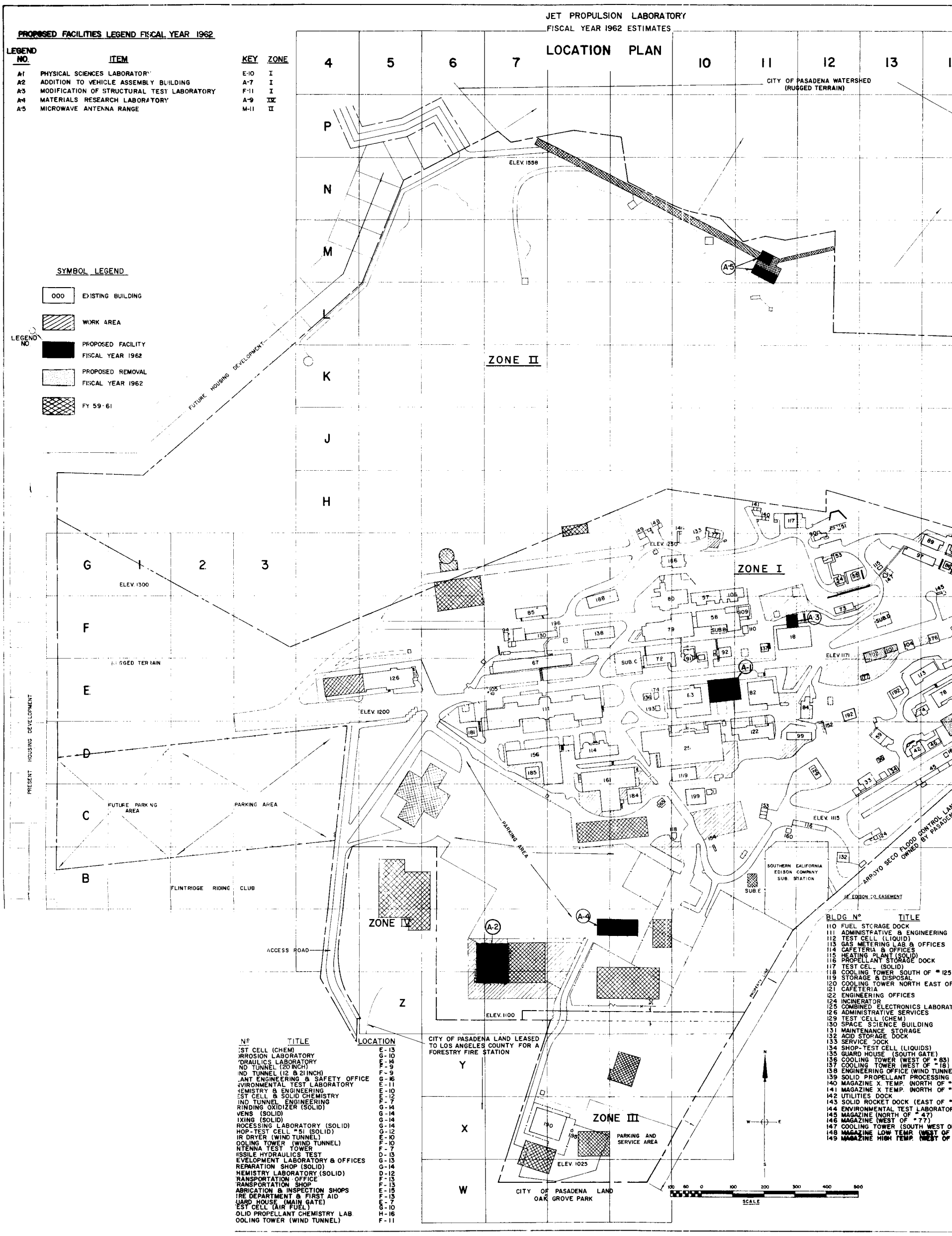
SYMBOL LEGEND

- 000 EXISTING BUILDING
- WORK AREA
- LEGEND NO — PROPOSED FACILITY FISCAL YEAR 1962
- PROPOSED REMOVAL FISCAL YEAR 1962
- FY 59-61



Nº	TITLE	LOCATION
	EST CELL (CHEM)	E-13
	ORROSION LABORATORY	G-10
	YDRAULICS LABORATORY	E-14
	ND TUNNEL (20 INCH)	F-9
	IND TUNNEL (12 & 21 INCH)	F-9
	ANT ENGINEERING & SAFETY OFFICE	G-16
	NVIRONMENTAL TEST LABORATORY	E-11
	HEMISTRY & ENGINEERING	E-10
	EST CELL & SOLID CHEMISTRY	E-12
	IND TUNNEL ENGINEERING	F-7
	RINDING OXIDIZER (SOLID)	G-14
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	IXING (SOLID)	G-14
	ROCESSING LABORATORY (SOLID)	G-14
	HOP-TEST CELL #51 (SOLID)	G-12
	IR DRYER (WIND TUNNEL)	E-10
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	RANSPORTATION SHOP	F-13
	ABRICATION & INSPECTION SHOPS	E-15
	IRE DEPARTMENT & FIRST AID	F-15
	UARD HOUSE (MAIN GATE)	E-7
	EST CELL (AIR FUEL)	G-10
	OLID PROPELLANT CHEMISTRY LAB.	H-16
	OOLING TOWER (WIND TUNNEL)	F-11

BLDG Nº	TITLE
110	FUEL STORAGE DOCK
111	ADMINISTRATIVE & ENGINEERING
112	TEST CELL (LIQUID)
113	GAS METERING LAB & OFFICES
114	CAFETERIA & OFFICES
115	HEATING PLANT (SOLID)
116	PROPELLANT STORAGE DOCK
117	TEST CELL (SOLID)
118	COOLING TOWER SOUTH OF #125
119	STORAGE & DISPOSAL
120	COOLING TOWER NORTH EAST OF
121	CAFETERIA
122	ENGINEERING OFFICES
124	INCINERATOR
125	COMBINED ELECTRONICS LABORAT
126	ADMINISTRATIVE SERVICES
129	TEST CELL (CHEM)
130	SPACE SCIENCE BUILDING
131	MAINTENANCE STORAGE
132	ACID STORAGE DOCK
133	SERVICE DOCK
134	SHOP-TEST CELL (LIQUIDS)
135	GUARD HOUSE (SOUTH GATE)
136	COOLING TOWER (WEST OF #83)
137	COOLING TOWER (WEST OF #18)
138	ENGINEERING OFFICE (WIND TUNNE
139	SOLID PROPELLANT PROCESSING
140	MAGAZINE X. TEMP. (NORTH OF #
141	MAGAZINE X TEMP. (NORTH OF #
142	UTILITIES DOCK
143	SOLID ROCKET DOCK (EAST OF #
144	ENVIRONMENTAL TEST LABORATOR
145	MAGAZINE (NORTH OF # 47)
146	MAGAZINE (WEST OF # 77)
147	COOLING TOWER (SOUTH WEST O
148	MAGAZINE LOW TEMP. (WEST OF
149	MAGAZINE HIGH TEMP. (WEST OF

JET PROPULSION LABORATORY
FISCAL YEAR 1962 ESTIMATES

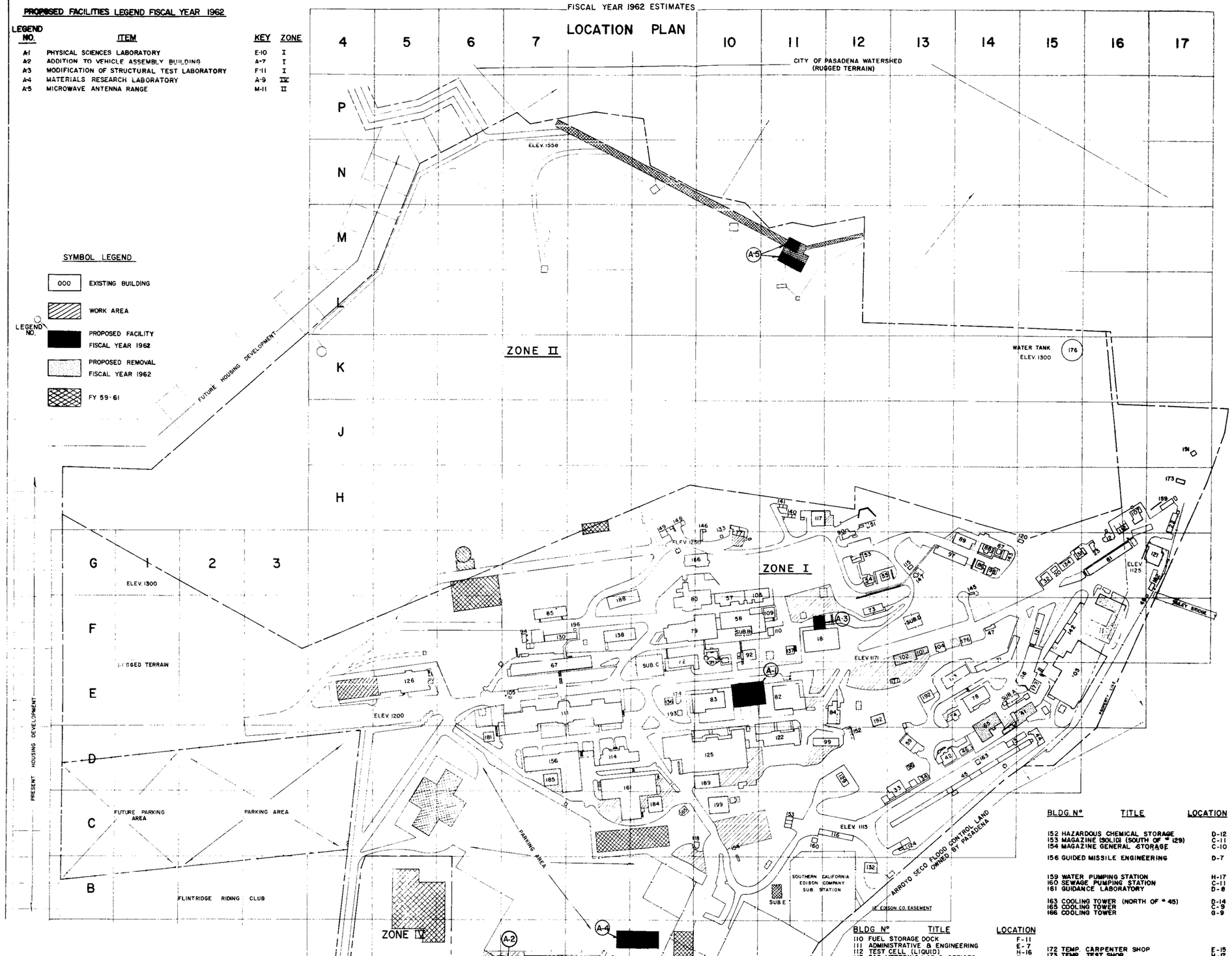
LOCATION PLAN

PROPOSED FACILITIES LEGEND FISCAL YEAR 1962

LEGEND NO.	ITEM	KEY	ZONE
A-1	PHYSICAL SCIENCES LABORATORY	E-10	I
A-2	ADDITION TO VEHICLE ASSEMBLY BUILDING	A-7	I
A-3	MODIFICATION OF STRUCTURAL TEST LABORATORY	F-11	I
A-4	MATERIALS RESEARCH LABORATORY	A-9	IV
A-5	MICROWAVE ANTENNA RANGE	M-11	II

SYMBOL LEGEND

- EXISTING BUILDING
- WORK AREA
- LEGEND NO. — PROPOSED FACILITY FISCAL YEAR 1962
- PROPOSED REMOVAL FISCAL YEAR 1962
- FY 59-61



BLDG. N°	TITLE	LOCATION
152	HAZARDOUS CHEMICAL STORAGE	D-12
153	MAGAZINE (SOLID) (SOUTH OF # 129)	C-11
154	MAGAZINE GENERAL STORAGE	C-10
156	GUIDED MISSILE ENGINEERING	D-7
159	WATER PUMPING STATION	H-17
160	SEWAGE PUMPING STATION	C-11
161	GUIDANCE LABORATORY	D-8
163	COOLING TOWER (NORTH OF # 45)	D-14
165	COOLING TOWER	C-9
166	COOLING TOWER	G-9

BLDG N°	TITLE	LOCATION
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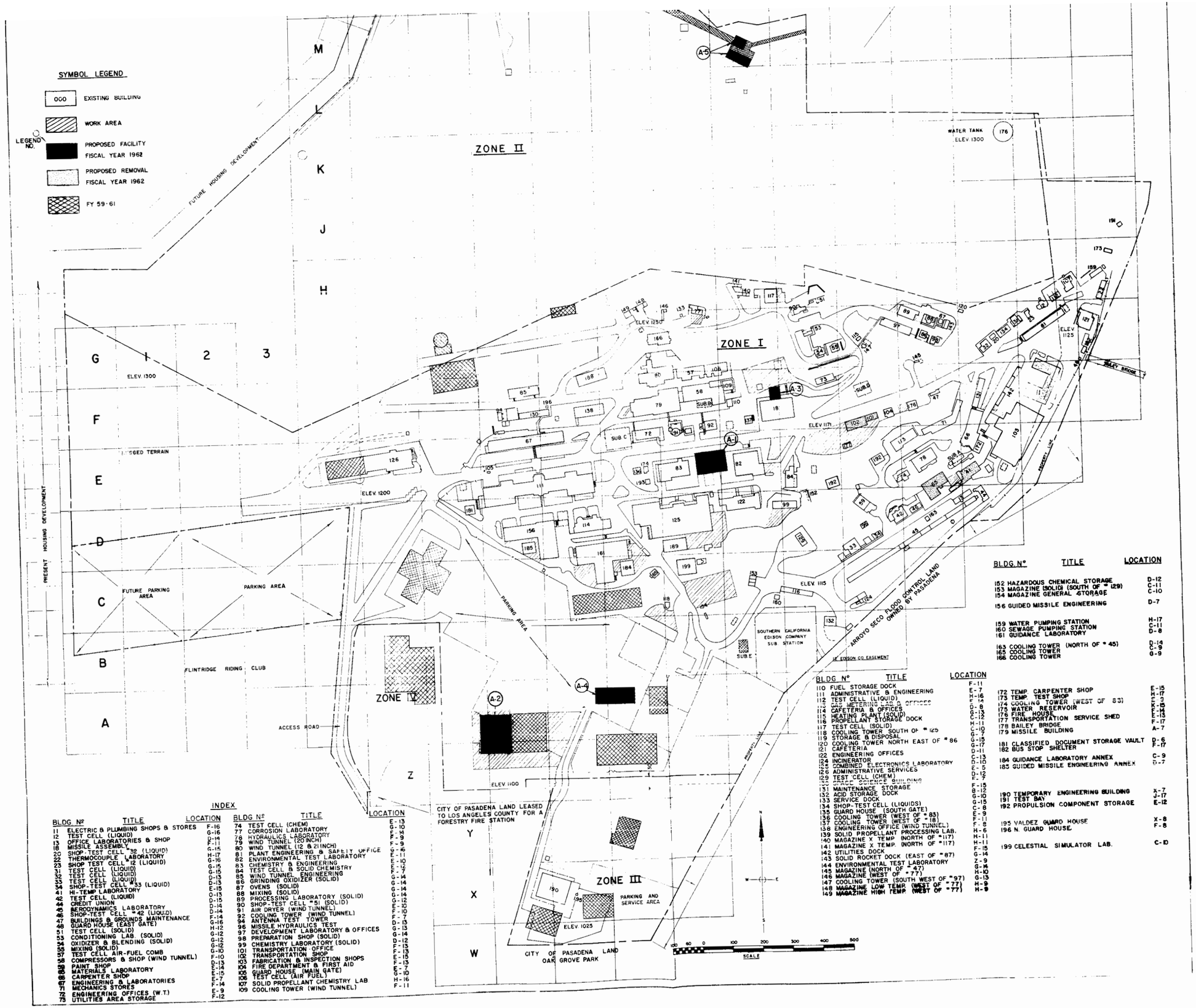
111	ADMINISTRATIVE & ENGINEERING	E-7
112	TEST CELL (LIQUID)	H-16
172	TEMP. CARPENTER SHOP	E-15
173	TEMP. TEST SHOP	D-17



BLDG. Nº	TITLE	LOCATION
152	HAZARDOUS CHEMICAL STORAGE	D-12
153	MAGAZINE (SOLID) (SOUTH OF # 129)	C-11
154	MAGAZINE GENERAL STORAGE	C-10
156	GUIDED MISSILE ENGINEERING	D-7
159	WATER PUMPING STATION	H-17
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BLDG Nº	TITLE	LOCATION
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114	CAFETERIA & OFFICES	G-8
115	HEATING PLANT (SOLID)	G-13
116	PROPELLANT STORAGE DOCK	C-12
117	TEST CELL (SOLID)	H-11
118	COOLING TOWER SOUTH OF # 125	C-10
119	STORAGE & DISPOSAL	G-7
120	COOLING TOWER NORTH EAST OF # 86	G-15
121	CAFETERIA	G-17
122	ENGINEERING OFFICES	D-11
124	INCINERATOR	C-13
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126	ADMINISTRATIVE SERVICES	E-5
129	TEST CELL (CHEM)	D-12
130	SPACE SCIENCE BUILDING	E-7
131	MAINTENANCE STORAGE	F-15
132	ACID STORAGE DOCK	B-12
133	SERVICE DOCK	G-10
134	SHOP-TEST CELL (LIQUIDS)	G-15
135	GUARD HOUSE (SOUTH GATE)	C-8
136	COOLING TOWER (WEST OF # 83)	E-9
137	COOLING TOWER (WEST OF # 18)	F-11
138	ENGINEERING OFFICE (WIND TUNNEL)	F-8
139	SOLID PROPELLANT PROCESSING LAB.	H-6
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141	MAGAZINE X TEMP. (NORTH OF # 117)	H-11
142	UTILITIES DOCK	F-15
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145	MAGAZINE (NORTH OF # 47)	G-16
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33	TEST CELL (LIQUID)	D-13
34	SHOP-TEST CELL #33 (LIQUID)	D-13
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42	TEST CELL (LIQUID)	D-13
44	CREDIT UNION	D-15
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83	CHEMISTRY & ENGINEERING	E-10
84	TEST CELL & SOLID CHEMISTRY	E-12
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86	GRINDING OXIDIZER (SOLID)	G-14
87	OVENS (SOLID)	G-14
88	MIXING (SOLID)	G-14
89	PROCESSING LABORATORY (SOLID)	G-14
90	SHOP-TEST CELL #51 (SOLID)	G-12
91	AIR DRYER (WIND TUNNEL)	E-10
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94	ANTENNA TEST TOWER	F-7
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97	DEVELOPMENT LABORATORY & OFFICES	G-13
98	PREPARATION SHOP (SOLID)	G-14
99	CHEMISTRY LABORATORY (SOLID)	D-12
101	TRANSPORTATION OFFICE	F-13
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103	FABRICATION & INSPECTION SHOPS	E-15
104	FIRE DEPARTMENT & FIRST AID	F-13
105	GUARD HOUSE (MAIN GATE)	E-7
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JET PROPULSION LABORATORY

FISCAL YEAR 1962 ESTIMATES

PHYSICAL SCIENCES LABORATORY

DESCRIPTION:

This project will provide a laboratory building with 24,000 square feet of floor space, of which 19,000 square feet will be devoted to laboratories and 5,000 square feet to offices. The laboratory space will be located in the basement and first floor and will include the physical, analytical, and synthetic chemistry laboratories, and the experimental physics and spectroscopy laboratories. Offices will be located on the second floor. The building will be air-conditioned and will be of a permanent type construction. Sketches of the proposed building are shown on the following two pages.

JUSTIFICATION:

The personnel and facilities of the physical sciences division are presently scattered throughout some eleven buildings, some inside the security fence and some outside. The laboratory space consists of modified test pits or temporary wooden structures. The existing facilities are inadequate to conduct experimental research in the fields of magnetohydrodynamics, plasma physics, reactor physics, radiation chemistry, and superconductivity.

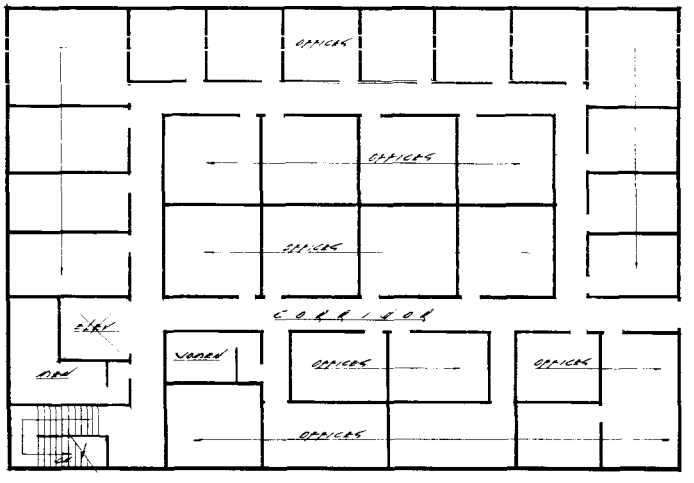
Because of the Jet Propulsion Laboratory's heavy commitment to the national weapons programs during the last ten years, the activities and facilities of the more basic research programs have been seriously restricted, frequently taking a secondary role in priority and emphasis. The recent organization of the physical sciences division is a major step toward achieving a carefully planned, widely-based basic research activity, and the present construction proposal is the first step toward providing the essential, and long needed support in space and research facilities. Since an essential requirement for a good research environment is ease of communication between the participants and the availability of common facilities and equipment, it is important to provide a single compact arrangement for the scattered elements of the division.

COST ESTIMATE:

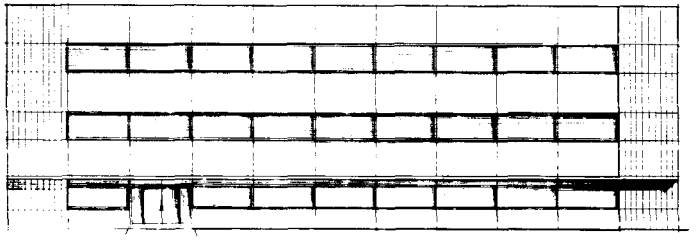
Building (108 by 75 feet; 3 floors; 24,000 square feet @ $27.70 per square foot).....	$665,000

JET PROPULSION LABORATORY
FISCAL YEAR 1962 ESTIMATES

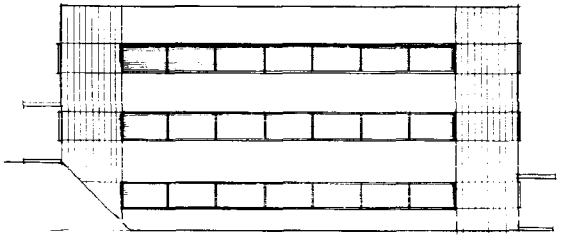
PHYSICAL SCIENCES LABORATORY



SECOND FLOOR PLAN



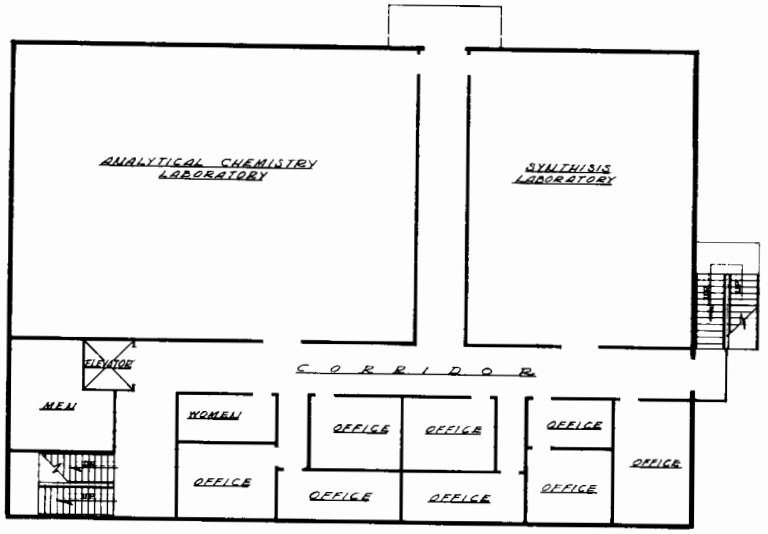
SOUTH ELEVATION



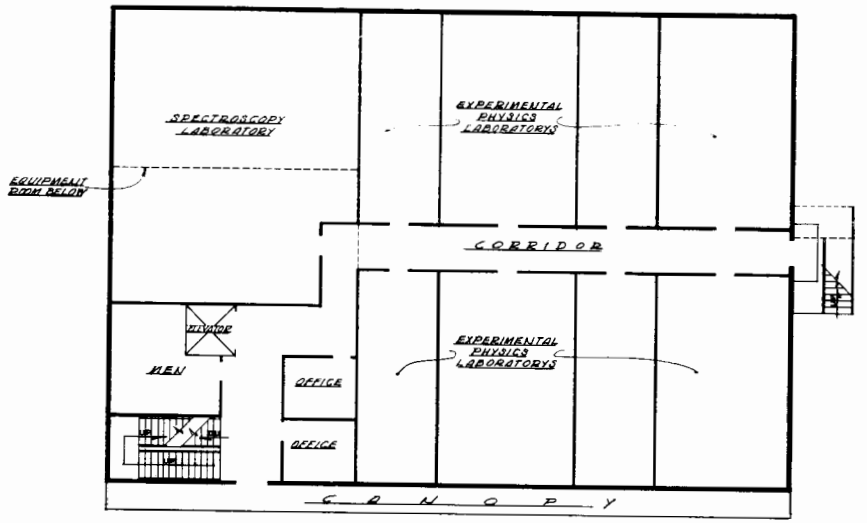
WEST ELEVATION

JET PROPULSION LABORATORY
FISCAL YEAR 1962 ESTIMATES

PHYSICAL SCIENCES LABORATORY



FIRST FLOOR



GROUND FLOOR

Utilities		$60,000
Utility connections	$5,500	
Electrical power connections and substation	35,000	
Grading and paving	5,500	
Cooling tower and piping	10,000	
Relocation of existing utilities	4,000	
Equipment		490,000
Vacuum Laboratory equipment	90,000	
Laboratory furniture	80,000	
Power supplies for laboratories	80,000	
Spectroscopy Laboratory equipment	100,000	
Cryostat Laboratory equipment	70,000	
Physics Laboratory equipment	70,000	
Design and engineering services		70,000
Total estimated cost		$1,285,000

CONSTRUCTION SCHEDULE:

Total estimated completion time	19 months

JET PROPULSION LABORATORY

FISCAL YEAR 1962 ESTIMATES

ADDITION TO VEHICLE ASSEMBLY BUILDING

DESCRIPTION:

This project proposes the construction of an 18,000 square foot addition to the present vehicle assembly building. As indicated in the sketch on the following page, the project will include an 8,000 square foot air-conditioned addition to the present main assembly room to be built of steel frame construction with wood frame and stucco curtain walls. The project will also provide a two story wing of 10,000 square feet to house a large stock room, paint shop, two mechanical laboratories, two electronic laboratories, and an inspection room. This wing will also be air-conditioned and will be constructed of brick and steel frame.

JUSTIFICATION:

The existing portion of the vehicle assembly facility is adequate to accommodate the early Ranger spacecraft assemblies and checkouts, along with simultaneous acceptance checks and tests of the proof test models. As the lunar and planetary program progresses, however, the addition of some 8,000 square feet of main bay assembly area is required to support larger and more complex spacecraft. This increased support area will provide adequate space to conduct the assembly, checkout, systems test (including certain environmental tests) and dummy runs on multiple spacecraft and proof test models. Additional working and storage space for several test fixtures, handling dollies, and spacecraft transporters is also required.

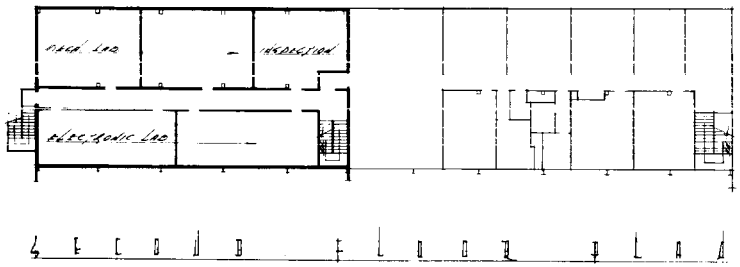
Additional laboratory space must be made available for supporting activities for the larger and more complex spacecraft in such areas as spacecraft and systems test, cable fabrication and checkout, and system test equipment assembly and checkout. Additional space is also required for the increased efforts of the quality assurance group.

COST ESTIMATE:

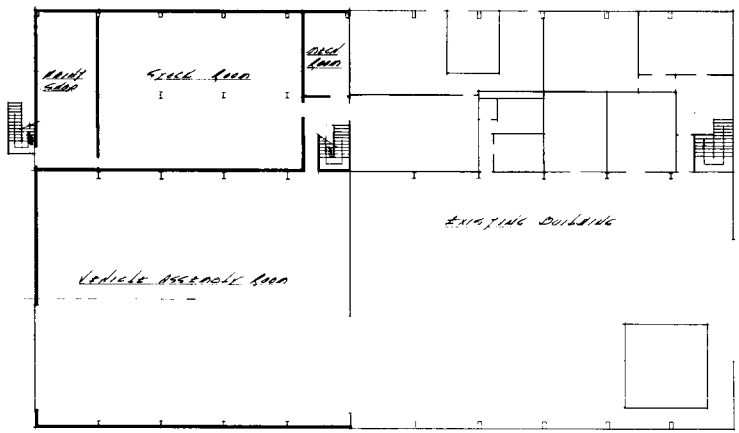
Building (18,000 square feet @ $25.00 per square foot)		$450,000
Utilities		41,000
Utility connections	$4,000	
Electrical power connections and substation	20,000	
Grading and paving	9,000	
Cooling tower and piping	8,000	

JET PROPULSION LABORATORY
FISCAL YEAR 1962 ESTIMATES

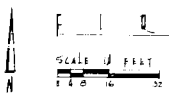
ADDITION TO VEHICLE ASSEMBLY BUILDING

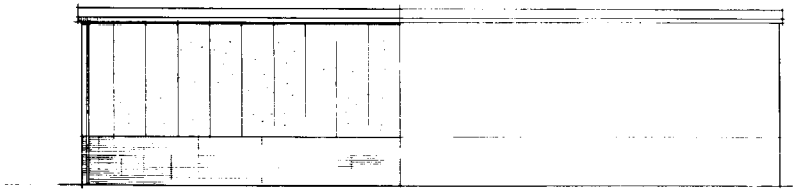


SECOND FLOOR PLAN



FIRST FLOOR PLAN





SOUTH ELEVATION

Equipment.....		$75,000
Machine tools.....	$10,000	
Spray booth.....	10,000	
Materials handling equipment.....	30,000	
Instrumentation.....	25,000	
Design and engineering services.....		44,000
Total estimated cost...		$610,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 19 months

JET PROPULSION LABORATORY

FISCAL YEAR 1962 ESTIMATES

MODIFICATION OF STRUCTURAL TEST LABORATORY

DESCRIPTION:

This project proposes modifications to the present missile assembly building to convert it into a structural testing facility to provide adequate capability and equipment for the mechanical component development and structural testing of spacecraft. The modifications will provide a 900 square foot air-conditioned storage space for partially completed and completed structural assemblies and components. A sketch of the proposed work is shown on the following page. The assembly room floor of the present building will be modified to contain utility tunnels and to provide multipurpose tie-down capability.

JUSTIFICATION:

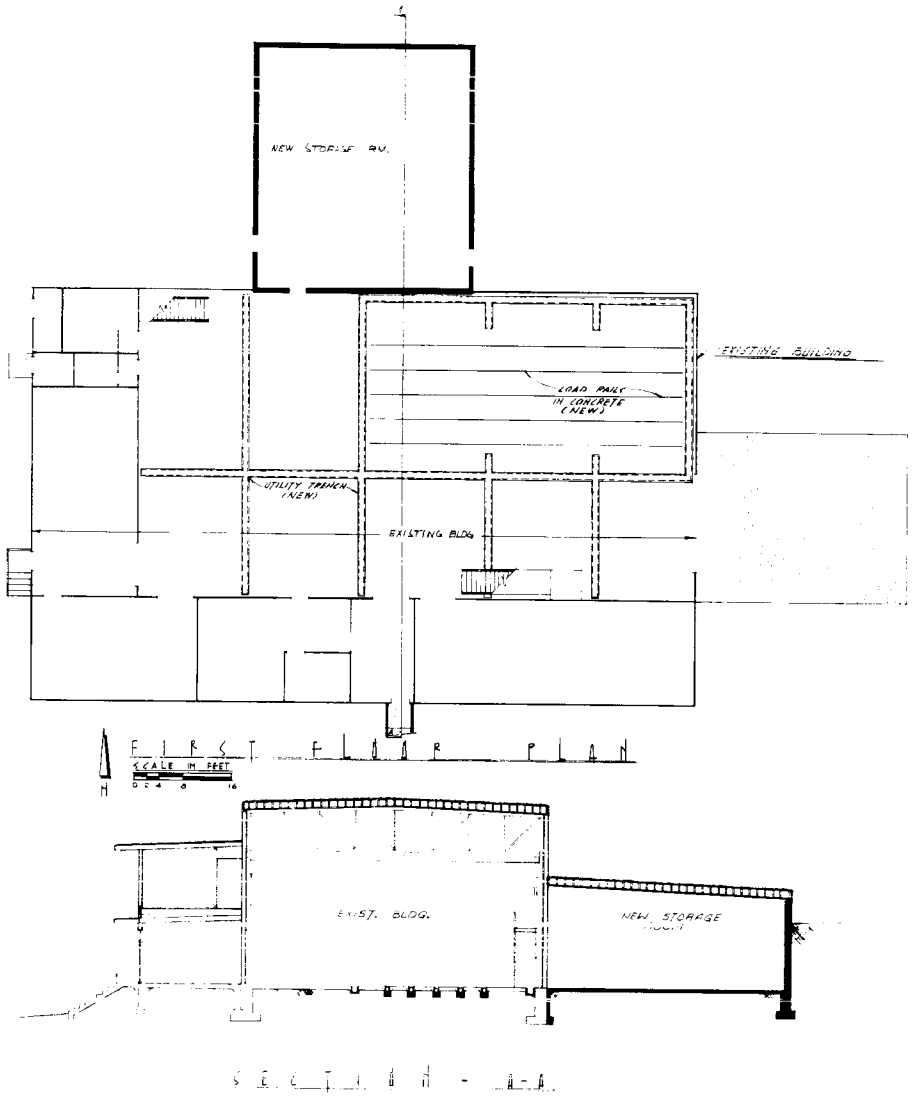
For many years, the present missile assembly building has been the only facility of the Jet Propulsion Laboratory in which mechanical advanced development, structural testing, and assembly and checkout of missiles and spacecraft have been accomplished. Upon completion of the new vehicle assembly facility, the spacecraft final assembly and checkout activities which are now accomplished in the missile assembly building will be transferred into the new facility. In addition to relieving the overcrowded conditions which have necessitated working outside and working in scattered locations, it will now be possible to modify and equip the existing missile assembly building into a structural test laboratory tailored to advanced component development and structural testing tasks.

COST ESTIMATE:

Building modifications		$96,500
Utilities		28,500
Utility connections	$2,500	
Electrical power connections and substation	10,000	
Grading and paving	6,000	
Cooling tower and piping	5,000	
Relocation of existing utilities	5,000	
Structural test equipment and instrumentation		125,000
Design and engineering services		12,000
Total estimated cost		$262,000

JET PROPULSION LABORATORY
FISCAL YEAR 1962 ESTIMATES

MODIFICATION OF STRUCTURAL TEST LABORATORY



CONSTRUCTION SCHEDULE:

Total estimated completion time..... 19 months

JET PROPULSION LABORATORY

FISCAL YEAR 1962 ESTIMATES

MATERIALS RESEARCH LABORATORY

DESCRIPTION:

This project will provide a 15,000 square foot laboratory building to house the facilities required to carry out supporting research and advanced development work on materials for space vehicles. The laboratory will be designed to accommodate precision equipment of the type needed to study the behavior of materials at extremely high temperatures, such as those encountered in rockets. It will also house special equipment for the study of effects of outer space environment upon materials and for development of special materials for use in solid state electronic components of space vehicles. The building will contain some offices for the technical personnel engaged in the above work and will be air conditioned. A sketch of the proposed construction is shown on the following page.

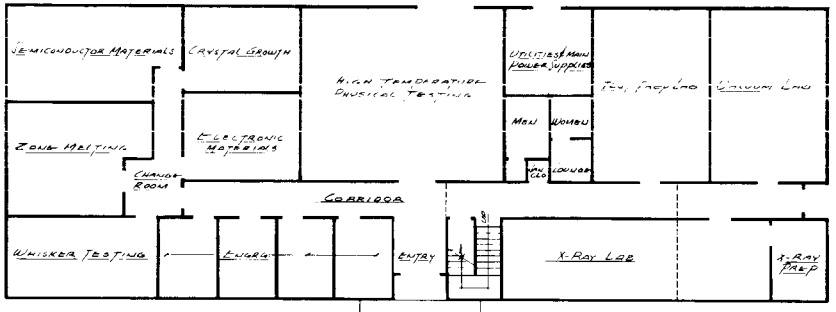
JUSTIFICATION:

The materials research laboratory will house the personnel and the equipment required by the mission assigned to the Jet Propulsion Laboratory. There has been no important increase in work space for the materials research group for the last ten years despite a marked growth in the work which it has been called on to do and a corresponding increase in the number of people involved.

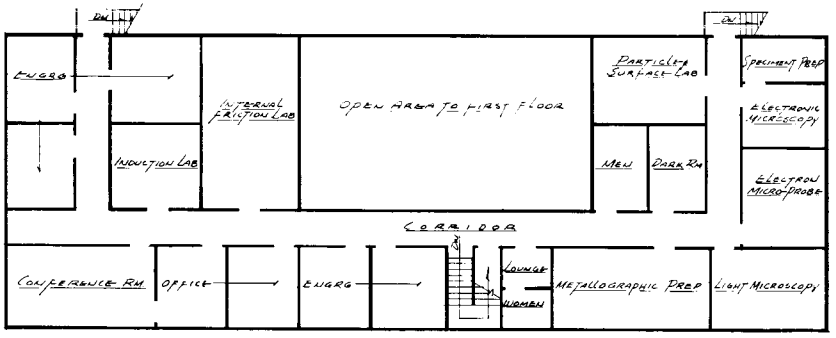
The performance of present day vehicles is limited by the lack of knowledge of the properties of materials at very high temperatures. Laboratories are required to permit study of the mechanical, thermal, and gas reaction properties of many different materials at 3500-6000°F or higher. The approach to a solution of these problems will be from the standpoint of metallurgy and ceramics and also from that of solid state physics. Development and testing of improved materials will be carried out on many space vehicle components including rocket nozzles and other propulsion components, fuel tanks and solid fuel rocket cases, and equipment to operate in the very high vacuum of outer space. Part of the work will be aimed at providing engineering data required to design advanced types of space vehicles. A substantial part of the work planned for the new laboratory will deal with the effects of high vacuum, radiation, and particles found in space upon materials which may be used for spacecraft. Some of the present limitations in space vehicle systems concern guidance and communications. It is planned in the new laboratory to work toward the development of solid state electronic devices which will permit considerable increases in sensitivity and range, together with major decreases in weight and size of space vehicle electronic devices and instruments for interplanetary space exploration.

JET PROPULSION LABORATORY
FISCAL YEAR 1962 ESTIMATES

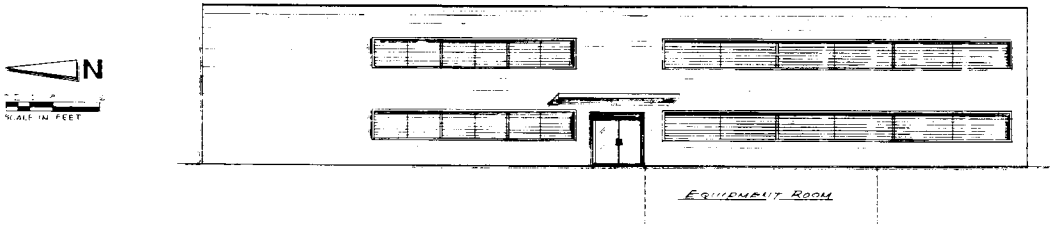
MATERIALS RESEARCH LABORATORY



FIRST FLOOR PLAN



SECOND FLOOR PLAN



WEST ELEVATION

CR6-14

COST ESTIMATE:

Building (15,000 square feet @ $26.75 per square foot).....		$401,500
Utilities.....		32,500
Utility connections.....	$4,000	
Electrical power connections and substation	17,000	
Grading and paving.....	5,500	
Cooling tower and piping.....	6,000	
Instrumentation and control equipment.....		40,000
Design and engineering services.....		41,000
Total estimated cost...		$515,000

CONSTRUCTION SCHEDULE:

Total estimated completion time.....	19 months

JET PROPULSION LABORATORY

FISCAL YEAR 1962 ESTIMATES

UTILITIES

DESCRIPTION:

This project provides for site preparation and for such utilities as roads, sewer lines, air lines, water lines, and power lines required for the new facilities being proposed in the fiscal year 1962 budget.

JUSTIFICATION:

Extensions to the laboratory utility systems are required to service those facilities being sited in areas not presently serviced.

COST ESTIMATE:

Site preparation, building demolition, and relocation of utilities	$235,000
Paving and roads	50,000
Air lines	10,000
Water lines	20,000
Power distribution	100,000
Sewer lines	10,000
Storm drains	35,000
Substation	100,000
Water tank	100,000
Design and engineering services	75,000
Total estimated cost	$735,000

CONSTRUCTION SCHEDULE:

Total estimated completion time	19 months

JET PROPULSION LABORATORY

FISCAL YEAR 1962 ESTIMATES

MICROWAVE ANTENNA RANGE

DESCRIPTION:

It is proposed to construct a microwave darkroom or anechoic chamber that would allow "free space" measurements from 1000 mc to 50,000 mc. The chamber will be approximately 30 feet wide by 20 feet high by 80 feet long and will be lined with a radio frequency absorbing material. The chamber will allow very accurate measurements to be made on model antennas and full size flight spacecraft. An erectable dielectric rotator will be used to make measurements on full size Ranger/Centaur/Saturn type spacecraft mockups. The rotator will have two axis rotation, azimuth and elevation, and will be capable of handling a spacecraft of approximately 2000 pounds. An elevator mechanism will be used to raise and lower the entire dielectric antenna rotator, both to service the rotator and to protect the test antenna from storm damage. The protecting shelter will consist of a room with a sliding front door and sliding roof. A sketch of the proposed installation is shown on the following page.

JUSTIFICATION:

A microwave darkroom is urgently needed to do antenna pattern calibration of flight spacecraft in a controlled radio frequency environment, and with very low risk of handling damage to the spacecraft. The erectable tower will provide high accuracy pattern range facilities for the Ranger/Centaur/Saturn spacecraft antenna development programs.

COST ESTIMATE:

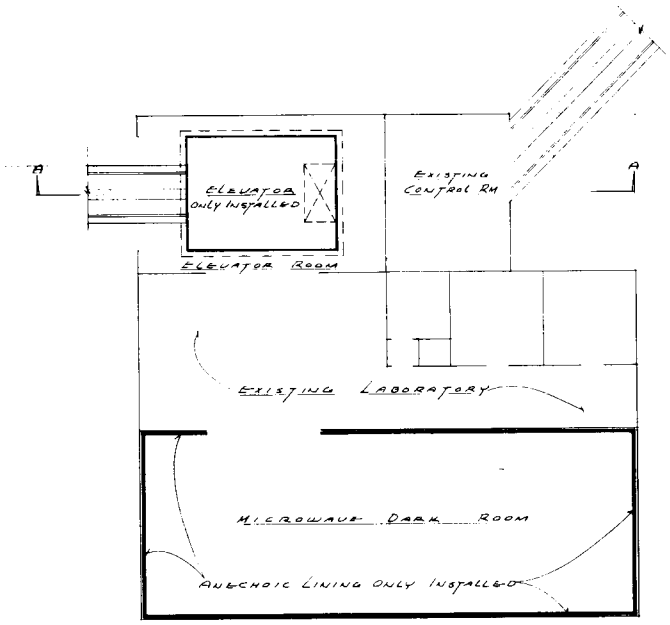
Tower	$60,000
Anechoic chamber lining	100,000
Hydraulic equipment	55,000
Design and engineering services	20,000
Total estimated cost...	$235,000

CONSTRUCTION SCHEDULE:

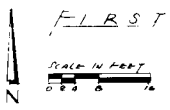
Total estimated completion time..... 19 months

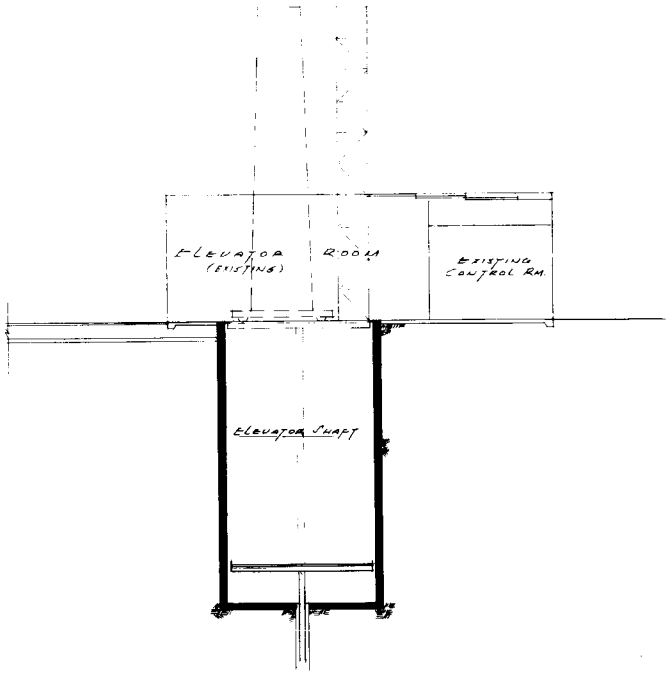
JET PROPULSION LABORATORY
FISCAL YEAR 1962 ESTIMATES

MICROWAVE ANTENNA RANGE



FIRST FLOOR PLAN





SECTION-A-A

LEGEND
PROPOSED CONSTRUCTION
EXISTING STRUCTURES

CF6-118

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

CONSTRUCTION OF FACILITIES - 1962 PROGRAM

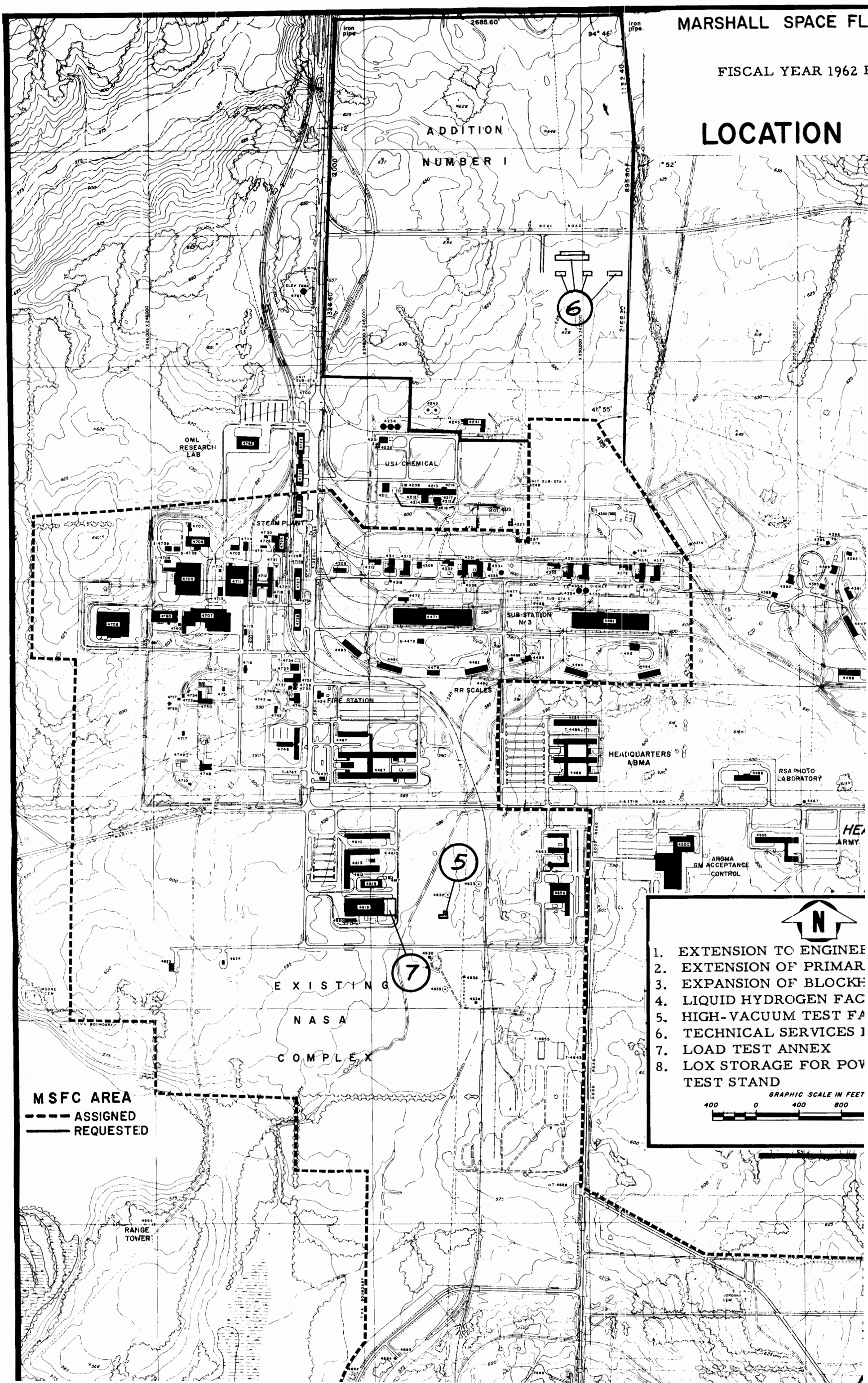
MARSHALL SPACE FLIGHT CENTER

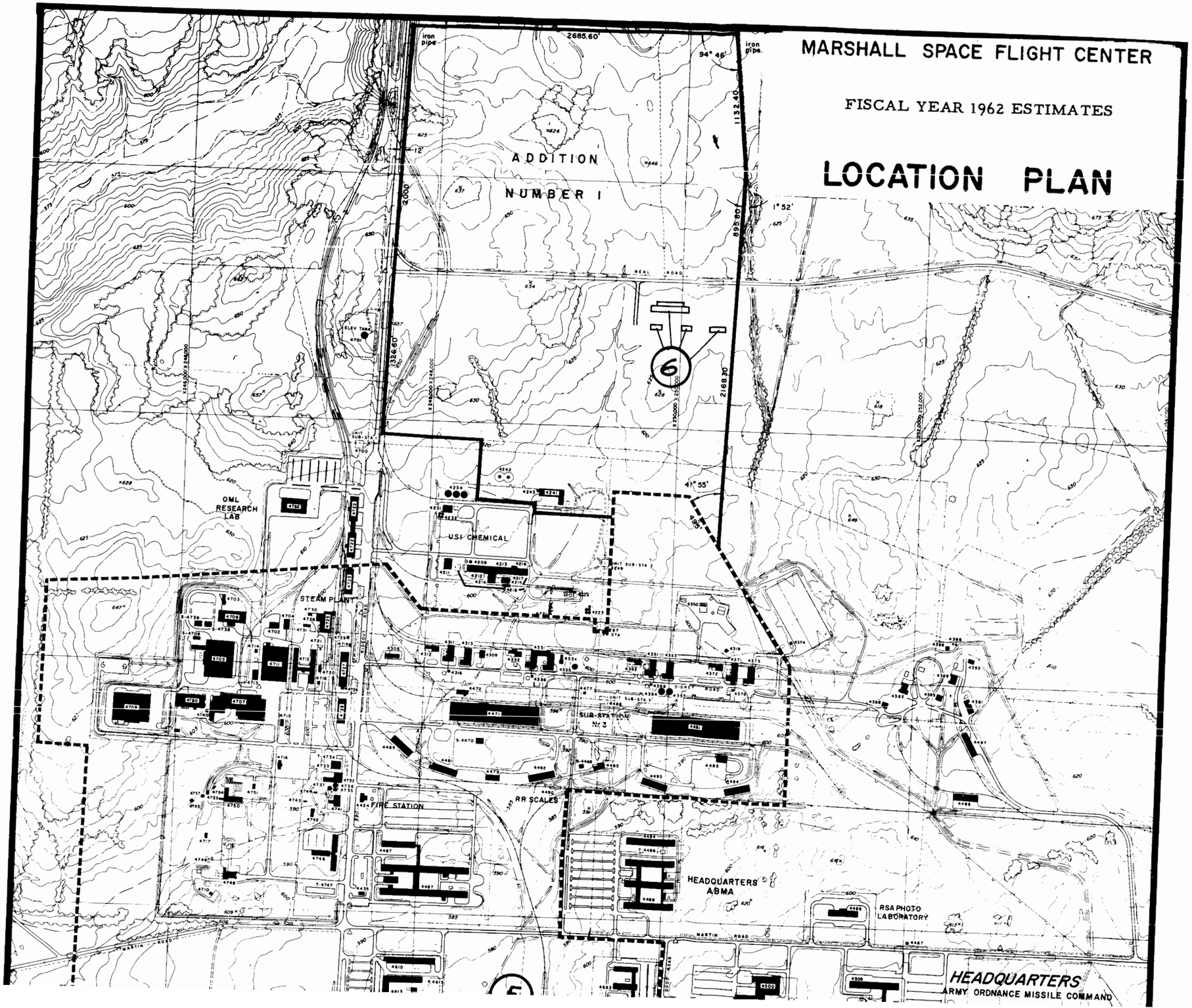
Page No.		
CF7-2	Location plan	
CF7-3	Extension to engineering building.....	$510,000
CF7-6	Extension of primary utilities.....	420,000
CF7-8	Expansion of blockhouse.....	2,500,000
CF7-11	Liquid hydrogen facility.....	1,700,000
CF7-14	High-vacuum test facility.....	701,000
CF7-18	Technical services facility.....	757,000
CF7-21	Load test annex.....	1,703,000
CF7-24	Lox storage for power plant test stand.....	600,000
CF7-27	Acceleration of the Saturn static test facility.....	4,000,000
	TOTAL.....	$12,891,000

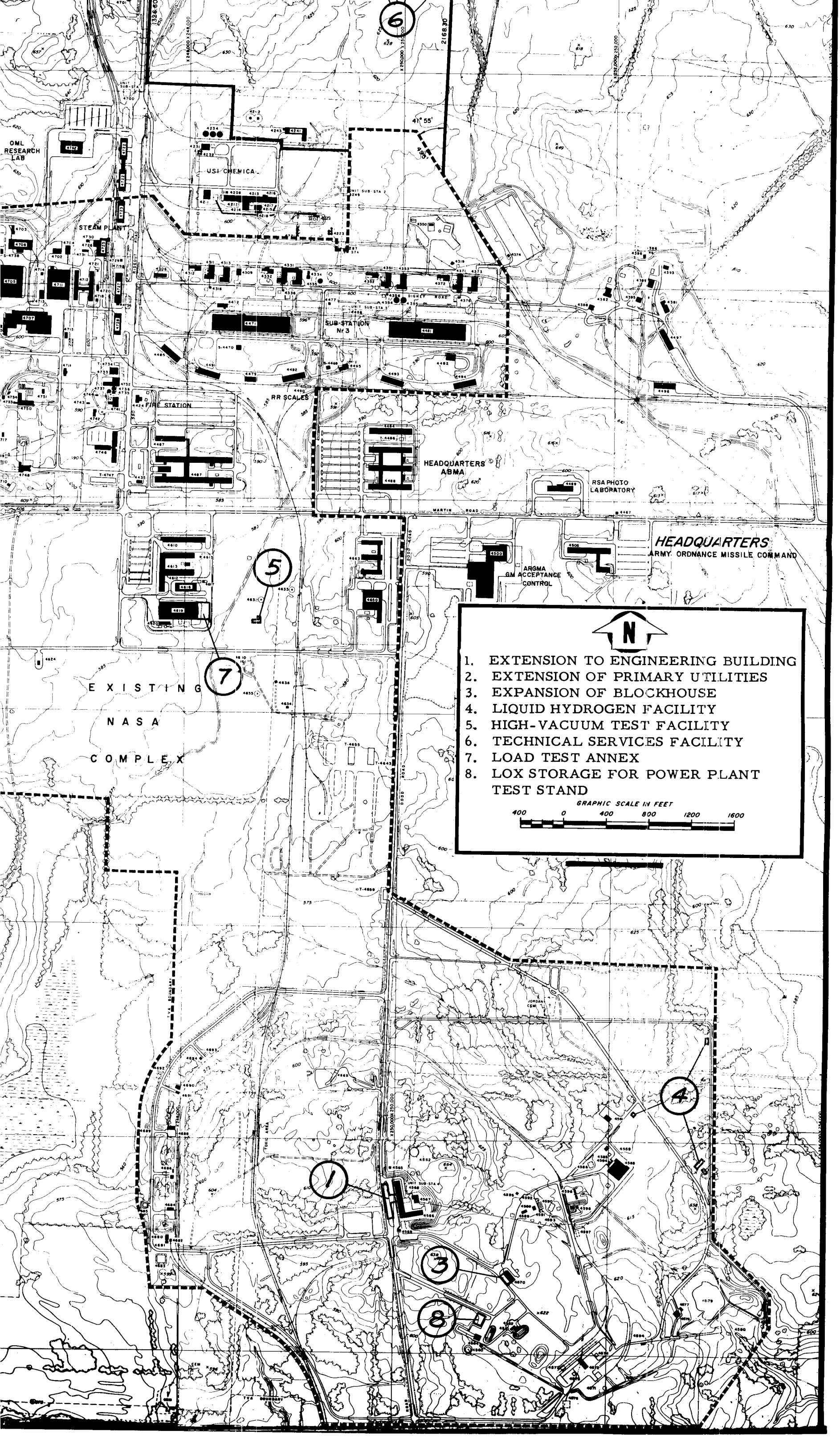
MARSHALL SPACE FL

FISCAL YEAR 1962 B

LOCATION




MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1962 ESTIMATES
LOCATION PLAN
ADDITION
NUMBER I
OML
RESEARCH
LAB
USI CHEMICAL
STEAM PLANT
SUB-STATION
Nr 3
FIRE STATION
RR SCALES
HEADQUARTERS
ABMA
RSA PHOTO
LABORATORY
HEADQUARTERS
ARMY ORDNANCE MISSILE COMMAND


OML RESEARCH LAB
USI CHEMICAL
STEAM PLANT
SUB-STATION Nr. 3
RR SCALES
FIRE STATION
HEADQUARTERS ABMA
RSA PHOTO LABORATORY
HEADQUARTERS
ARMY ORDNANCE MISSILE COMMAND
ARGMA
GM ACCEPTANCE CONTROL
EXISTING
NASA
COMPLEX
N
1. EXTENSION TO ENGINEERING BUILDING
2. EXTENSION OF PRIMARY UTILITIES
3. EXPANSION OF BLOCKHOUSE
4. LIQUID HYDROGEN FACILITY
5. HIGH-VACUUM TEST FACILITY
6. TECHNICAL SERVICES FACILITY
7. LOAD TEST ANNEX
8. LOX STORAGE FOR POWER PLANT TEST STAND
GRAPHIC SCALE IN FEET
400 0 400 800 1200 1600

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

EXTENSION TO ENGINEERING BUILDING

DESCRIPTION:

This project provides for the design and construction of an extension to the existing engineering building. A sketch of the proposed extension is shown on the following page. The structure will match the existing building which is a concrete slab on grade, masonry walls and a flat deck, concrete roof of pre-cast, pre-stressed members. The interior floor finish will be asphalt tile, painted masonry walls, with the exposed painted roof deck as a ceiling. The building will be air-conditioned and will have fluorescent lighting. The scope of the work will include a relocation of Dodd Road, incidental site work, and connections to existing utilities. The relocation of Dodd Road is required because location to the North or West would require excavation into a hill. Location to the East would place the building in a position in which it would not be protected by existing artificial blast barriers; considerable excavation and the erection of artificial barriers would be required.

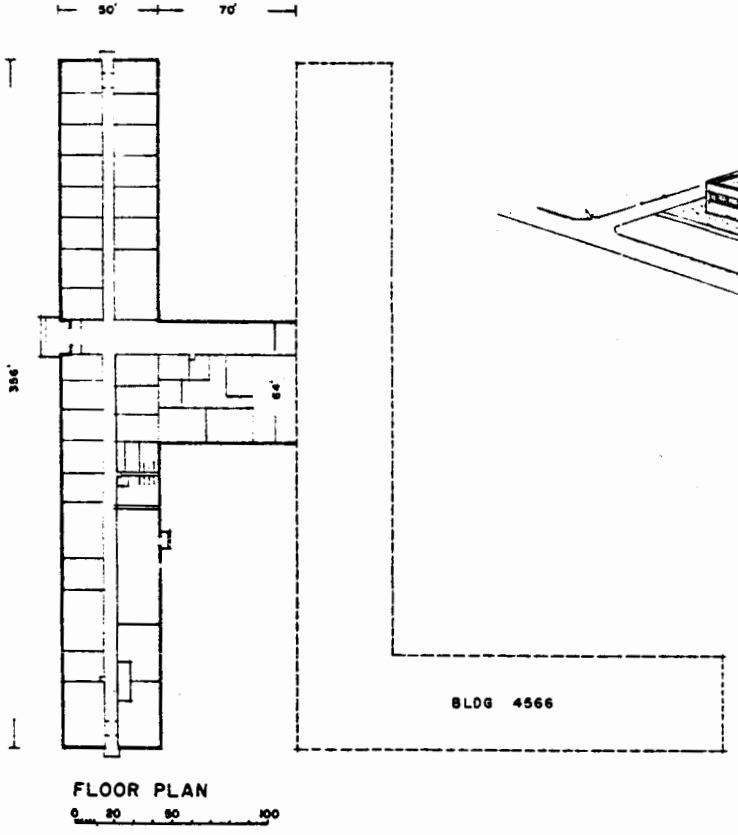
JUSTIFICATION:

The Saturn test program will be greatly expanded by the time this building can be constructed. The mission requirements for engineering planning and programming have increased to the point that available office space has become badly overcrowded. In a number of instances, unit, section, and branch supervisors must share a 15- by 20-foot office with as many as eight engineers, technicians, and clerks. Such congested work areas are not conducive to the creative thinking required of the individuals involved. Some division personnel are now working in inadequate facilities in the test area. The technical personnel in charge of such facilities as the Saturn dynamic test facility and the Saturn static test stand, should operate as an integrated organization with a maximum of efficiency in communication. The additional requirements placed on this organization by the expanded effort and by the creation of new test facilities will increase the requirement for this facility to a critical degree.

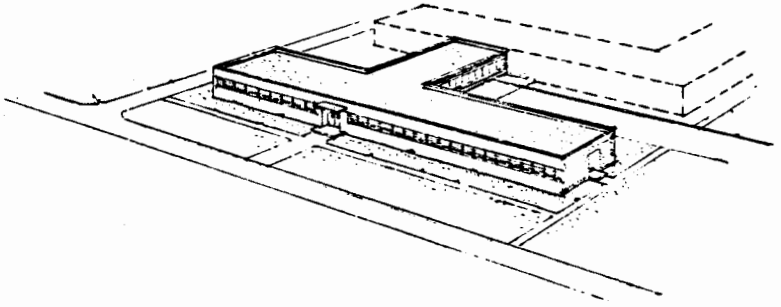
The site chosen is the only one combining the features of a compactly integrated arrangement of offices with the safety requirement of remaining within a blast-protected zone. Any other location would involve extensive and costly earth moving preparations, either for fill, cut, or erection of new blast-protection barricades due to the existing terrain and neighboring test stands.

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1962 ESTIMATES

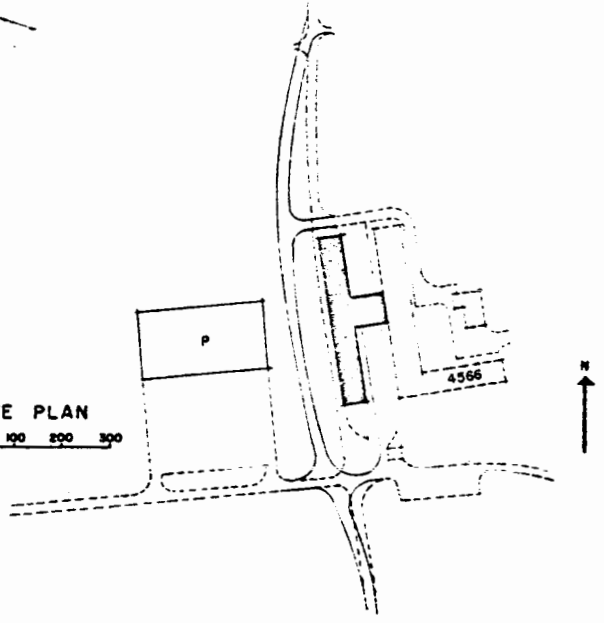
EXTENSION TO ENGINEERING BUILDING



FLOOR PLAN



PERSPECTIVE



SITE PLAN

COST ESTIMATE:

Site work and utility connections.....	$48,000
Building (22,730 square feet at $18.00 per square foot).....	408,000
Design and engineering services.....	54,000
Total estimated cost.....	$510,000

CONSTRUCTION SCHEDULE:

Total estimated completion time.....	15 months

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

EXTENSION TO PRIMARY UTILITIES

DESCRIPTION:

This project provides for extensions to primary utilities and roads systems necessitated by the construction of new facilities. The scope of work includes:

1. A new 1,200 pair telephone cable from the telephone exchange on Redstone Arsenal to the Marshall Center, and the installation of a 600 pair cable north along Rideout Road. A new cross-connect cable will be cut in releasing enough cable pairs to service new construction in the fabrication and assembly engineering division area.

2. Construction of new secondary roads.

3. Installation of additional secondary feeder cables to provide adequate capacity to new construction areas and an increase in the capacity of unit substations as required to provide for increased loads.

4. Installation of an additional filter at the potable water filtration plant and the installation of additional potable and industrial water pipe to areas of new construction.

5. The installation of new and the replacement of existing sewer pipe with larger sizes to areas of new construction.

6. The installation of steam lines of increased capacity.

JUSTIFICATION:

The requested extensions to the existing utilities systems are required to adequately support new facilities approved in the fiscal year 1961 budget and requested in the fiscal year 1962 budget. Emergency requirements for the expansion of the primary electrical substation have been met by the use of fiscal year 1961 funds.

The number of telephone cables to the Marshall Center was inadequate prior to the transfer of the facility from the Army. Installation of the additional 1,200 pair cables will take care of present delays in placing calls and will provide for the increased demands that will result from the construction of new facilities.

The existing road net requires extensions and repairs to alleviate congested traffic conditions and to carry heavier traffic loads.

Present transformer capacities and lines are not adequate to meet the the loads to be connected. A 500 kva transformer and 600 feet of feeder line will be added to the nitrogen booster battery, a 500 kva transformer will be added to the static test tower, and a 225 kva transformer will be added to test cell C.

During past summer periods, the water treatment plant has had to meet a peak demand rate of 4.8 million gallons a day for an eight hour period. During the peak demand, the desirable filtration rate is exceeded. The addition of another filter will alleviate this deficiency.

Sewer lines will be extended northward along Rideout Road. Modifications to the steam distribution system will be made to avoid excessive pressure drop and additional lines will be installed to permit connections to new structures.

COST ESTIMATE:

Communications system	$100,000
Electrical distribution	95,000
Road construction	25,000
Sewers	50,000
Water system	100,000
Steam lines	50,000
Total estimated cost	$420,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 12 months

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

EXPANSION OF BLOCKHOUSE

DESCRIPTION:

This project provides for the construction and instrumentation of an addition to the existing blockhouse in the space vehicle test area. The structure will include a partial basement housing the heating, air conditioning, and electrical switchgear, rooms for vibration transducer calibration, instrumentation checkout and modification, record preparation and review, and parts storage. The first floor will house digital data acquisition and processing equipment, oscillographs and oscillograph processing equipment, vibration analysis, instrumentation programming, and a visitor's viewing room. Approximately 350 instrumentation channels will be installed. The second floor will provide facilities for the control functions of the test stand operation, with the supporting functions of control equipment checkout and modification, camera and television maintenance, and service, preparation, evaluation, and operating supplies. Electrical and electronic connections to the various test positions will be through existing tunnel and cable duct banks.

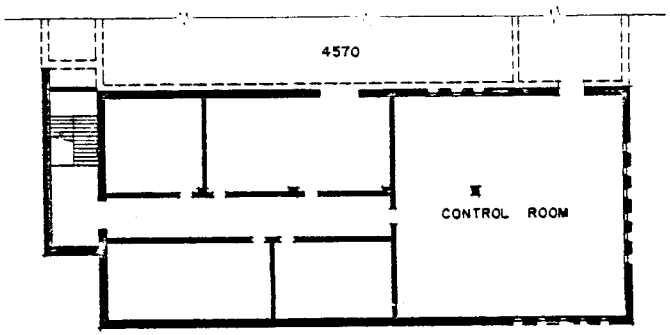
The structure will be constructed of reinforced concrete to match the existing building and to meet safety requirements for blast protection. Floors will be asphalt tile. The ceiling will be exposed structural slab for the basement and acoustical panels in the other floors. The addition will be air-conditioned and will have fluorescent lighting. A sketch of the proposed work is presented on the following page.

JUSTIFICATION:

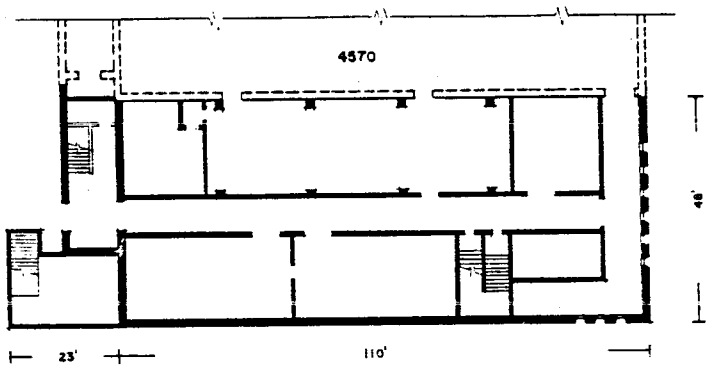
Upon conversion of the East side of the Jupiter static test tower to Saturn first-stage testing, it was found that all available instrumentation was required to meet minimum test programs for this position. The situation has seriously affected operation of other positions served by the blockhouse: the West side of the static test tower, the power plant test stand, and the cold calibration test stand. While certain types of instrumentation may be readily shifted from one position to another, certain fixed channels of information, by reason of their peculiar application to a particular test position, cannot be changed without incurring serious delays. Major interference results with the other test positions which are also used in the Saturn program. The situation will worsen when the dynamic test position is activated early in 1961. The blockhouse itself is very overcrowded as a growth of approximately 800 percent in instrumentation alone has been experienced since the building was originally built. Storage, repair and maintenance functions have been displaced to provide every possible square foot of space for

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1962 ESTIMATES

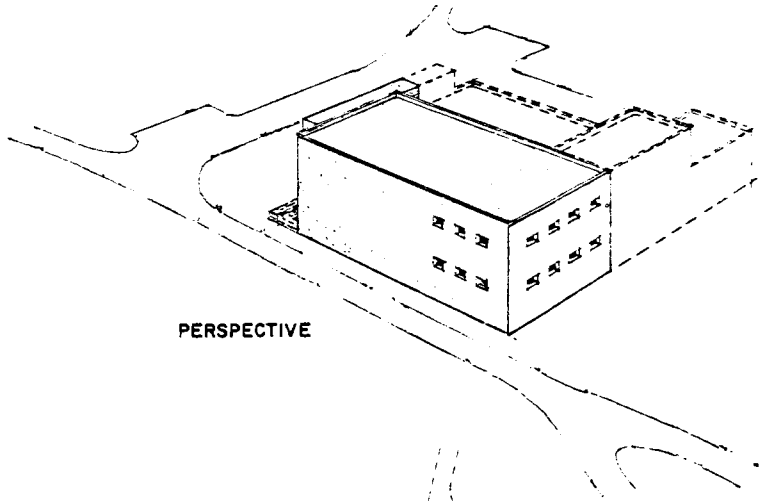
EXPANSION OF BLOCKHOUSE



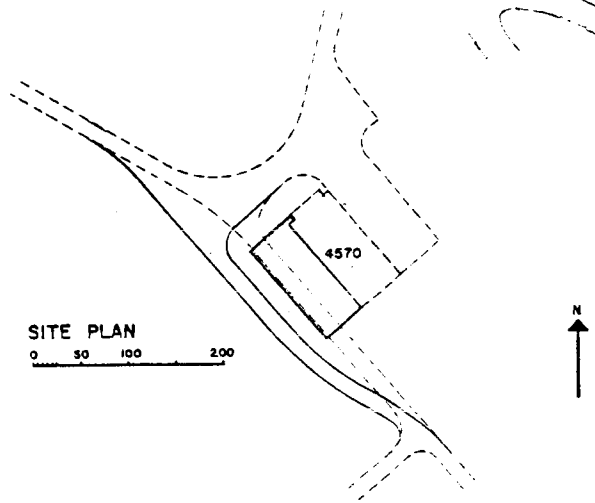
SECOND FLOOR PLAN



FIRST FLOOR PLAN
(BASEMENT UNDER)
0 10 20 40



PERSPECTIVE



SITE PLAN
0 50 100 200

instrumentation. The proposed expansion is urgently required to permit the effective operation of this key facility.

COST ESTIMATE:

Site work and utilities		$39,000
Building construction (16,400 square feet at $30.50 per square foot)		500,000
Control system		72,000
Extension of visual and oral warning and communication systems	$20,000	
Control equipment, consoles, and racks	35,000	
Work benches, and laboratory equipment	12,000	
Cables, ducts, and trays	5,000	
Instrumentation system		1,628,000
Oscillograph groups	300,000	
Digital data acquisition units	950,000	
Vibration analysis equipment	145,000	
Conditioning and test equipment	120,000	
Work benches and cabinets	4,000	
Cables, trays, columns, and panels	69,000	
Installation	40,000	
Design and engineering services		261,000
Total estimated cost		$2,500,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 15 months

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

LIQUID HYDROGEN FACILITY

DESCRIPTION:

This project provides for the construction of a facility in which small liquid hydrogen fueled power plants may be static tested and where other features of liquid hydrogen propulsion systems may also be tested. As indicated in the sketch on the following page, the facility will consist of an H-shaped concrete structure, the outside of one end of which will be used for engine testing. A covered engine mounting position, a concrete pad for supporting a water-cooled diffuser, and a steam ejector will be provided. A concrete pad for mounting special test hardware will be constructed at the opposite end of the H structure. Liquid hydrogen and liquid oxygen tanks will be provided. Other facilities will include a small instrumentation termination room; a steam accumulator; a 600 square foot prefabricated type support building housing control and special power equipment; a boiler; a workshop for the mechanical crews; and a small control building connected to the position with a cable duct. A modification is required in the existing components test laboratory to house additional instrumentation recorders.

JUSTIFICATION:

The Marshall Space Flight Center has been assigned the mission, as part of the Saturn space vehicle program, for the technical supervision of contractor efforts involving liquid hydrogen fueled propulsion systems. The responsibility for successfully performing this mission requires the availability of an in-house capability for checking the work of the contractors in order independently to evaluate the performance of their engines. Such a facility is also required as a back-up position in case of a catastrophe that renders the contractors' back-yard facilities inoperable, and to provide capability for independently exploring means of correcting weak spots in the engine. Since the work will largely involve components, it is proposed to construct the facility adjacent to the existing components test laboratory.

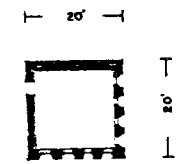
COST ESTIMATE:

Site work	$80,000
Exterior utilities	100,000
Construction of stand	100,000
Fuel tanks, LOX tanks, and piping	200,000
Steam system	80,000
Trailer shed (1,200 square feet @ $6.24 per square foot)	7,500

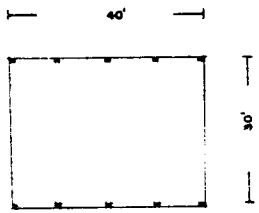
MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

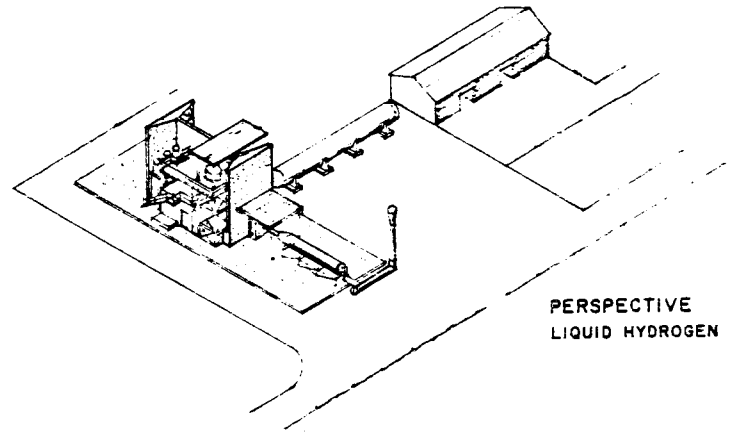
LIQUID HYDROGEN FACILITY



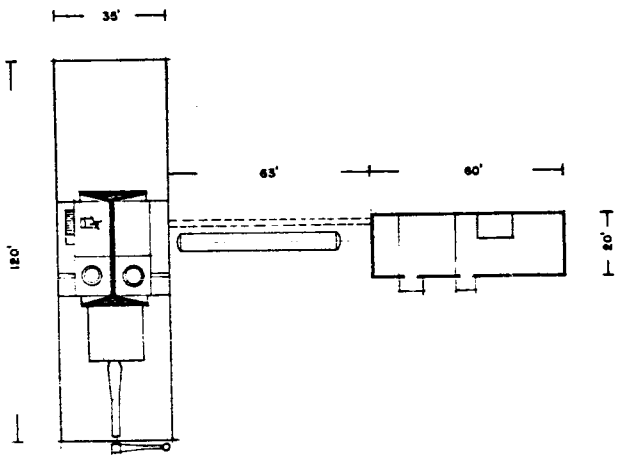
CONTROL BLDG
PLAN
0 10 20 30



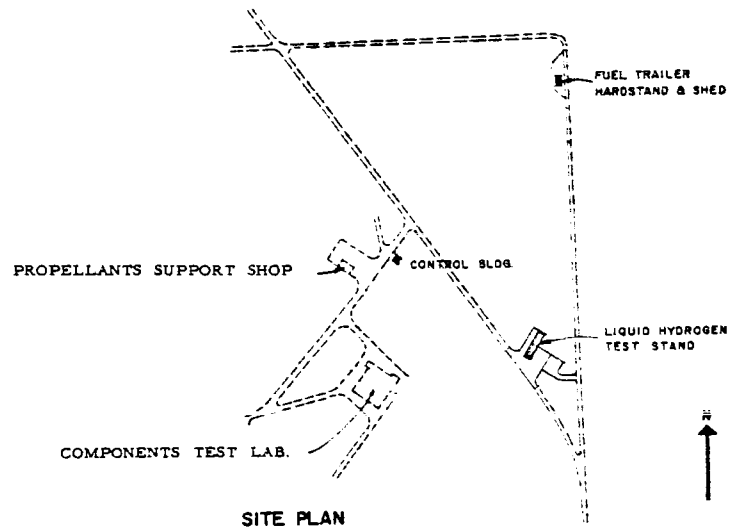
SHED
PLAN
0 10 20 30



PERSPECTIVE
LIQUID HYDROGEN TEST STAND



LIQUID HYDROGEN TEST STAND
PLAN
0 10 30 60



SITE PLAN
0 200 400

Equipment for stand	$32,500
Control building (400 square feet @ $32.50 per square foot)	13,000
Duct bank	17,000
Modification of components test laboratory	100,000
Control system	70,000
Instrumentation	94,000
Digital data system	588,000
Design and engineering services	218,000
Total estimated cost	$1,700,000

CONSTRUCTION SCHEDULE:

Total estimated completion time	17 months

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

HIGH-VACUUM TEST FACILITY

DESCRIPTION:

The construction proposed under this project will provide a research facility to study base heating problems, spatial attitude control nozzles, and upper stage vernier problems, and a facility to test materials and components under simulated high altitude and space environments. The facility will provide a capability of producing pressure altitudes of from 10^{-5} to 10^{-9} millimeter of mercury (mm Hg) which is equivalent to 80 to 300 miles of altitude. The project (see sketch on following page) will include:

1. The main vacuum chamber which will have a volume of about 4,000 cubic feet. Low pressures will be obtained through the use of combined mechanical and cryopumping. Down to a pressure of 1 mm Hg (0 mm Hg = absolute vacuum), the mechanical pump is superior and will be used for rough pumping. The cryopump using helium as a working gas, will provide additional pumping down to the low pressure of 1×10^{-9} mm Hg. Since the cryopump pumps by freezing out the gas molecules on a 20° K (20° C above absolute zero or -253° C) cold surface, an extension of the vacuum to a pressure of 1×10^{-10} or 1×10^{-12} mm Hg (400 to 500 miles altitude) appears feasible if the vacuum chamber is purged of certain noncondensables prior to pumping. Nitrogen or carbon dioxide can be used as a purging gas.

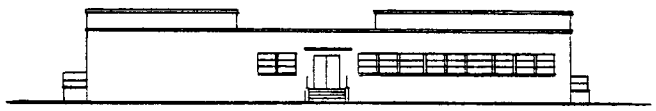
2. A 4,650 square foot air-conditioned building to house engineering and technical personnel. In addition to the main vacuum chamber, several smaller chambers will be incorporated in which small component tests can be performed simultaneously. Provisions will also be incorporated for simulating the solar radiation spectrum at corresponding altitudes. Building construction will be structural concrete frame with masonry walls and partitions.

JUSTIFICATION:

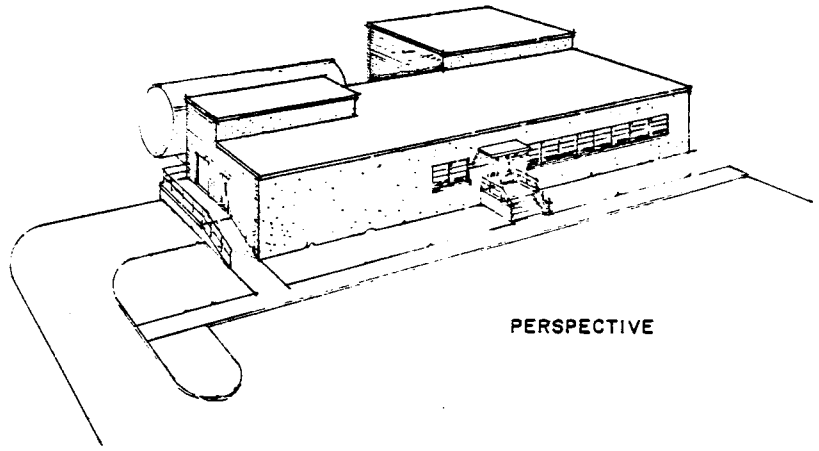
In connection with the launch missions assigned to the Marshall Center, many problems must be investigated under simulated high altitude and space environments. Some examples of application are listed, all of which are vital to the completion of the Marshall missions:

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1962 ESTIMATES

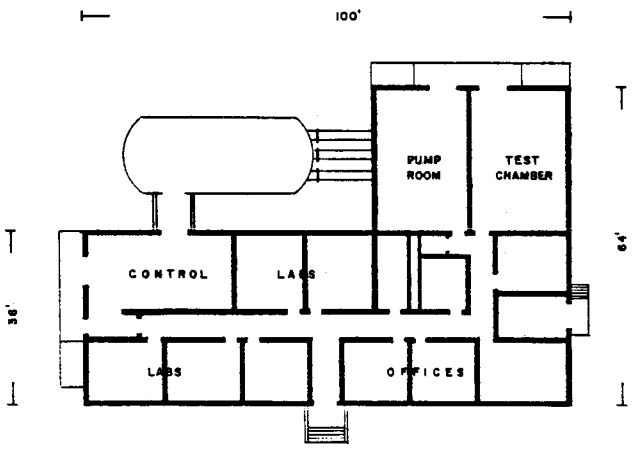
HIGH-VACUUM TEST FACILITY



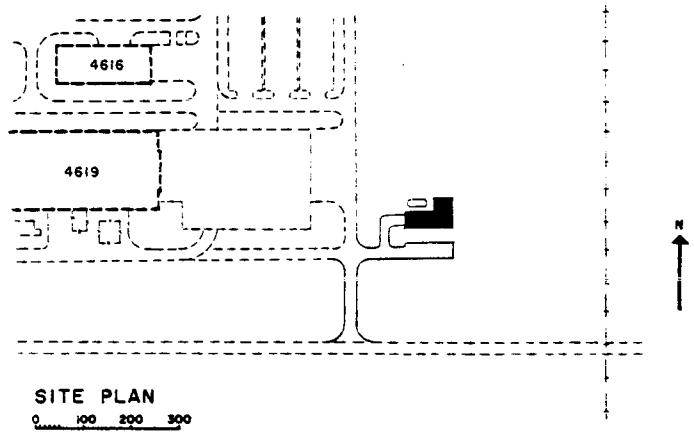
ELEVATION



PERSPECTIVE



FLOOR PLAN
0 10 20 30



SITE PLAN
0 100 200 300

Base heating caused by rocket exhaust jets: A severe base heating problem occurs in flight due to the action of the rocket exhaust jet. At a sufficiently high altitude, the mushrooming effect of the exhaust jet results in some of the high-temperature gases being directed back towards the base of the vehicle. This causes burning of structural members and the malfunction of components in the engine compartment due to abnormally high temperatures. The problem is very complex and is aggravated when interference exists between adjoining jets of a clustered array of rocket engines. The effects can only be studied by subjecting scale models to an almost identical flight environment. Such an investigation depends on establishing multiple jet patterns under vacuum conditions of sufficient duration to permit the measurement of base flow and base heating information.

Spatial attitude control nozzles and upper stage vernier: Injecting payloads into orbital or spatial trajectories places very severe requirements on guidance and control systems. For example, the proper orientation and alignment of stages and payloads during coast periods will be accomplished by the use of small attitude control nozzles and upper stage verniers. The nozzles require very careful design in order that the thrust levels can be accurately predicted. Since they must operate in the near-vacuum environment of space, it is therefore necessary that proper low pressure simulation be provided and maintained for a sufficient period of time to allow careful measurements of thrust and jet flow patterns.

Materials and component testing: For the study of materials and components, the solar radiation spectrum must be simulated in addition to pressure simulation. There are sufficient data currently available to determine this radiation spectrum up to the limits of pressure simulation. Tests must be conducted under this simulated environment since the effect of solar radiation on materials is not adequately understood at present.

All of the tests mentioned above are of current and future interest for missions assigned to the Marshall Center. The tests must be conducted in a facility which has a high pumping rate at low pressures in order to maintain constant testing conditions. Investigation has shown that the cryopumping technique can meet this requirement. Commercial sun lamps will provide solar radiation simulation.

COST ESTIMATE:

Building (4,650 square feet at $20.20 per square foot).	$94,000
Helium cryopump.....	267,000
Mechanical roughing pump.....	25,000
Vacuum chambers.....	120,000
Auxiliary equipment.....	45,000
Instrumentation.....	100,000
Design and engineering services.....	50,000
Total estimated cost.....	$701,000

CONSTRUCTION SCHEDULE:

Total estimated completion time.....	12 months

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

TECHNICAL SERVICES FACILITY

DESCRIPTION:

This project provides for the construction of a facility that will house the shops required for the maintenance of the Marshall Space Flight Center. A sketch of the facility is shown on the following page. The scope of work includes:

1. A maintenance building with sheet metal, millwright, welding, and machine shops, and shop space for carpentry, plumbing, air conditioner repair, electrical and instrument repair, and for roads and grounds maintenance. A few offices and a locker and clean up room for workmen will also be provided. The office section will be constructed of concrete frame and masonry exterior walls and will be air-conditioned. The shop section will be constructed of structural steel columns with corrugated cement asbestos siding and steel bar joists supporting a built-up roof.

2. A paint shop and storage building with a circulating water system for removing paint fumes from the spray paint booth area. Space will be provided for the storage of paint and painter's equipment. The building will be constructed with a concrete frame and masonry walls.

3. A pre-fabricated metal building for the storage of construction materials, and sheet metal, plumbing, and electrical supplies.

4. An open equipment shed for the inspection and servicing of construction equipment such as motor cranes, graders, and bulldozers. The shed will be constructed of concrete frame with steel bar joists supporting a built-up roof.

5. Site improvements including a parking area, a fenced open storage material yard, and utilities.

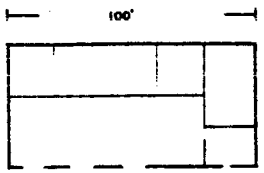
JUSTIFICATION:

With the transfer of the Marshall Center to the NASA, maintenance services previously provided by the Post Engineer of Redstone Arsenal became the responsibility of Marshall Center. A maintenance branch has been established and charged with responsibility for the following plant maintenance services:

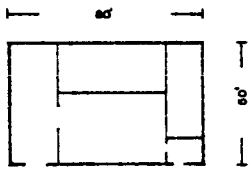
1. Maintenance of buildings, structures, and equipment.

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1962 ESTIMATES

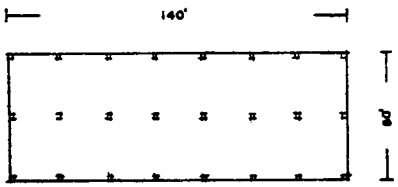
TECHNICAL SERVICES FACILITY



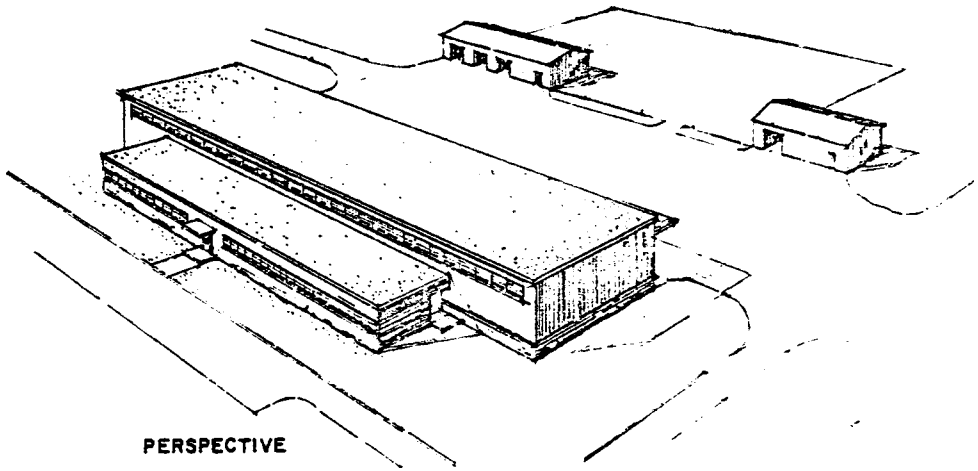
STORAGE BLDG.
FLOOR PLAN



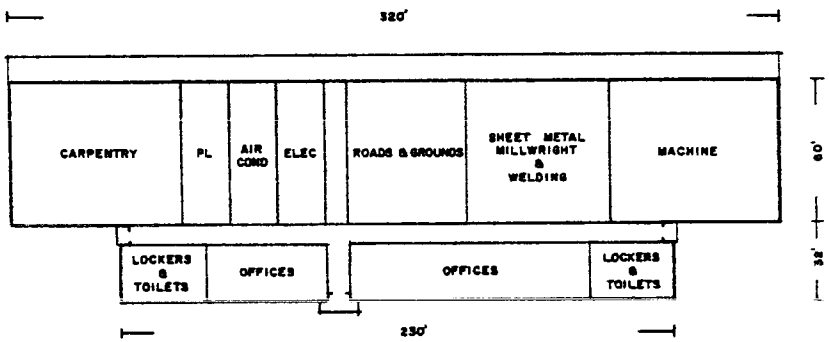
PAINT BLDG.
FLOOR PLAN



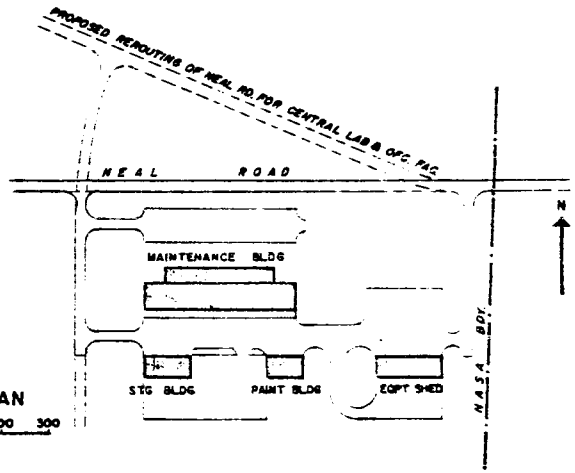
EQUIPMENT SHED
PLAN



PERSPECTIVE



MAINTENANCE BLDG.
FLOOR PLAN
0 20 40 60



SITE PLAN
0 100 200 300

2. Modifications to buildings and structures.

3. Maintenance of grounds and maintenance and repair of secondary roads and miscellaneous surfaced areas.

4. Custodial services and refuse handling.

5. Insect and rodent control.

The maintenance branch has a complement of 250 employees. The proposed facility will provide the permanent shops, administrative areas, and storage facilities for the branch.

With the exception of two small buildings of less than 4,000 square feet in area, none of the plant maintenance facilities were transferred to the NASA by the Army. At present, most of maintenance operations are still carried on within Army shops which must be vacated as soon as possible by the terms of the Army-NASA transfer agreement. As a temporary solution, the service functions will be relocated within various NASA buildings as the availability of space permits. The proposed facility will permit the consolidation of the widely scattered operations into an adequate and efficient central operation capable of meeting the service requirements of the Center.

COST ESTIMATE:

Site preparation and utility connections.....	$120,000
Maintenance building (26,400 square feet @ $15.25 per square foot).....	403,000
Paint shop and storage building (4,000 square feet @ $16.50 per square foot).....	66,000
Storage building (5,000 square feet @ $8.00 per square foot).....	40,000
Equipment shed (7,000 square feet @ $6.00 per square foot).....	42,000
Design and engineering services.....	86,000
Total estimated cost...	$757,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 15 months

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

LOAD TEST ANNEX

DESCRIPTION:

It is proposed to construct a 17,600 square foot addition to the structural test laboratory for load testing of the full size Saturn first stage (S-1) structure.

The proposed annex will provide the means for testing the present Saturn S-1 structure, and will also accommodate expected modifications and advancements.

The building for the load test annex will consist of a high bay extension of 13,530 square feet to the present facility, which will be 110 feet long, 123 feet wide, and 140 feet high. A low bay of 4,070 square feet will parallel the length of the high bay and will be 110 feet long, 37 feet wide, and 20 feet high. The total size of the extension will be 17,600 square feet. Construction of the high bay will be structural steel frame with corrugated cement asbestos siding. Reinforced concrete floors with instrumentation tunnels will be provided to accept test loads up to 10,000,000 pounds. The low bay area will be constructed of masonry, and will not require special foundations. A sketch of the proposed building is shown on the following page.

The proposed facility will not include office or administrative space since adequate facilities are available in the adjoining building. Special power, wiring and instrumentation controls will be provided for running tests on the main test floor and for monitoring in the low bay area. Heating for both areas and air conditioning only in the low bay instrumentation area will be provided.

The primary piece of equipment for the annex will consist of a free standing 10,000,000-pound capacity static test tower of structural steel, 80 feet wide by 80 feet deep by 110 feet high. The second major piece of equipment will be a 100-ton overhead crane to handle a full length booster and place it in the static tower. The crane will have a 120-foot height under the hook.

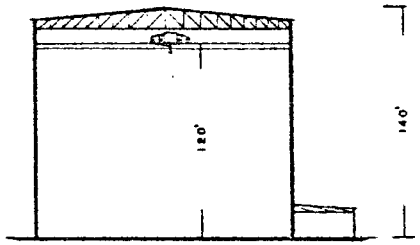
Although the majority of miscellaneous test and measuring equipment will be made available from existing stocks, some additional items such as hydraulic cylinders and recording instrumentation will be required.

JUSTIFICATION:

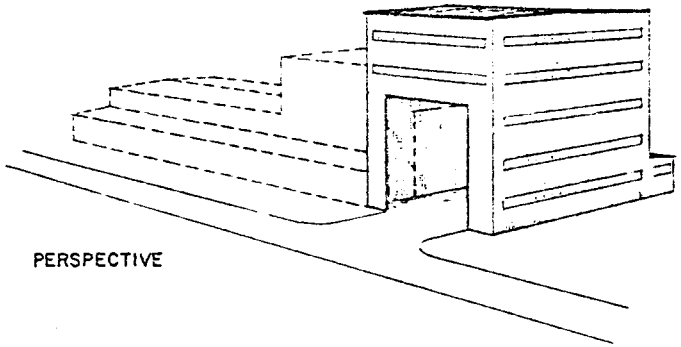
To adequately load launch vehicles undergoing engineering flight tests, it is necessary to apply complete launch, hold-down, rebound, flight, and

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1962 ESTIMATES

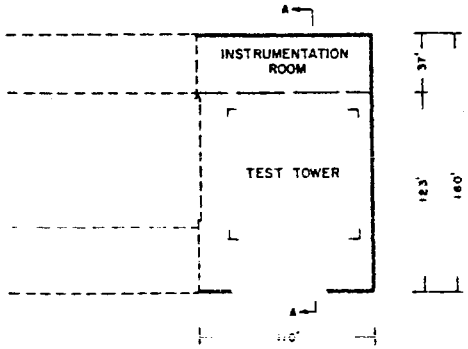
LOAD TEST ANNEX



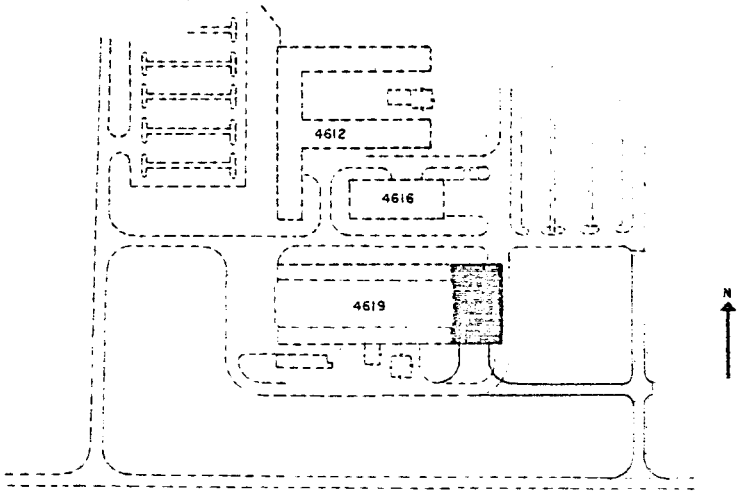
SECTION A-A



PERSPECTIVE



FLOOR PLAN
0 20 60 100



SITE PLAN
0 100 200 300

engine cutoff loads to full scale structures. The test facility must be capable of loading the vehicle well beyond the levels expected in flight in order to determine safety factors. A loads test program which is limited to less than this introduces areas of doubt since empirical data are not available for vehicles of the Saturn and larger classes.

The existing facility at the Marshall Center for the testing and verification of vehicle structures was primarily designed for the Jupiter system. With the advent of the Saturn vehicle program, the magnitude of structural loads increased tenfold and physical size increased many times. The existing facility can accommodate test specimens of only 40 feet in length, and can handle loads of only 3,000,000 pounds. Because of height limits, only short sections can be tested. Also, the 3,000,000 pound load limit will not permit adequate testing of the Saturn vehicle at all flight conditions. No static test facility capable of imposing the required stresses on the Saturn vehicle exist elsewhere in Government or in industry.

The limitations of the existing load test facilities have resulted in only limited test information being available to the Saturn designers. As a result of the test data being obtained from short sections instead of full scale test specimens, the designers are inclined to use higher safety factors. This results in a decrease in mission capability as the vehicles become overdesigned and consequently heavier than required.

The fact that some Saturn flights will have been completed prior to the time the proposed load test annex can be ready for use does not detract from the need for the facility. Early flights of the Saturn will not subject the airframe to the higher loads and bending moments which will be experienced on later flights. The proposed load test annex is required to subject the full scale Saturn to the higher loads and bending moments in order to verify the structural integrity of the vehicle and enable either over- or under-design to be corrected before the vehicle is flown under these more demanding conditions.

COST ESTIMATE:

Building cost (17,600 square feet at $42.20 per square foot)	$743,000
Paving, grading and drainage	30,000
Power, wiring and instrumentation controls	400,000
Load tower	300,000
Crane	120,000
Hydraulic cylinders and recording instrumentation	50,000
Design and engineering services	60,000
Total estimated cost	$1,703,000

CONSTRUCTION SCHEDULE:

Total estimated completion time	14 months

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

LOX STORAGE FOR POWER PLANT TEST STAND

DESCRIPTION:

It is proposed to install two, 28,000-gallon, vacuum-insulated liquid oxygen storage tanks, between the power plant test stand and the blockhouse. The tanks will be mounted in a concrete pit, complete with associated piping and pumping equipment to provide the necessary supply of oxidizer to the test stand. The project will include a hardstand and railroad spur track to facilitate recharging the storage tanks. A sketch of the proposed installation is shown on the following page.

JUSTIFICATION:

The power plant test stand plays a vital role in the Saturn first stage research and development program. It is the position at which all eight H-1 engines are checked, fired, and calibrated prior to clustering. (The H-1 engine produces 188,000 pounds of thrust at sea level.) Liquid oxygen requirements are presently being met by the utilization of two small portable tanks, belonging to the U. S. Army, supplemented by trailers as needed to meet required test frequencies. This present operation is costly and inefficient because the rolling stock must also service other test positions, thus incurring scheduling and timing difficulties. Recall of the portable tanks by the U. S. Army will create an even greater logistical problem of relying solely on the use of trailers for the liquid oxygen supply.

The proposed permanent storage facility will reduce operating costs and safety hazards in that the use of hoses and special couplings will be eliminated; the required number of service personnel will be reduced; liquid oxygen losses will be reduced; recovery of unused quantities of liquid oxygen will be made possible; and the pit location will provide a means of containing an accidental spillage. A deluge system will dissipate this spillage. This is an important safety feature not presently available.

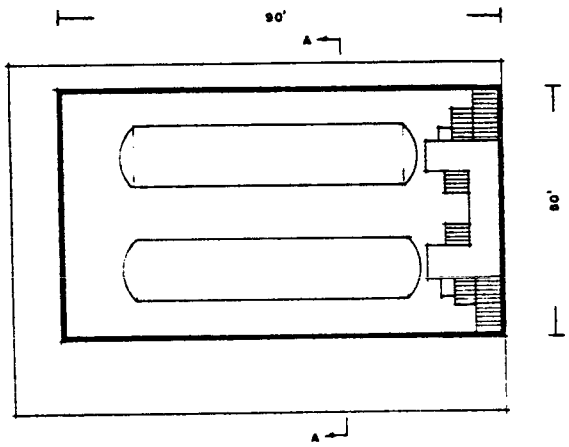
COST ESTIMATE:

Utilities and site work.....	$48,000
Two Lox tanks installed.....	220,000
Concrete pit and piping system.....	267,000
Design and engineering services.....	65,000
Total estimated cost...	$600,000

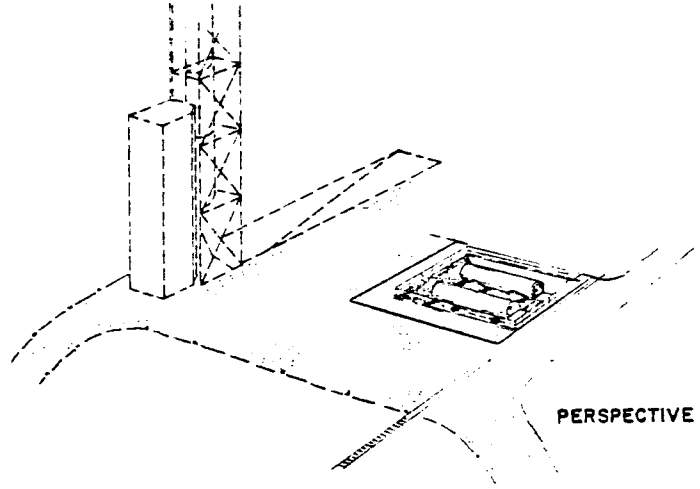
MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1962 ESTIMATES

LOX STORAGE FOR POWER PLANT TEST STAND

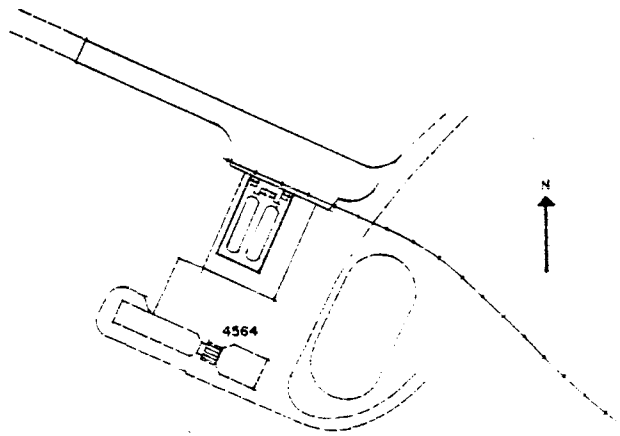
SECTION A-A



PLAN
0 10 20 30



PERSPECTIVE



SITE PLAN
0 50 100 200

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 17 months

MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1962 ESTIMATES

ACCELERATION OF THE SATURN STATIC TEST FACILITY

DESCRIPTION:

This project will provide additional funds to allow activation of the Saturn Static Test Facility in 24 months, from finalization of criteria, so as to achieve an operational date of December 1962. As originally approved in the fiscal year 1961 budget in the amount of $10,800,000, construction time for this facility was estimated at 30 months. An additional six months was estimated for installation of locally manufactured tailor-made items to suit the individual configurations of the vehicle to be tested. These items are the flame deflector, missile adaption hardware, and the fire fighting systems. This schedule represented a total elapsed time to activation of 36 months. The compression of this schedule into a 24-month period will be accomplished as follows:

By accelerating engineering design: This will be accomplished by premium payment to the architect engineering firm for expediting design effort and labor force augmentation.

By expediting the facility construction and the installation of instrumentation and controls: This will be accomplished by the use of extra shifts and overtime premium pay; a premium for mobilization of the maximum of extra usable equipment; the use of specialized handling equipment, such as conveyors and assembly lines; providing extra heating and weather protection required for multi-shift operation; and by providing for access roads, special loading, unloading, and storage areas to expedite transportation of materials to place of use.

By expediting the delivery of materials and equipment involving: The special ordering, handling, and shipping of materials and equipment; the buying of small lot quantities, due to large lot unavailability, of items, such as, steel shapes, special electrical equipment, high-pressure pipe, valves, fittings, and anchoring devices for pipes and conduits; and the evaluation and procurement of suitable but different materials and equipment than that specified by contract due to earlier availability.

By contracting for labor and materials for specially tailored components and equipment originally planned for in-house fabrication using materials stock to be procured in the fiscal year 1963: Departure from the original plan in this case is now necessary by reason of the fact that the workload at the Marshall Center prohibits the use of in-house labor for

this work at the present time and in the projected future. Contracting for this work will permit installation of this equipment to begin four months earlier than originally planned.

JUSTIFICATION:

At the present time only a single facility exists that is capable of testing the first stage of the Saturn launch vehicle. Present funding will provide for a second such test stand that will be operational in December 1963. Operating with only the existing Saturn test stand currently results in frequent delays in vehicle development. To support the continued development of the Saturn first stage, the present test stand is required continuously for R&D tests. However, each time a flight vehicle is tested, the R&D testing is interrupted for a period of approximately 12 weeks. This delay is incurred by the time required to remove the R&D vehicle; to erect, checkout and test the flight vehicle; and to return the R&D vehicle to the stand and prepare it for continued testing.

Although this technique of operation is costly and time consuming and introduces periodic delays in the development program, a factor of far greater concern is the possibility of a major accident on the test stand. Should such an accident occur, the Saturn program would come to a complete halt for a period of several months to a year while the stand was being rebuilt. It is imperative that every step be taken to avoid the possibility of such a prolonged and catastrophic delay in the development of Saturn, a program that is of major national importance.

All possible effort must therefore be made to accelerate at the fastest possible rate the construction of the second Saturn static test facility at the Marshall Center. It is therefore urgent that these additional construction funds be made available to bring into operation at the earliest possible date the second test stand so that the uninterrupted progress of the Saturn vehicle development program can be insured.

COST ESTIMATE:

Accelerating engineering design.....		$100,000
Expediting facility construction and the installation of instrumentation and controls.....		800,000
Construction.....	$350,000	
Instrumentation and controls.....	450,000	
Expediting the delivery of materials and equipment...		1,000,000
Construction materials.....	450,000	
Instrumentation and control equipment and materials.....	550,000	

Contracting for components originally planned for local manufacture..... $2,100,000

	Expedited Contract Effort			
	Labor Estimate	Materials Estimate	Total	
Flame deflector.	$725,000	$380,000	$1,105,000	
Missile adaption hardware.....	425,000	320,000	745,000	
Fire fighting equipment.....	150,000	100,000	250,000	
	Total estimated cost.....			$4,000,000

The cost breakdown includes estimates for increased contractor costs for supervision and contract management.

CONSTRUCTION SCHEDULE:

Total estimated completion time (accelerated)..... 24 months

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

CONSTRUCTION OF FACILITIES - 1962 PROGRAM

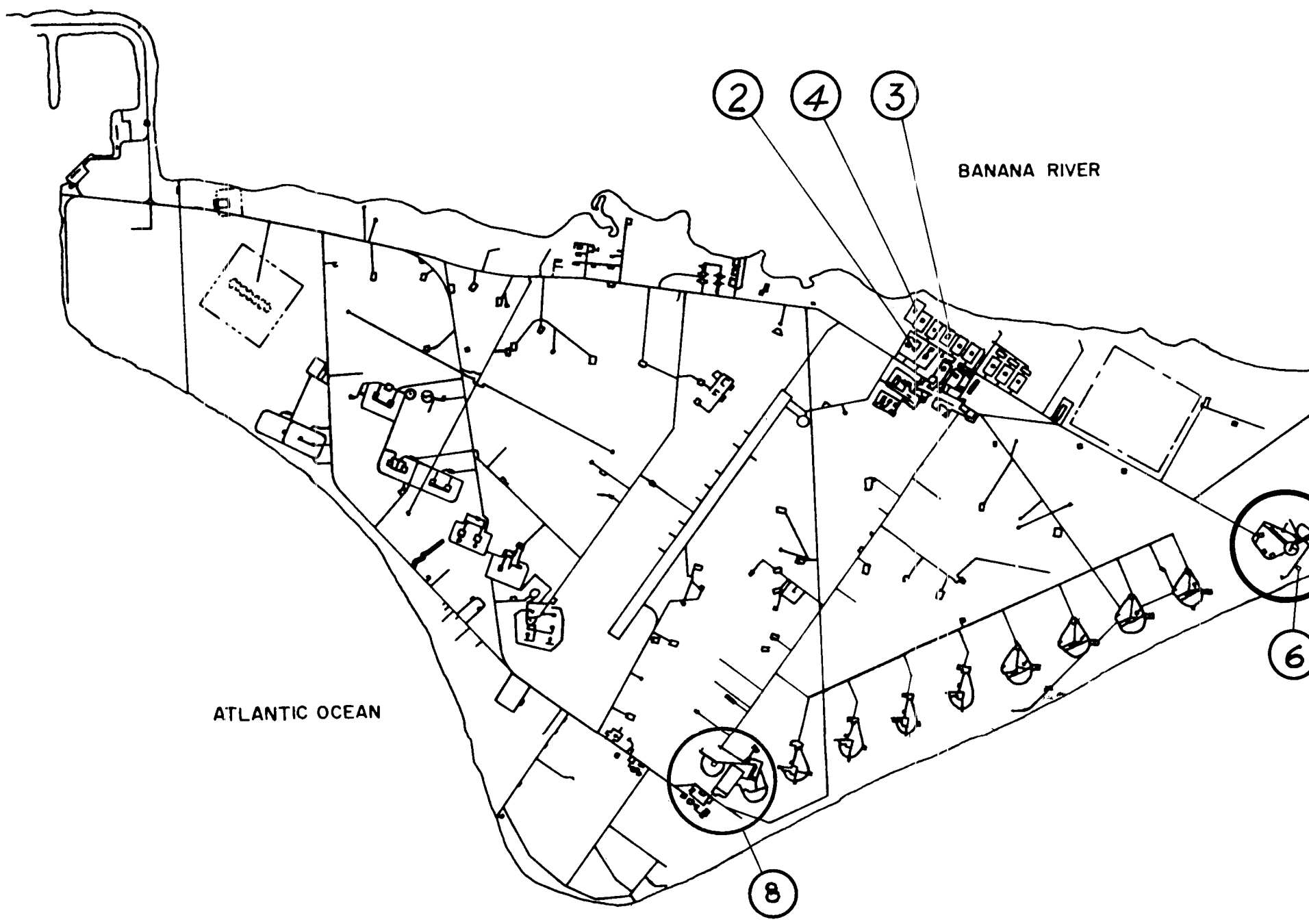
ATLANTIC MISSILE RANGE

Page No.		
CF8-2	Location plan	
CF8-3	Completion of Saturn launch complex No. 37...	$10,961,000
CF8-14	Central shop and maintenance facility.....	743,000
CF8-17	Spacecraft facility.....	844,000
CF8-20	Extension of assembly building.....	1,035,000
CF8-22	Liquid hydrogen system for Saturn launch complex No. 34.....	2,800,000
CF8-25	Modifications to Saturn launch complex No. 34	2,800,000
CF8-29	Saturn barge No. 2.....	600,000
CF8-32	Modifications to launch complex No. 36.....	18,800,000
CF8-38	Modifications to Saturn launch complex No. 37	11,000,000
	TOTAL.....	$49,583,000

ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

LOCATION PLAN

CAPE PLAN

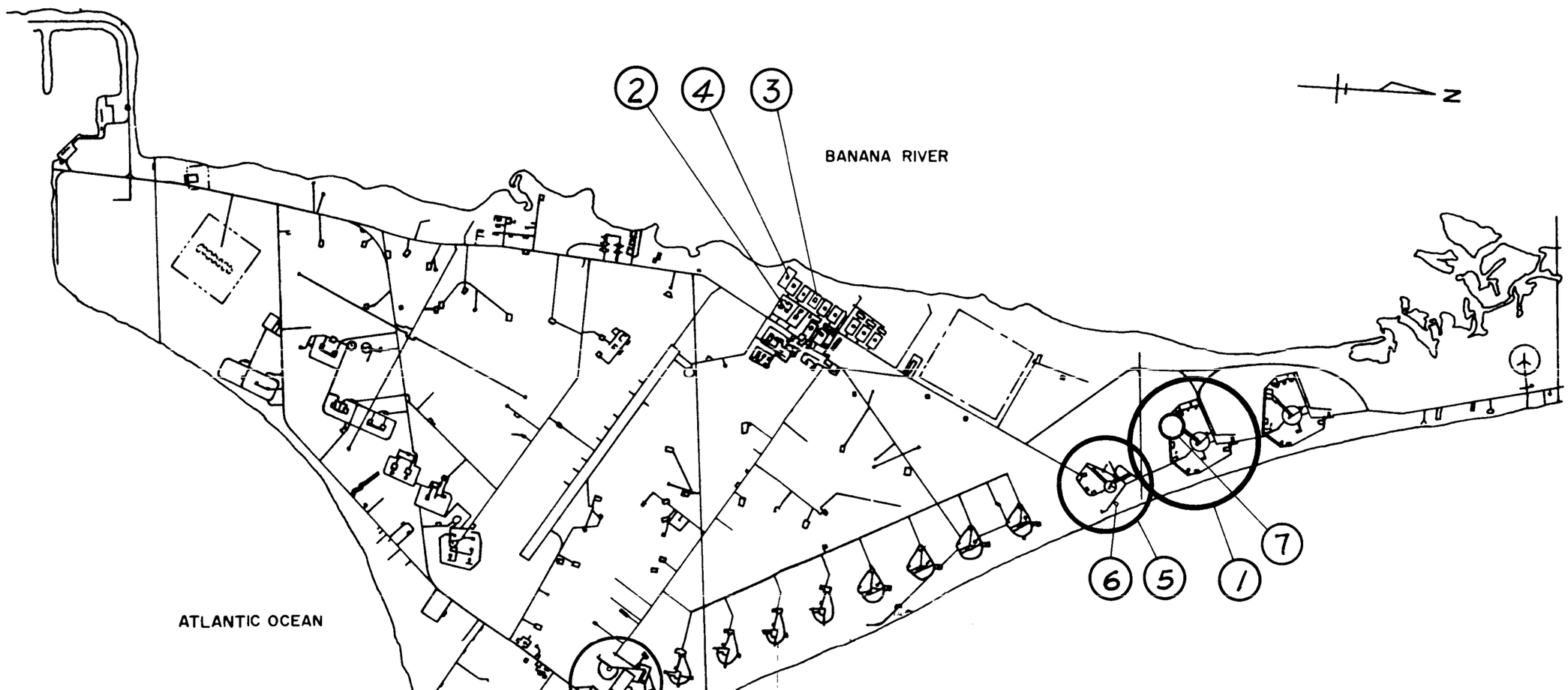


1. COMPLETION OF SATURN LAUNCH COMPLEX NO. 37
2. CENTRAL SHOP AND MAINTENANCE FACILITY
3. SPACECRAFT FACILITY
4. EXTENSION OF ASSEMBLY BUILDING
5. LIQUID HYDROGEN SYSTEM FOR SATURN LAUNCH COMPLEX NO. 34
6. MODIFICATIONS TO SATURN LAUNCH COMPLEX NO. 34
7. MODIFICATIONS TO SATURN LAUNCH COMPLEX NO. 37
8. MODIFICATIONS TO LAUNCH COMPLEX NO. 36

ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

LOCATION PLAN

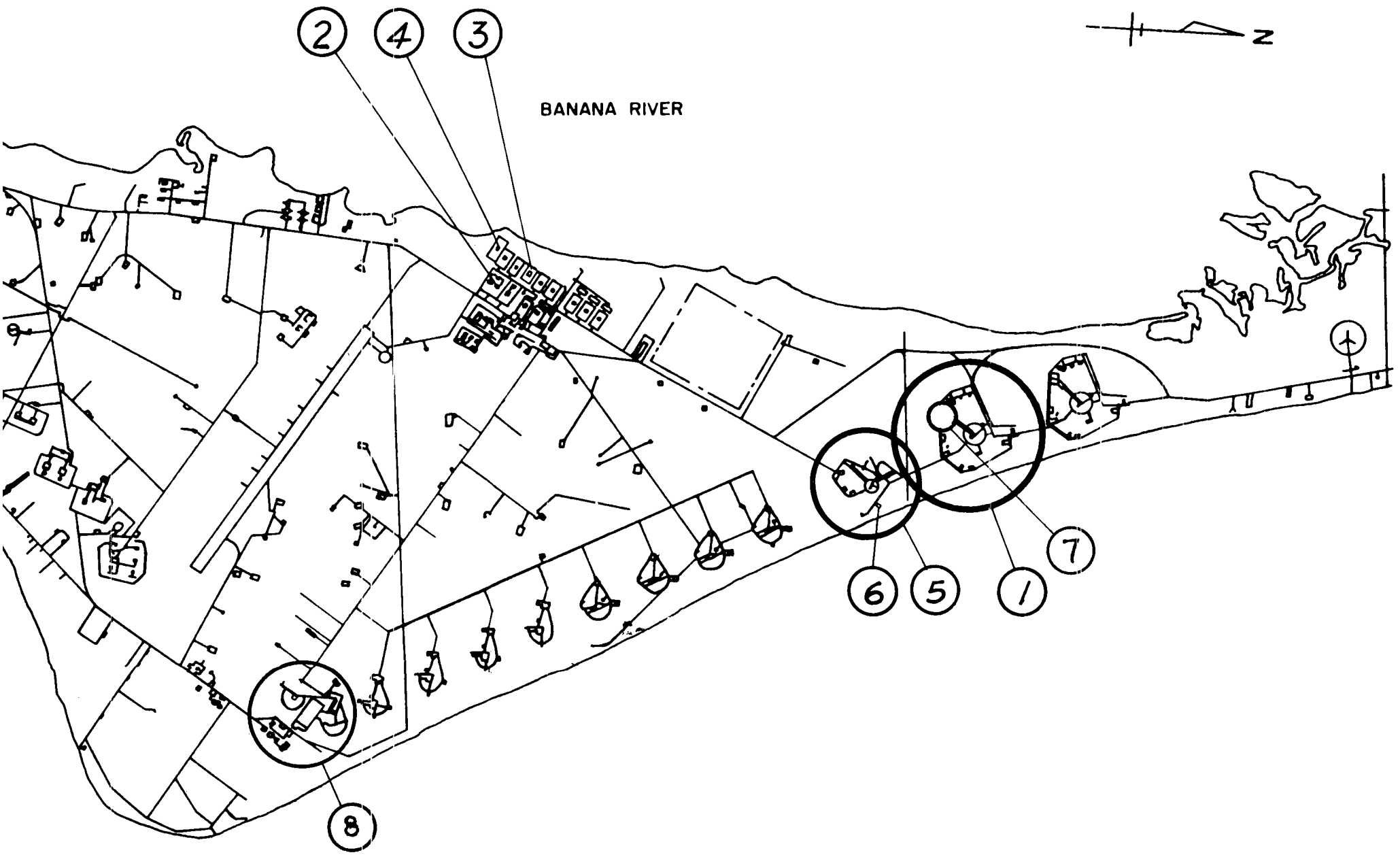
CAPE PLAN



ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

LOCATION PLAN

CAPE PLAN



UNCH COMPLEX NO. 37
ENANCE FACILITY

UILDING
OR SATURN LAUNCH COMPLEX NO. 34
LAUNCH COMPLEX NO. 34
LAUNCH COMPLEX NO. 37
COMPLEX NO. 36

0 5 10
SCALE: 1000 FEET

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

COMPLETION OF SATURN LAUNCH COMPLEX NO. 37

DESCRIPTION:

Funds are requested in this project to complete the construction of Saturn launch complex No. 37 for which initial funding was provided in the fiscal year 1961 budget. Sketches of the complex and some of its major components are shown on the following seven pages.

JUSTIFICATION:

The initial funding for construction of Saturn launch complex No. 37 in the 1961 budget provides for construction of the complete basic structure and for the procurement and installation of certain long lead time items necessary for use of the complex in launching the S-1 version of the Saturn vehicle. Funds are requested in this project to complete the procurement and installation of items for the S-1 version, and to permit the additional construction and equipment necessary for the use of the complex in launching the C-1 version of the Saturn vehicle. Funding for the liquid hydrogen system for complex No. 37 was provided in the fiscal year 1961 as discussed in the project write-up on page CF8-22.

The funds requested in this project will provide for the following items:

Range utilities: Extensions of the underground water, sewage, power, and communication lines are required to the junction point outside the new operations support building.

High-pressure gas system: The basic facility for supplying high-pressure gas was funded in the 1961 budget. The funds requested in this project will provide for expansion of the facility to handle C-1 upper stage pressurization repropellant tanks, and actuate pneumatic controls.

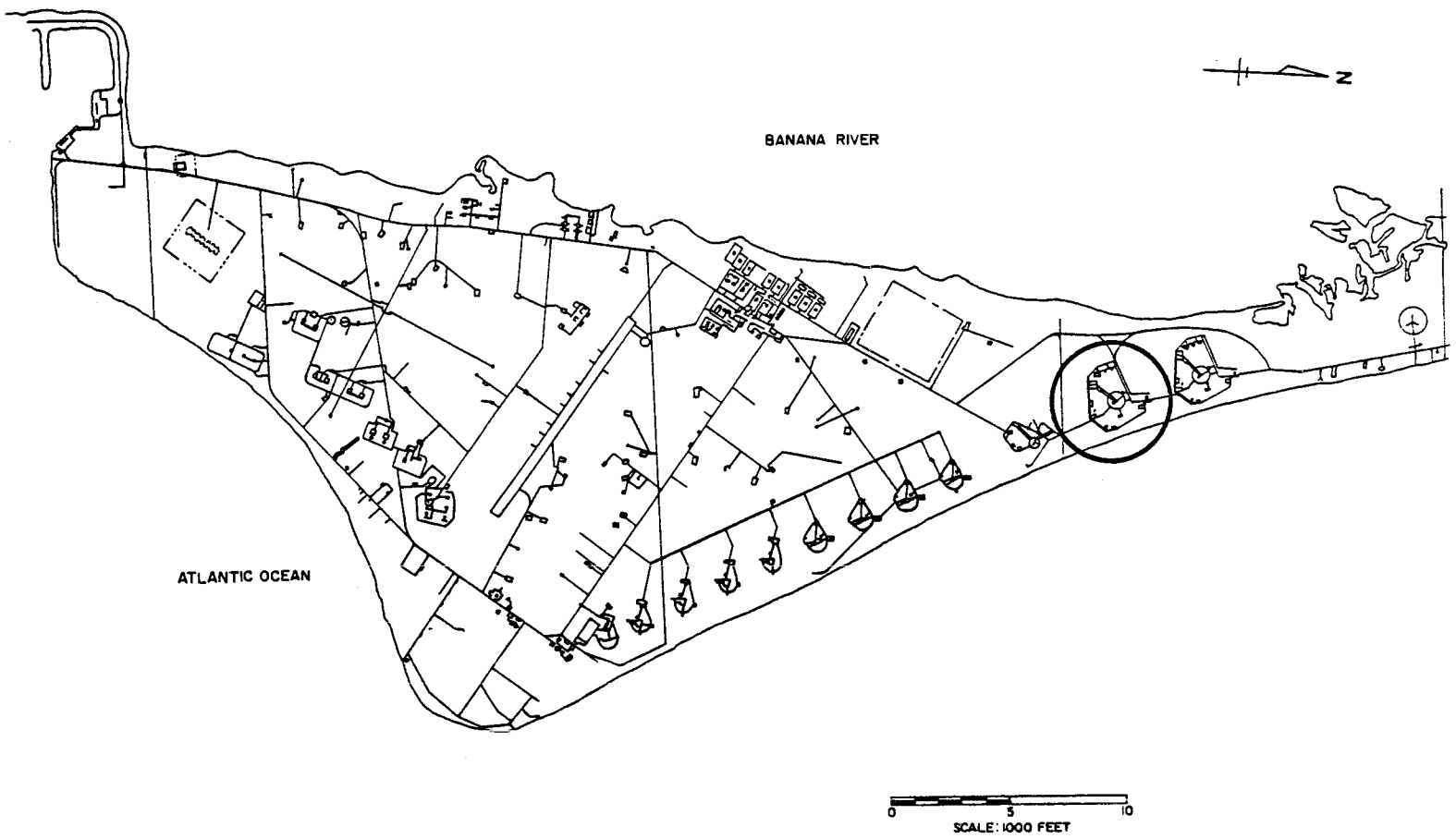
Instrumentation: Electronic, electrical, and mechanical equipment is required in the blockhouse and in other facilities in the launch complex, and for remotely located instrumentation sites. Ground-based measuring, telemetry, and flight safety equipment, and equipment needed to extend range tracking capabilities associated with launch must be provided.

Propellant tanks and lines: Propellant tanks and lines will be installed to the launch complex, including a cryogenic system for liquid oxygen. Additional storage and pumping capacities are required.

ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

COMPLETION OF SATURN LAUNCH COMPLEX NO. 37

CAPE PLAN

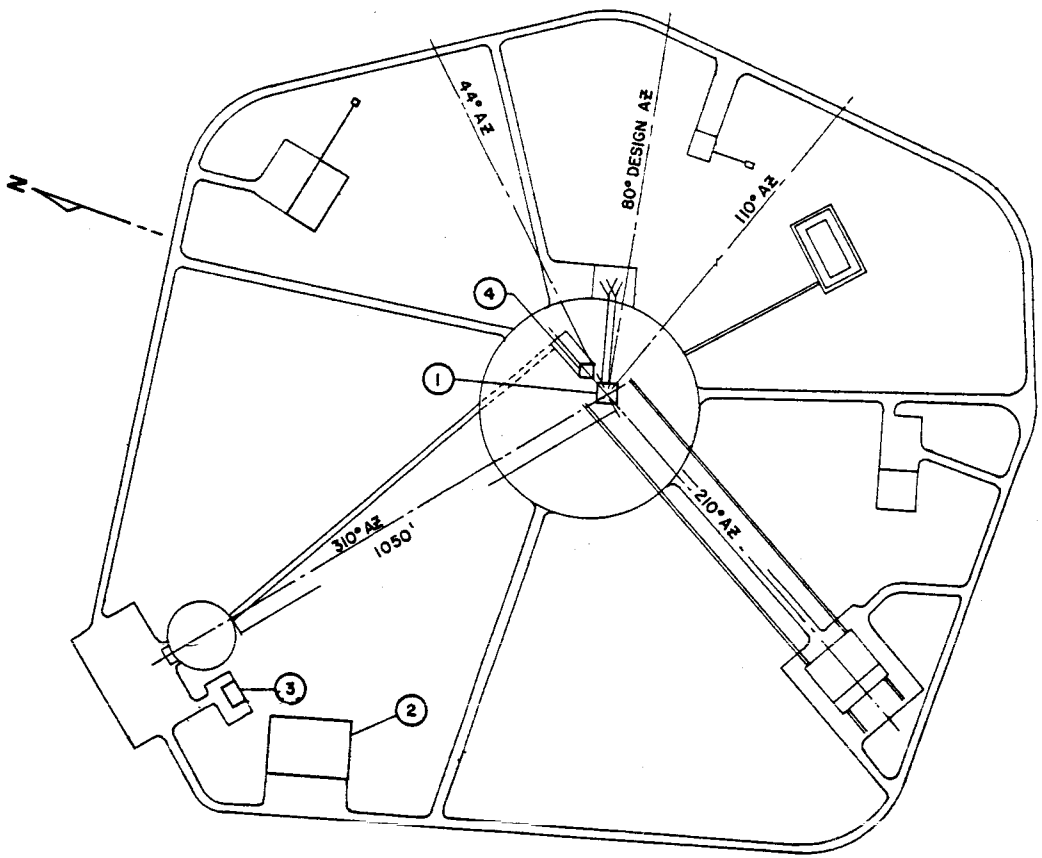


ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

COMPLETION OF SATURN LAUNCH COMPLEX NO. 37

SITE PLAN

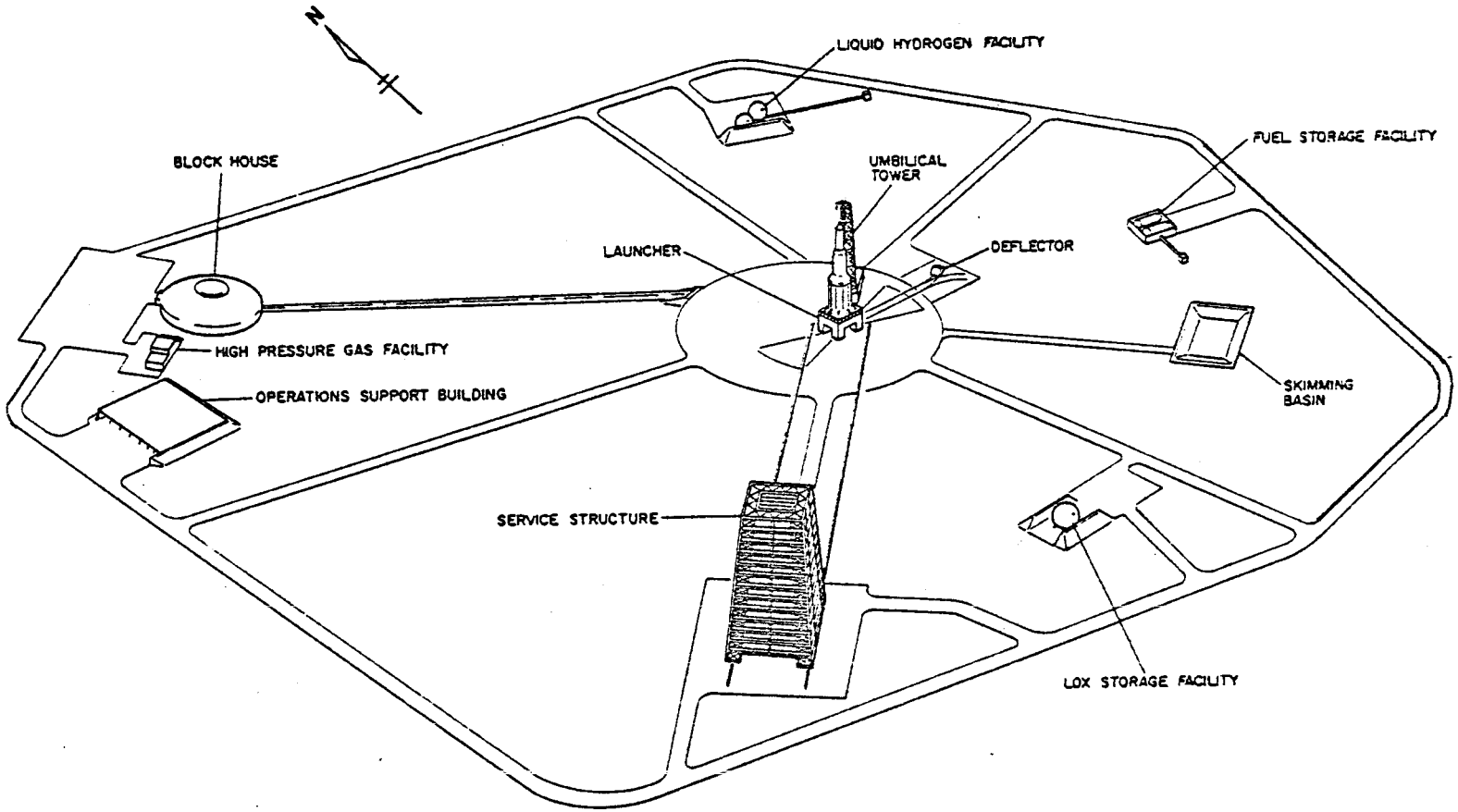


1. BOOSTER PROTECTOR, LAUNCHER, DEFLECTOR, AND ARMS
2. OPERATIONS SUPPORT BUILDING
3. HIGH PRESSURE GAS FACILITY
4. UMBILICAL TOWER

ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

COMPLETION OF SATURN LAUNCH COMPLEX NO. 37

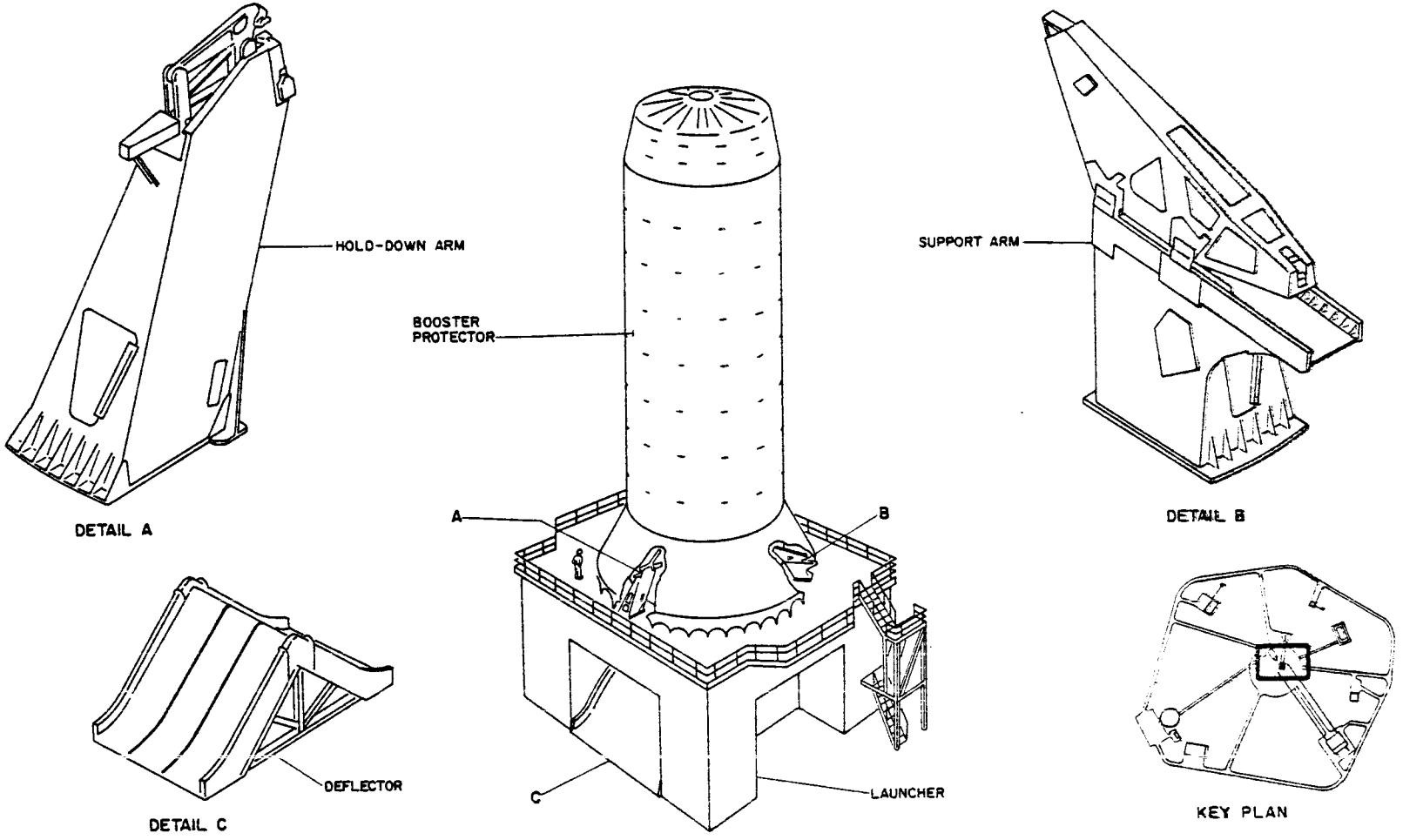
PERSPECTIVE VIEW



ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

COMPLETION OF SATURN LAUNCH COMPLEX NO. 37

BOOSTER PROTECTOR, DEFLECTOR, LAUNCHER, AND ARMS



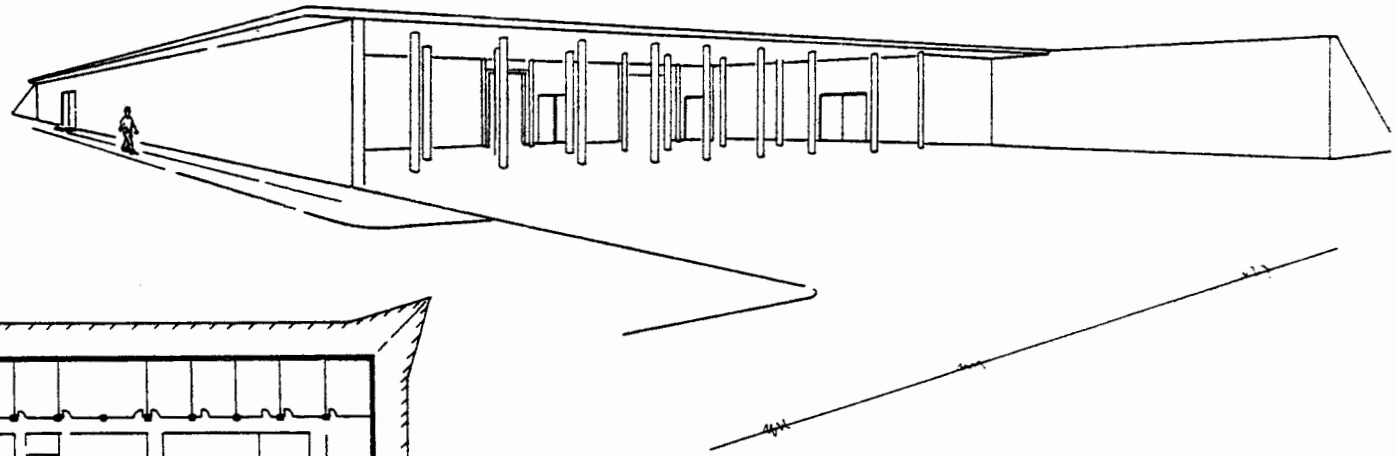
PERSPECTIVE VIEW

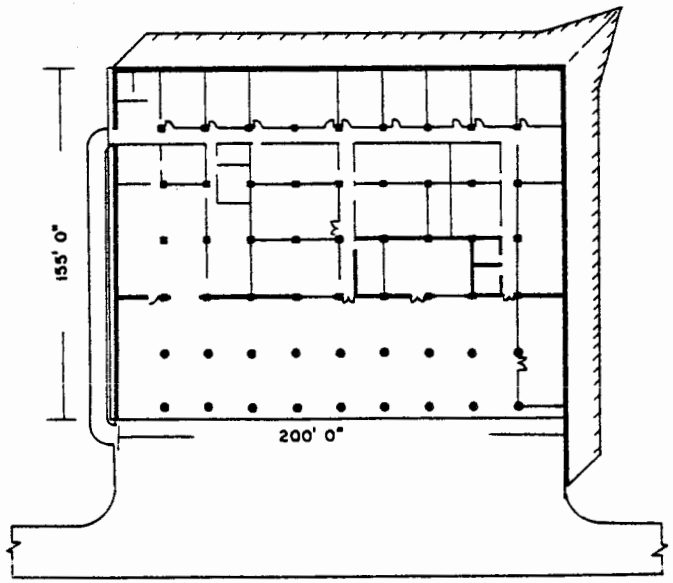
ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

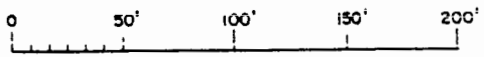
COMPLETION OF SATURN LAUNCH COMPLEX NO. 37

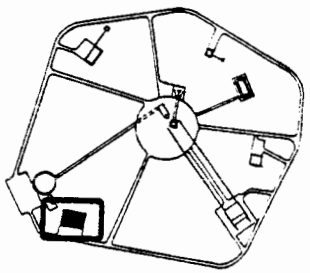
OPERATIONS SUPPORT BUILDING





PLAN VIEW



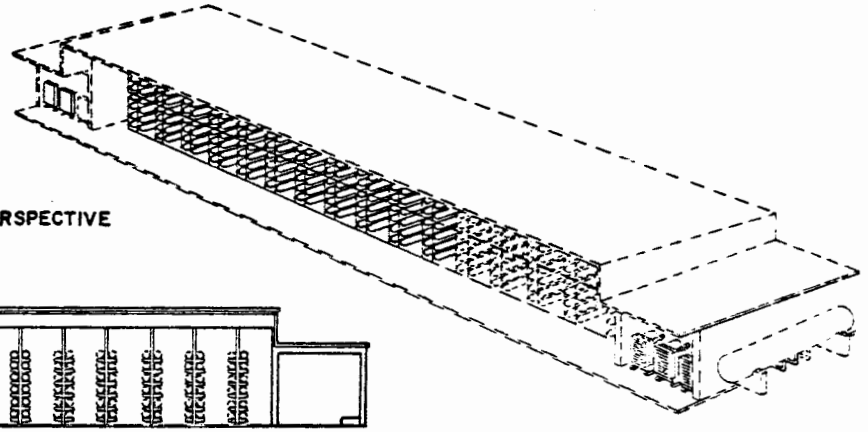


KEY PLAN

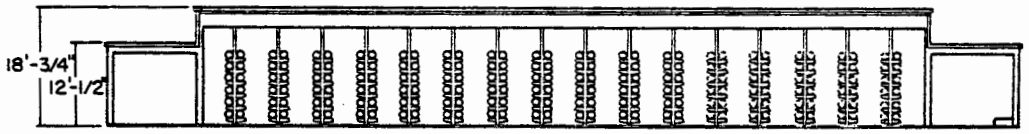
ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

COMPLETION OF SATURN LAUNCH COMPLEX NO. 37

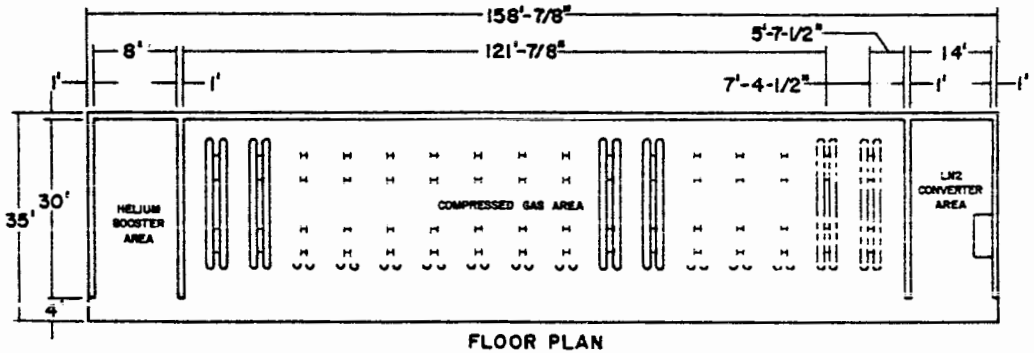
HIGH PRESSURE GAS FACILITY



PERSPECTIVE

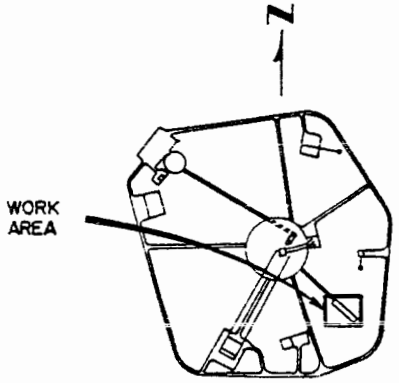


FRONT ELEVATION



FLOOR PLAN

0 10 20 30 40

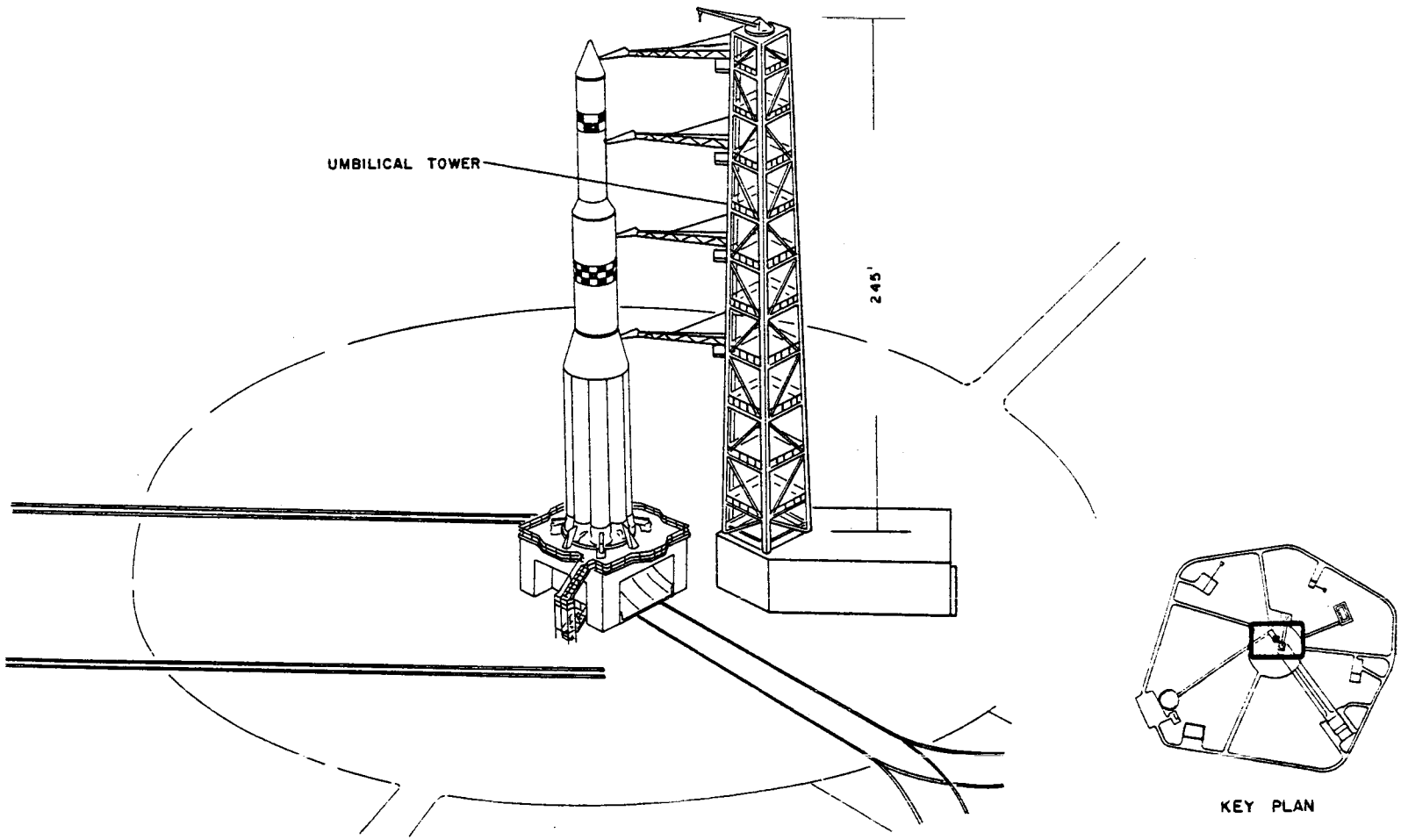


ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

COMPLETION OF SATURN LAUNCH COMPLEX NO. 37

UMBILICAL TOWER



PERSPECTIVE VIEW

Electrical installation: Completion of the installed lines and electrical outlets to service the launch complex are covered by this item.

Completion of blockhouse: Funds are required for completion of the blockhouse.

Service structure modifications: Construction of the service structure will be accomplished substantially with existing funds; but minor modifications to wiring and to propellant lines are required by the C-1 configuration and associated payloads.

Umbilical tower: As a back-up pad for early booster flights, launch complex No. 37 will employ umbilical masts to the booster with no external connections to the dummy upper stages. Fiscal year 1962 funds will provide for the upper portion of the tower structure, which will carry power and propellant lines to the live upper stages prior to lift-off.

Booster protector and anchor: It was originally intended that the booster would be removed from the launcher and stored horizontally under shelter in case of an approaching hurricane. Further study of the time and labor involved, as well as the risk of damaging the booster, has led to the concept of protecting the vehicle on the launcher by anchoring the service structure to the launch pad and by providing a shelter attached to the service structure. An additional benefit from this plan is that the vehicle will be protected from wind loading arising from line squalls and local thunderstorm activity. Such phenomena occur with too little warning to permit vehicle removal, but a weather shelter can be placed in position quickly enough to prevent excessive wind loading.

Deflector: Two spare dry type steel flame deflectors will be mounted on rails that can be moved into position to replace a deflector damaged during launchings. Flame erosion studies reveal that the spares will be necessary for vehicles with C-1 thrust characteristics.

Launcher and arms: This item provides for the procurement and installation of 8 launcher arms on the launch stand. The stand must be modified to accept the arms which are bolted on top of the pedestal and fitted to the vehicle. Four of the new arms are hold-down arms capable of restraining the vehicle while thrust is developed during the ignition sequence and supporting the dead load of the vehicle during the entire pre-launch period. The remaining four arms are for support purposes only and are required to supplement the preceding four arms which otherwise would overstress the vehicle structure.

Operations support building: The construction of a revetted operations support building 1,000 feet from the launch pad is necessary for the blast protection of instrumented laboratories and shop equipment. The building will provide 20,000 square feet of engineering and laboratory space and 10,000 square feet of shed type storage and work space.

Special power sources: Special equipment and power sources are required at the launch complex, over and above that in the blockhouse, for vehicle check-out prior to launch. Included in the items are highly sensitive equipment peculiar to the Saturn vehicle to provide special power for an on-site digital computer, and precision controls to provide close voltage regulations for the computer.

Models, documentation, and handbooks: The funds under this item will provide for the construction of models of service structures and supporting facilities necessary to development of the most effective servicing procedures; and for the documentation and preparation of the required operational handbooks.

COST ESTIMATE:

Range utilities		$190,000
High-pressure gas system		800,000
Instrumentation		1,695,000
Extended range tracking	$345,000	
Ground-based measuring equipment	600,000	
Ground-based telemetry equipment	600,000	
Ground-based flight safety equipment	150,000	
Propellant tanks and lines		1,540,000
Liquid oxygen tanks and transfer lines	900,000	
Rocket propellant tanks and transfer lines	400,000	
Tanks for liquid nitrogen	240,000	
Electrical installation		100,000
Completion of blockhouse		1,566,000
Service structure modifications		100,000
Umbilical tower		950,000
Booster protector and anchor		300,000
Deflector		350,000
Launcher and arms		1,800,000
Launch pedestal modifications	1,050,000	
Hold-down arms (4)	450,000	
Support arms (4)	300,000	

Operations support building.....		$870,000
Site preparation and roads.....	$39,000	
Building (30,000 square feet @ $15.93 per square foot).....	478,000	
Mechanical and laboratory equipment...	229,000	
Utility connections.....	60,000	
Design and engineering services.....	64,000	
Special power sources.....		300,000
Models, documentation, and handbooks.....		400,000
Total estimated cost...		$10,961,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 17 months

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

CENTRAL SHOP AND MAINTENANCE FACILITY

DESCRIPTION:

Funds are requested for the construction of a central shop and maintenance facility to support NASA activities at the Atlantic Missile Range. A sketch of the proposed facility is shown on the following page. Construction will be of concrete with masonry walls and steel frame.

The first floor will provide 11,935 square feet of gross shop area for the adaption, modification, and maintenance of launch vehicles and spacecraft ground and on-board equipment and systems. Approximately 3,000 square feet of this area will be used for personnel and building services. The second floor will provide 11,935 square feet of gross area for laboratory and engineering functions related to the adaption, modification, and maintenance of launch vehicles and spacecraft. Approximately 2,500 square feet of this area will be used for personnel and building services. The total gross area to be provided by the project will be 23,870 square feet.

JUSTIFICATION:

The proposed facility is required to provide working space and to accommodate equipment required in the Saturn, Agena, and Centaur vehicle programs. It is intended to result in the maximum consolidation of machine shop and maintenance operations of NASA vehicle and spacecraft groups at the Atlantic Missile Range. By this means, the shop installations in the various NASA assembly buildings will be restricted to small lathe and drill press operations.

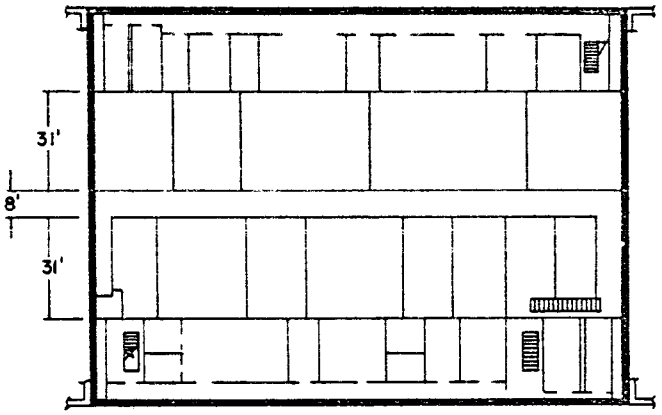
This project will permit a much needed expansion of machine shop facilities to relieve dangerously overcrowded existing conditions. Additional space will be provided for electrical, communications, and instrumentation shops in support of all NASA launch vehicles and spacecraft. Laboratory and engineering space required in proving, modifying, and maintaining vehicles, equipment, and instrumentation will be provided in the second floor area of the building. The facility will also provide shop support for the Mercury project.

The site is ideally located between two existing assembly buildings insuring minimum construction costs and an improvement in the operations in the assembly buildings. The facility's usefulness will be further improved by its location in the center of the NASA industrial area.

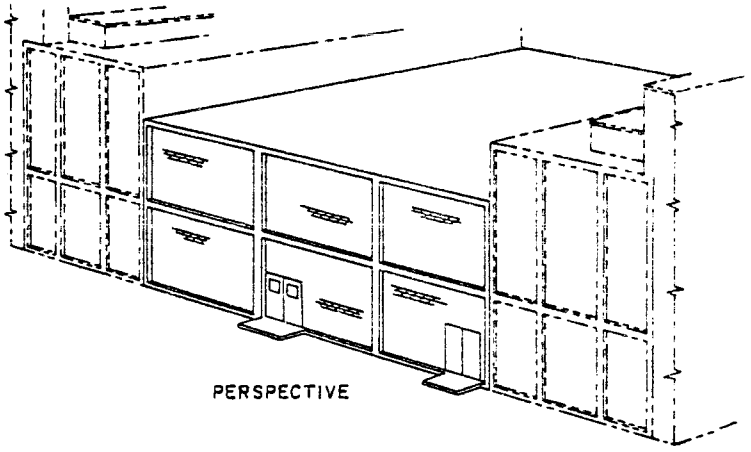
ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

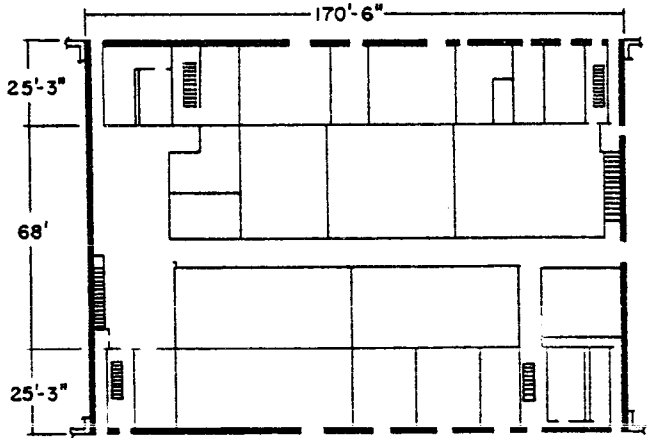
CENTRAL SHOP AND MAINTENANCE FACILITY



SECOND FLOOR PLAN

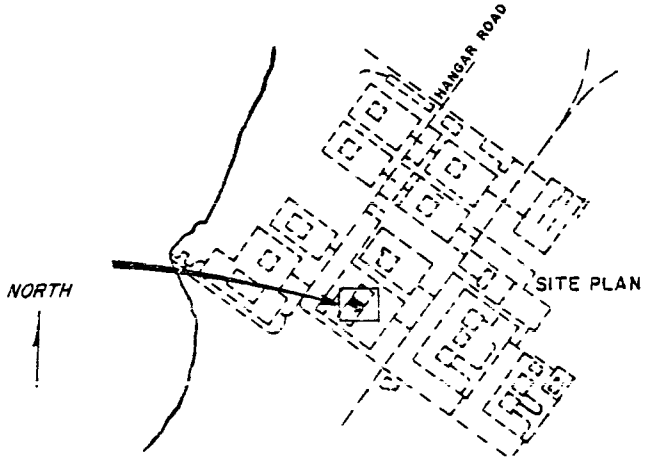


PERSPECTIVE



FIRST FLOOR PLAN

0 10 20 30 40 50 60 70 80



SITE PLAN

COST ESTIMATE:

Site preparation and utility connections.....		$81,000
Building construction (23,870 square feet @ $23.40 per square foot).....		558,190
Equipment.....		70,810
Laboratory and shop benches.....	$20,000	
Machine tools.....	36,810	
Furniture.....	14,000	
Design and engineering services.....		33,000
Total estimated cost...		$743,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 16 months

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

SPACECRAFT FACILITY

DESCRIPTION:

It is proposed to construct a two-story engineering and laboratory building 45 feet by 131 feet, with a high bay checkout area at the rear, 60 feet by 60 feet with a 45-foot hook height. The facility will provide checkout capabilities including laboratory and assembly facilities for the preparation and evaluation of spacecraft and flight components under closely controlled environments of temperature, humidity, pressure, fungus and spore-free ambients, and radiation, to simulate actual flight conditions. The facility will also form the nucleus of a biomedical and space medicine facility at the Atlantic Missile Range for the preparation, evaluation, and conditioning of space passengers, their clothing, equipment, food and waste systems.

A sketch of the proposed facility will be found on the following page.

JUSTIFICATION:

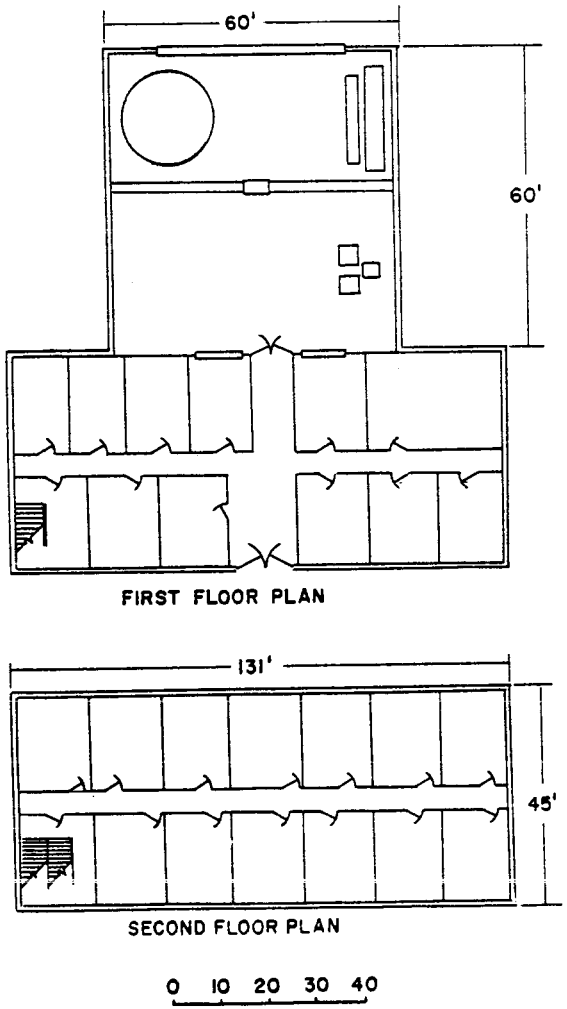
The modification of an existing building at the Atlantic Missile Range has recently been completed to house the initial, smaller group of spacecraft in the Delta and Ranger class. This building is not suitable for conversion to the larger, more sophisticated spacecraft, nor would launch schedules allow for interference to permit additional modifications, even if they were feasible. The facility requested in this project is required to provide accommodations for the advanced, large spacecraft, including those intended for un-manned and manned lunar missions in the 10,000 to 20,000-pound range.

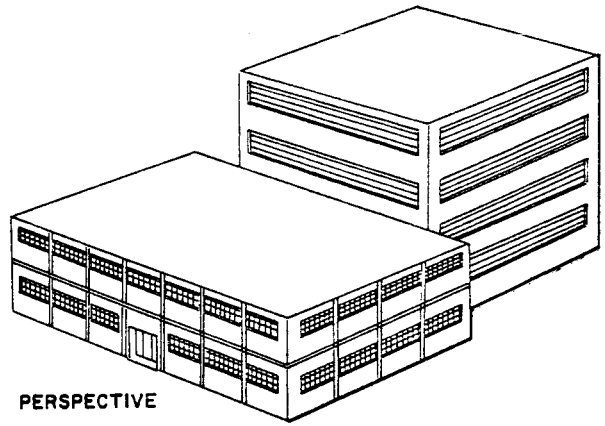
COST ESTIMATE:

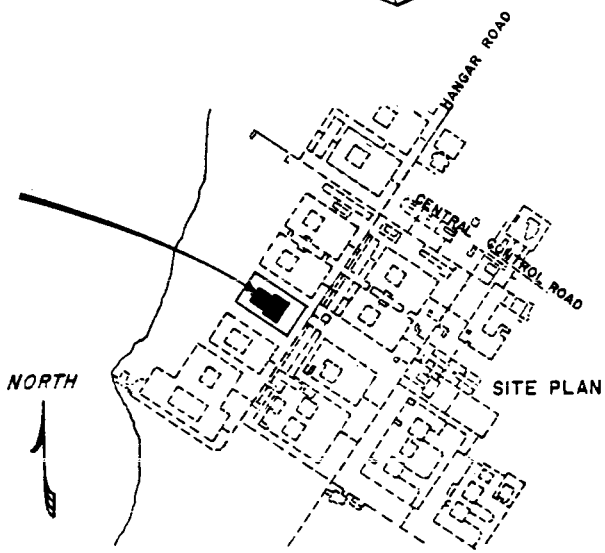
Site preparation and utility connections.....	$134,550
Building construction (15,390 square feet @ $20.50 per square foot).....	315,800
Special air-conditioning equipment (200-ton capacity plus added fungus and spore control features).....	230,650

ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

SPACECRAFT FACILITY







Equipment		$126,000
Bridge crane	$35,000	
Furniture	16,000	
Machine tools	9,000	
Laboratory equipment	66,000	
Design		37,000
Total estimated cost		$844,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 15 months

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

EXTENSION OF ASSEMBLY BUILDING

DESCRIPTION:

This project provides for construction of a two-story wing on the North side and a second floor addition to the South side of the assembly building, now under construction. A 40-ton bridge crane will be added to the high bay handling area. The first floor of the North side wing will provide approximately 7,880 square feet of laboratory and check-out space and 600 square feet for personnel services and building utilities. Both second floor additions will provide 14,284 square feet of gross engineering area and 4,196 square feet of gross area for personnel services and building utilities. Gross total area provided is 26,960 square feet. A sketch of the proposed work is presented on the following page.

JUSTIFICATION:

The assembly building now under construction will permit one C-1 Saturn vehicle to be stored and one C-1 to be checked out simultaneously. While the ability to check out one C-1 at a time was considered acceptable in the early part of the program, continuing studies have indicated that scheduling problems require a capability in the 1962-63 period to check out two C-1 Saturns simultaneously. To provide the necessary floor space, engineering offices and scientific laboratories must be concentrated in the planned new wing areas rather than in the vehicle staging zone. The capacity of the wings must also be increased to allow for the additional personnel and equipment required in double check-out operations. An additional 40-ton bridge crane must also be provided.

COST ESTIMATE:

Site preparation.....	$22,000
Building extension (26,960 square feet @ $23.30 per square foot).....	628,000
Equipment, including bridge crane.....	275,000
Design and engineering services.....	110,000
Total estimated cost....	$1,035,000

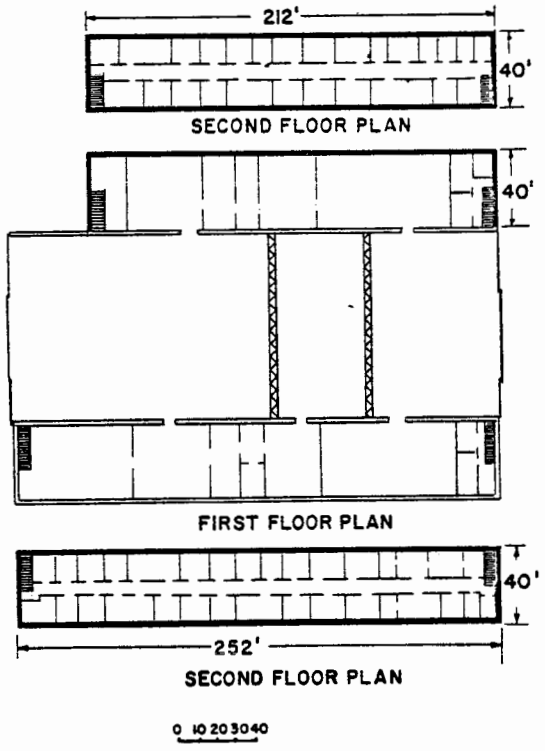
CONSTRUCTION SCHEDULE:

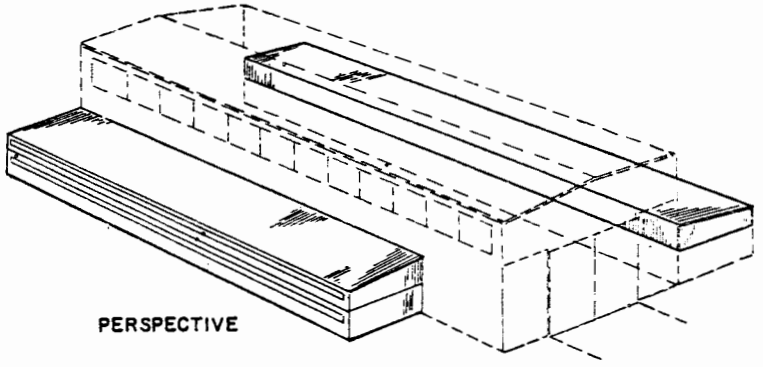
Total estimated completion time.....	16 months

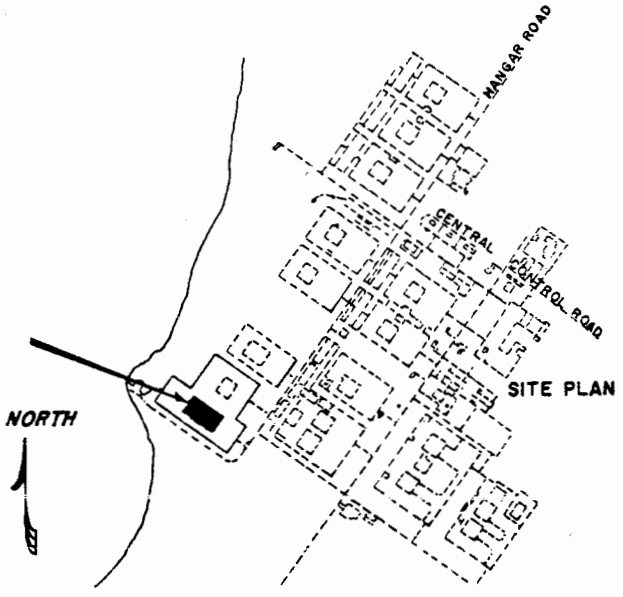
ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

EXTENSION OF ASSEMBLY BUILDING







ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

LIQUID HYDROGEN SYSTEM FOR SATURN LAUNCH COMPLEX NO. 34

DESCRIPTION:

Funds are requested for the installation of liquid hydrogen storage and transfer facilities for Saturn launch complex No. 34. The project covers the construction of a closed cycle loading system which is mandatory for the safe handling of this high flammability material, explosion-proof wiring, vacuum insulation of the storage tanks, remote control of the fueling operation from the blockhouse, and special venting throughout the system. A sketch of the proposed installation is shown on the following page.

JUSTIFICATION:

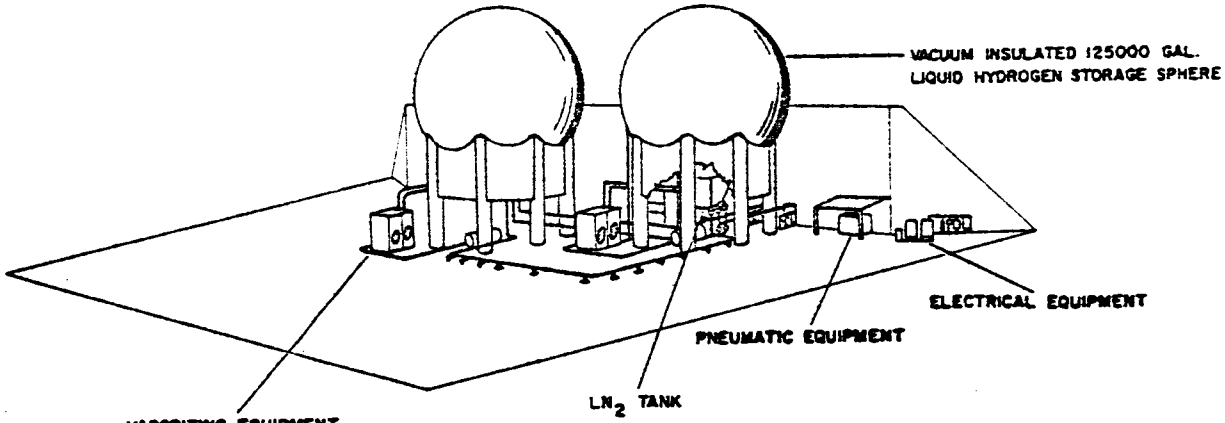
Liquid hydrogen storage and transfer facilities are required for fueling the upper stages of the Saturn vehicle. Funds for the installation of a hydrogen system for complex No. 34 were originally provided in the 1961 budget; a similar system was to be requested for complex No. 37 (now under construction) in the 1962 budget. Subsequent studies indicated that the construction schedule for the hydrogen system for complex No. 34 would conflict with the initial launchings scheduled for complex No. 34. This was considered to be unsatisfactory from the viewpoint of costs, schedules, and safety. A decision was accordingly made to install the approved hydrogen system on complex No. 37 since the construction schedule for that complex was such that launchings were not scheduled to be made during the period required for installation of the hydrogen system. As a result of this adjustment in the site location of the approved hydrogen system, it is now possible to maintain the desired launch schedule sequence so that the initial non-hydrogen staged launchings will take place from complex No. 34, the first hydrogen staged launchings will take place from complex No. 37 (during which period complex No. 34 will receive its hydrogen system), and hydrogen staged launchings will then alternate between the two complexes as required.

COST ESTIMATE:

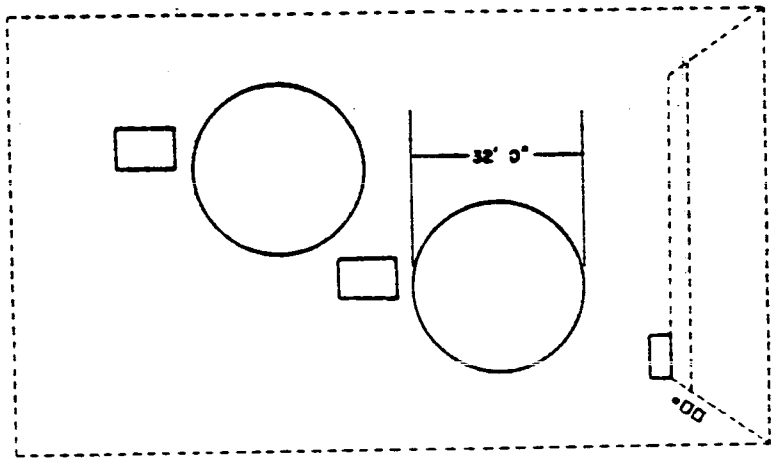
Site development	$87,000
Service tower modifications	282,000
Hydrogen storage	540,000
Evaporation system and helium heat transfer system	276,000
Liquid nitrogen cooling system	296,000
Fuel and vent lines	484,000

ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

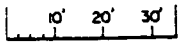
LIQUID HYDROGEN SYSTEM FOR SATURN LAUNCH COMPLEX NO. 34

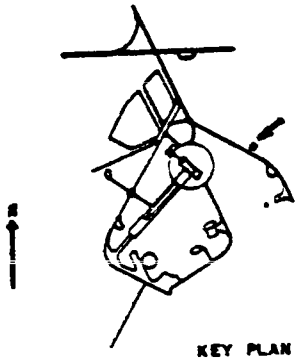


PERSPECTIVE VIEW



PLAN VIEW





KEY PLAN

Vacuum systems	$304,000
Oxygen trace indicator	39,000
Local control station	110,000
Blockhouse indicator and control station	139,000
Valve fittings and control apparatus	63,000
First liquid hydrogen fill, installation, and testing	120,000
Venting and disposal system	60,000
Total estimated cost	$2,800,000

CONSTRUCTION SCHEDULE:

Total estimated completion time	18 months

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO SATURN LAUNCH COMPLEX NO. 34

DESCRIPTION:

Saturn launch complex No. 34 was originally constructed to accommodate the S-1 Saturn made up of a live first stage and dummy upper stages. It is now necessary to use this complex to launch the C-1 configuration which uses live upper stages. The scope of the work includes modifications, chiefly in the nature of additions, to the launch pad, blockhouse, service structure, and umbilical mast. Service tower changes involve the installation of additional platforms from which the live upper stages will be checked out and serviced. Alterations to the umbilical mast includes its extension to higher levels in order to fuel the upper stages and to carry the telemetry and control circuits. Blockhouse modifications are required to accommodate the additional control consoles and other equipment associated with the additional fueling, telemetry, and control requirements at the stand. A special power source must also be installed to energize an on-site digital computer.

The location and components of the launch complex are shown on the following two pages.

JUSTIFICATION:

Very little was known initially about the ultimate vehicle configurations which would be fired from launch complex No. 34. For this reason, a two-phase program was undertaken. The first phase provided all basic facilities which could be projected into the reasonable future, with emphasis on the first group of Saturns known as the S-I series using live boosters and dummy upper stages. It was also possible to include in the initial phase all basic features to support later configurations. It was not possible, however, to provide for the total requirements for the group of launch vehicles now termed the C-1 series which use live upper stages. The modifications proposed in this project reflect vehicle requirements which have developed subsequent to the initial construction.

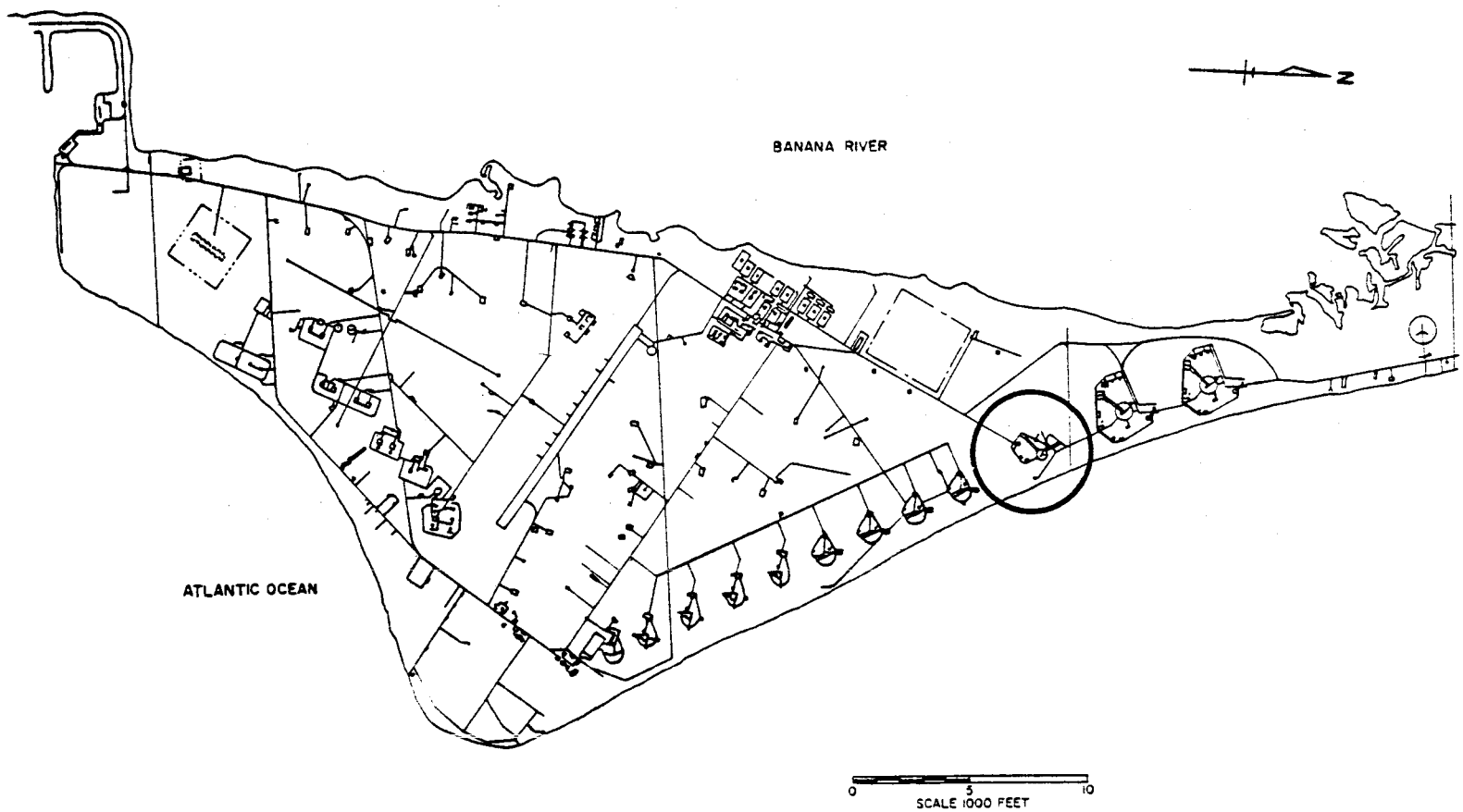
COST ESTIMATE:

Special power source	$300,000
High-pressure gas system	750,000
Modifications to blockhouse and pad	200,000
Umbilical tower	550,000
Propellant service	950,000
Design and engineering services	50,000
Total estimated cost	$2,800,000

ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO SATURN LAUNCH COMPLEX NO. 34

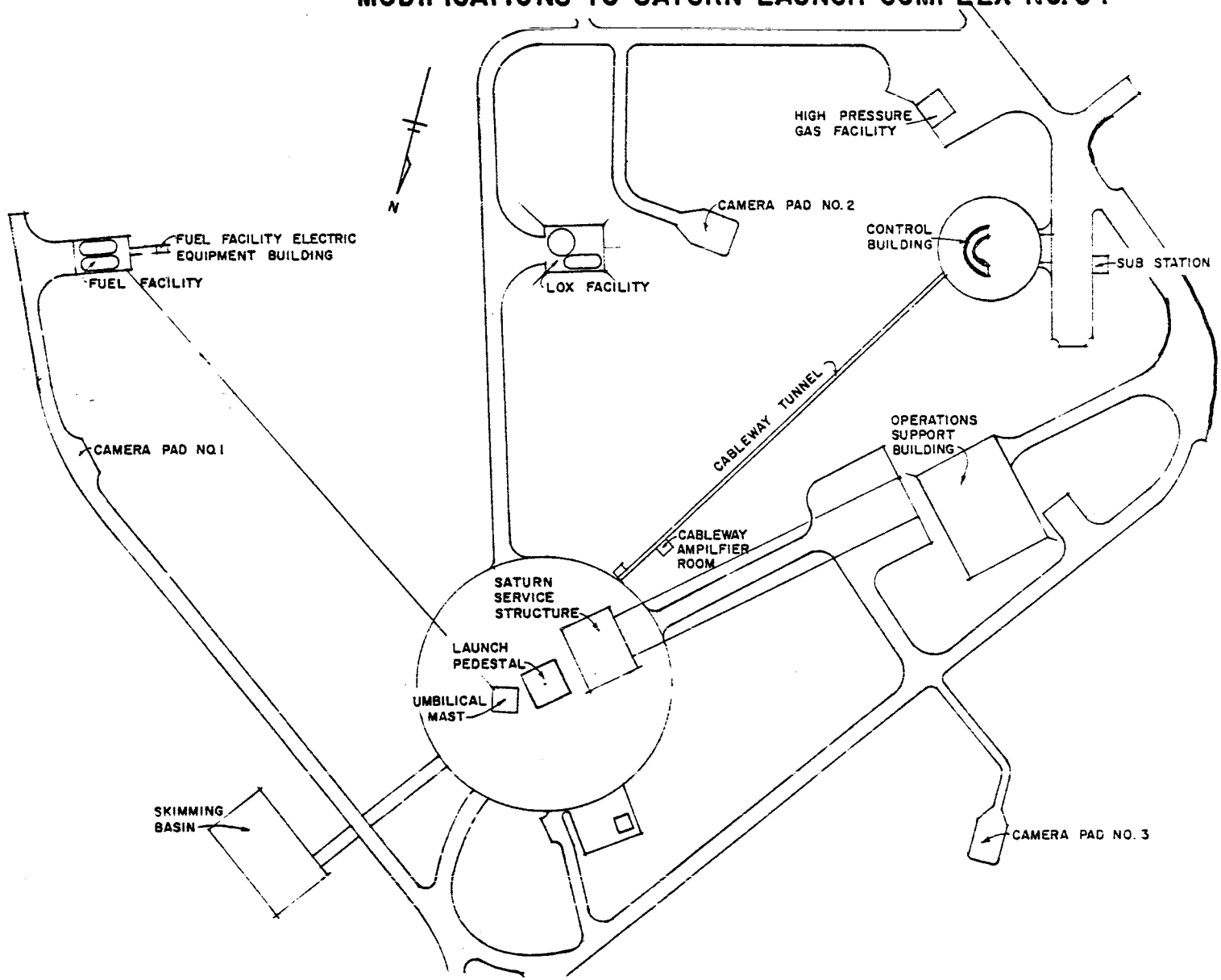
CAPE PLAN



ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO SATURN LAUNCH COMPLEX NO. 34



CONSTRUCTION SCHEDULE:

Total estimated completion time..... 10 months

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

SATURN BARGE NO. 2

DESCRIPTION:

An additional barge is required to provide transportation for the S-I vehicle and its upper stages between the Marshall Space Flight Center and the Atlantic Missile Range. The barge will be equipped with its own electric power source, an instrument room, a galley, berthing accommodations for 10 persons, and a humidity control compartment for its sensitive cargo. A sketch is shown on the following page.

JUSTIFICATION:

Because the Saturn vehicle dimensions exceed existing land bridge clearances, it was determined, early in the Saturn program that barge transportation would be used between the Marshall Space Flight Center and the Atlantic Missile Range. A contract has been let for the design and fabrication of barge No. 1 to support the initial four vehicle phase of the program, covering transportation needs through the calendar year 1962. This barge will enable delivery of complete S-I Saturns (booster and dummy upper stage) on four month centers, based upon the following transit cycle:

Deliver booster[1/] to the Atlantic Missile Range.....	1 month
Return to the Marshall Center.....	1 month
Deliver dummy upper stage to the Atlantic Missile Range	1 month
Return to the Marshall Center.....	1 month
Total...	4 months

1/ The barge cannot carry both booster and upper stage at the same time.

Starting in the calendar year 1963, the launch schedule will require deliveries on two month centers. An additional barge is necessary to meet this schedule. The second barge will also provide a valuable back up in the event of damage to the first barge.

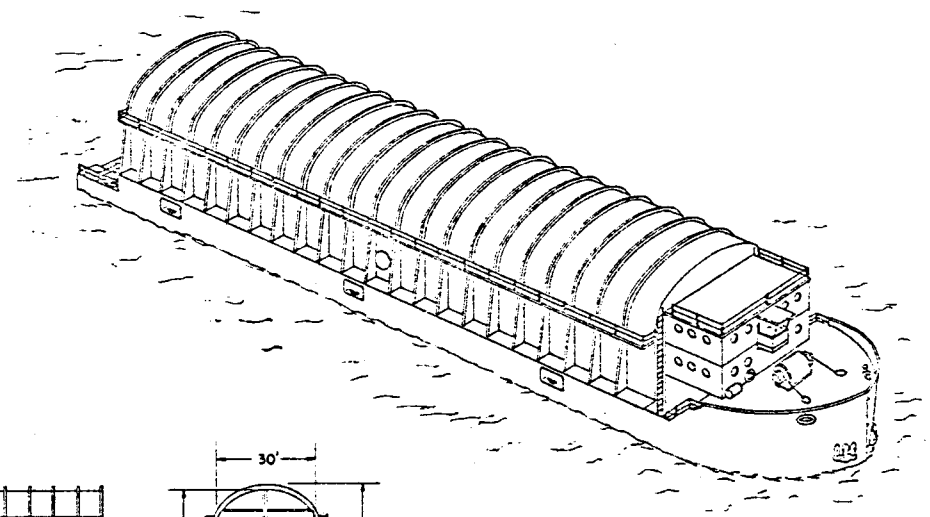
COST ESTIMATE:

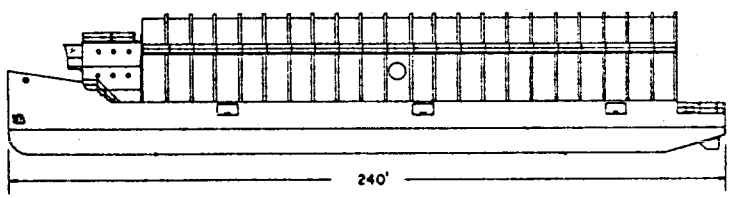
Construction.....	$550,000
Design and engineering services.....	50,000
Total estimated cost...	$600,000

ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

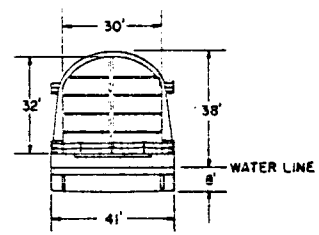
SATURN BARGE NO. 2

PERSPECTIVE VIEW





SIDE VIEW



REAR VIEW

CF8-30

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 12 months

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO LAUNCH COMPLEX NO. 36

DESCRIPTION:

This project provides for the construction of a new launch pad, identified as pad 36B, which will be incorporated into the existing launch complex No. 36 in completion of a dual pad, single blockhouse concept. The new launch pad will consist of the launch stand (pad and pedestal), service tower, umbilical mast, propellant loading system, cableway to blockhouse, and the associated equipment providing launch capability for the Centaur and Atlas Agena-B vehicles. It will support both Department of Defense and NASA programs. Sketches of the proposed modifications are shown on the following four pages.

JUSTIFICATION:

Studies by the recently created Air Force-NASA Committee on Launch Stand Loading have established the fact that insufficient launching facilities exist at the Atlantic Missile Range to satisfy the projected launch schedules of the Department of Defense and the NASA for programs involving Atlas. These programs include the Atlas research and development program, and the programs involved in the use of the Centaur and the Agena class vehicles. No provisions exist for alternate or backup facilities for these programs, or for the Mercury program, should an explosion or other castrophe occur. A master plan has been developed based on the modification of existing Atlas pads so that the maximum degree of interchangeability could be realized. However, the plan also recognized that the modification program could not satisfy total needs and that one new launch complex would be necessary. Construction of pad 36B will provide the additional launch capacity in the most economical fashion by utilizing the existing blockhouse and associated equipment that would be common to both pads.

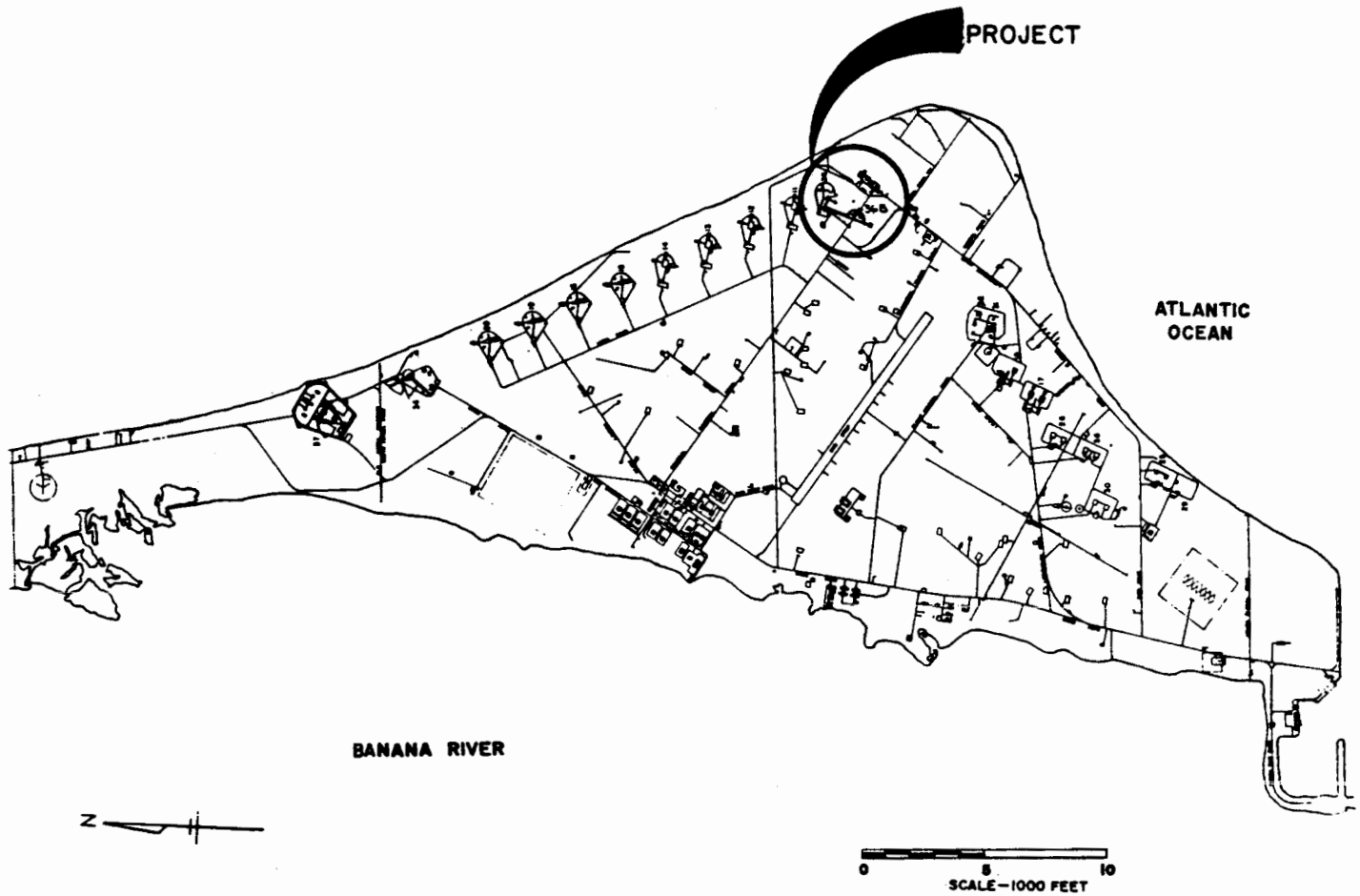
To implement the master plan, a Memorandum of Agreement has been executed with the Air Force whereby the Air Force will immediately initiate a program to modify the existing Atlas complexes to provide the mutually supporting backup capabilities, and NASA will construct an additional pad to provide the increased total launching capacity required to meet scheduled firing rates. Included in the design of this new pad will be launch capacity for both the Centaur and the Atlas Agena-B programs which will contrubte additional backup capability. Action has been initiated by the Air Force to implement the modification program on the existing stands. This project fulfills the total requirements outlined in the master plan.

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO LAUNCH COMPLEX NO. 36

CAPE PLAN

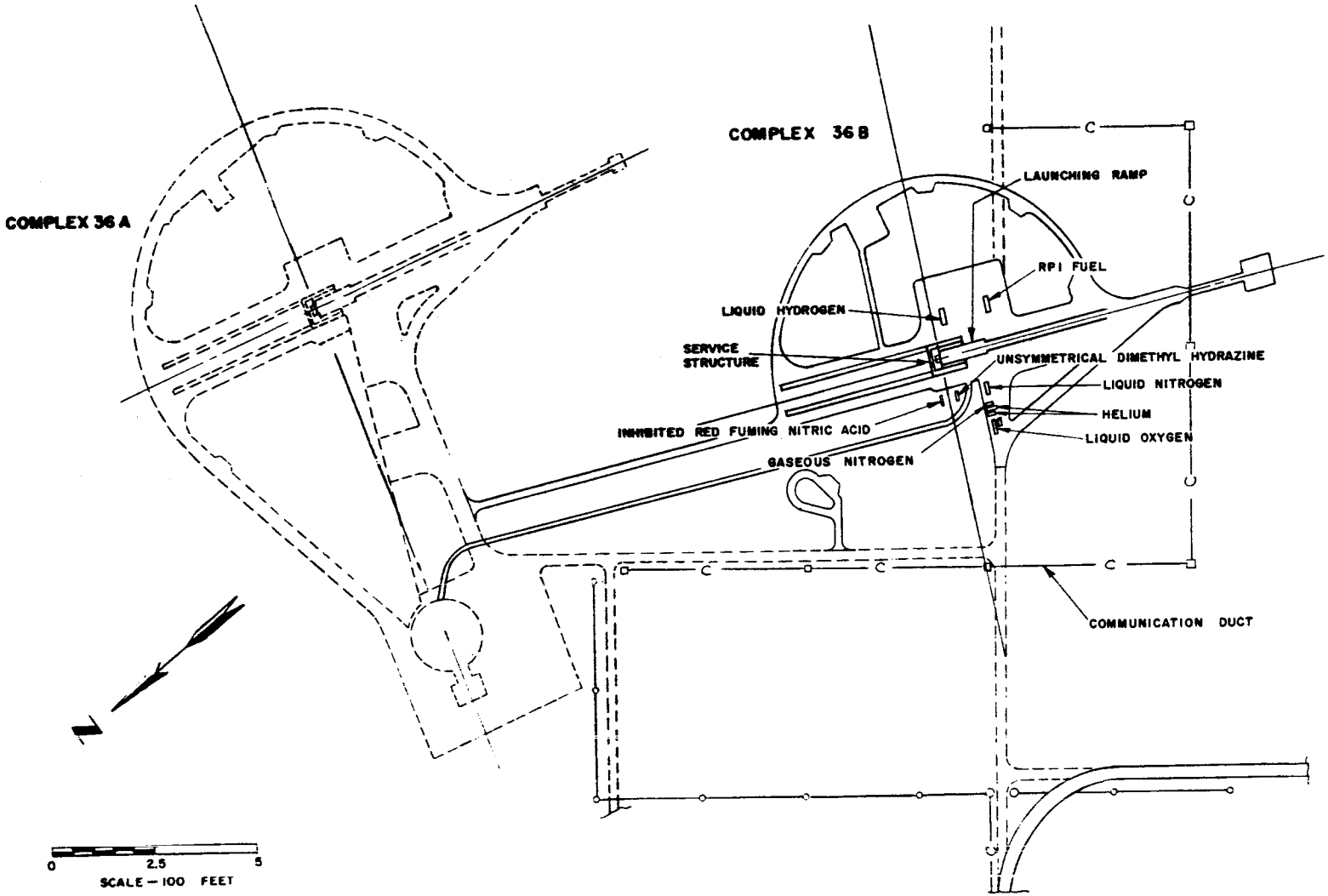


ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

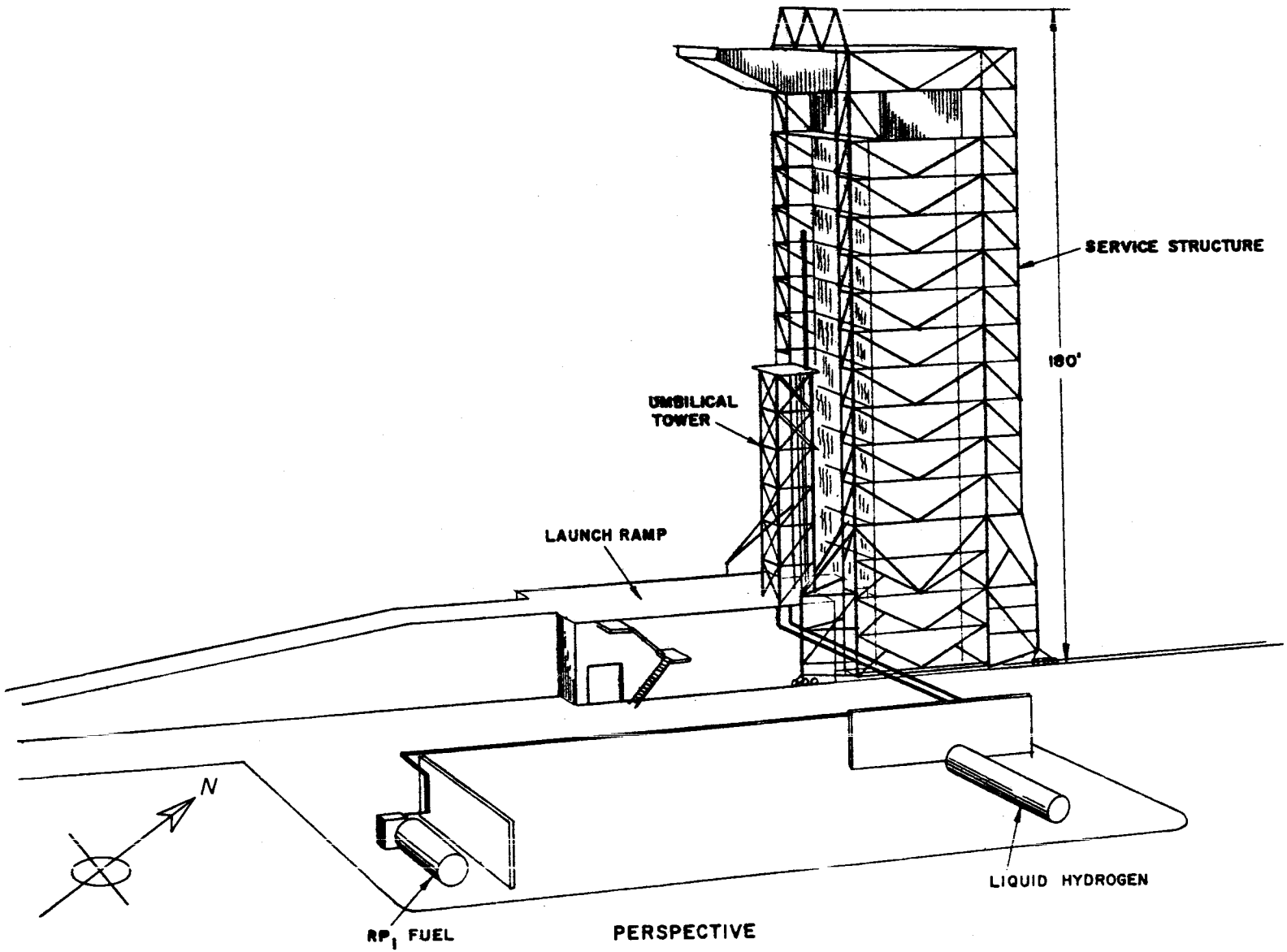
MODIFICATIONS TO LAUNCH COMPLEX NO. 36

SITE PLAN



ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO LAUNCH COMPLEX NO. 36



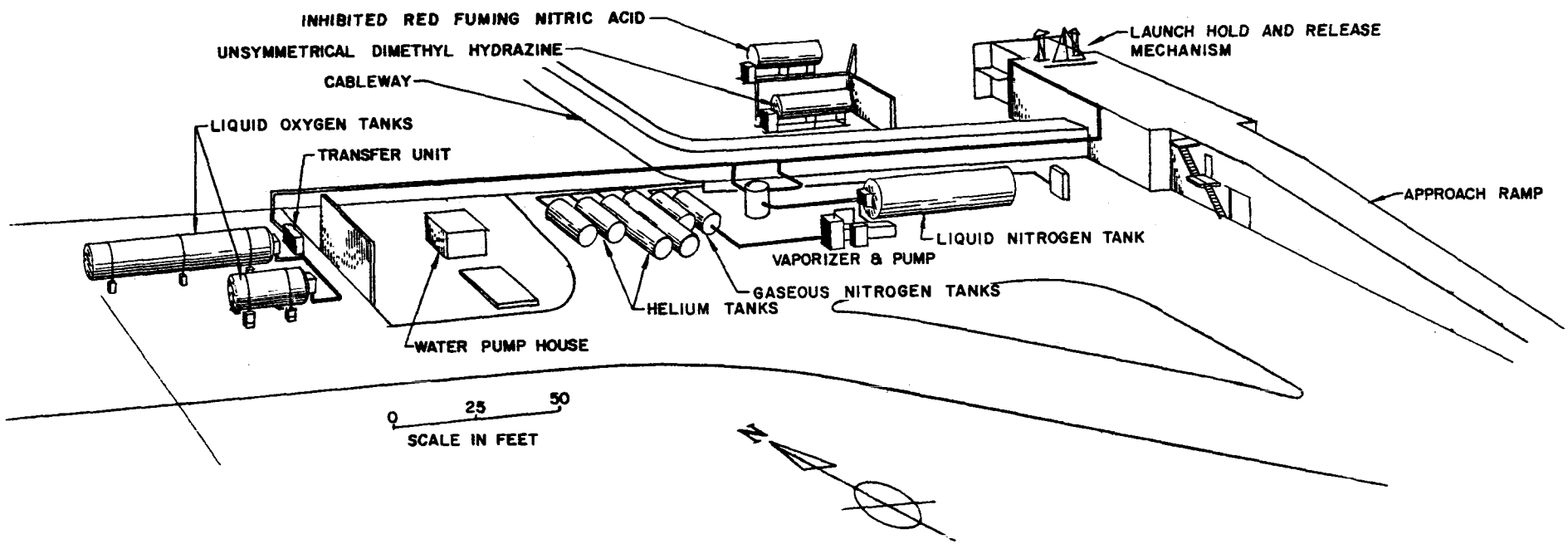
PERSPECTIVE

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO LAUNCH COMPLEX NO. 36

SUPPORTING SYSTEMS



PERSPECTIVE

CFB-36

COST ESTIMATE:

Construction			$6,000,000
Site preparation		$150,000	
Launch pad		850,000	
Launch pedestal		410,000	
Launcher hardware		695,000	
Umbilical mast		580,000	
Cableway		275,000	
Service tower		1,500,000	
Propellant loading system		1,140,000	
Design and engineering services		400,000	
Ground support equipment			12,800,000
Atlas stages		7,100,000	
Launch hardware	$500,000		
Launch control hardware	1,000,000		
Instrumentation	1,800,000		
Installation and checkout	3,800,000		
Agena stages		2,300,000	
Ground handling equipment	201,000		
Servicing equipment	496,000		
Launch monitoring and control equipment	347,000		
Specialized electronic control equipment	366,000		
Installation and checkout	890,000		
Centaur stages		3,100,000	
Ground handling equipment	200,000		
Servicing equipment	500,000		
Launch monitoring and control equipment	340,000		
Specialized electronic control equipment	410,000		
Installation and checkout	1,650,000		
Design and engineering services		300,000	
Total estimated cost			$18,800,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 18 months

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO SATURN LAUNCH COMPLEX NO. 37

DESCRIPTION:

This project consists of the construction of a second launch pad to be incorporated into launch complex No. 37 in completion of a dual pad, single blockhouse concept. The design of complex No. 37 is adaptable to the addition of a second pad, which will include a launch stand, umbilical tower, propellant services, high-pressure gas system, cableway to the existing blockhouse, and ground support equipment. The existing service tower rails will be extended 300 feet so that the existing tower can shuttle between the two pads. The size of the blockhouse will be increased to provide for additional instrumentation space. Sketches of the proposed modifications are shown on the following three pages.

JUSTIFICATION:

Currently two launch complexes are authorized in support of the Saturn program, both of which are designed on the basis of the single blockhouse -- single pad concept. Complex No. 34 is nearing completion, whereas construction is about to begin on complex No. 37. Recent revisions in the Saturn program to implement accelerated development of the Saturn C-2 launch vehicle have created a serious deficiency in Saturn launch capacity. Accommodation of the Saturn C-2 development flights in addition to the Saturn C-1 flights concurrently scheduled in the Apollo program will nearly saturate the launch capability of pads 34 and 37 during and following the flight development phase of the Saturn C-2. Consequently, should a major accident occur on one of these two pads, the launch rate of Saturn vehicles would be reduced significantly due to the long construction and rehabilitation period that follows an on-pad explosion. To so reduce the launch rate would have a major impact on two important programs. It would seriously delay the Saturn C-2 flight development and it would retard progress in the Apollo manned orbital laboratory program for which the Saturn C-1 will be used.

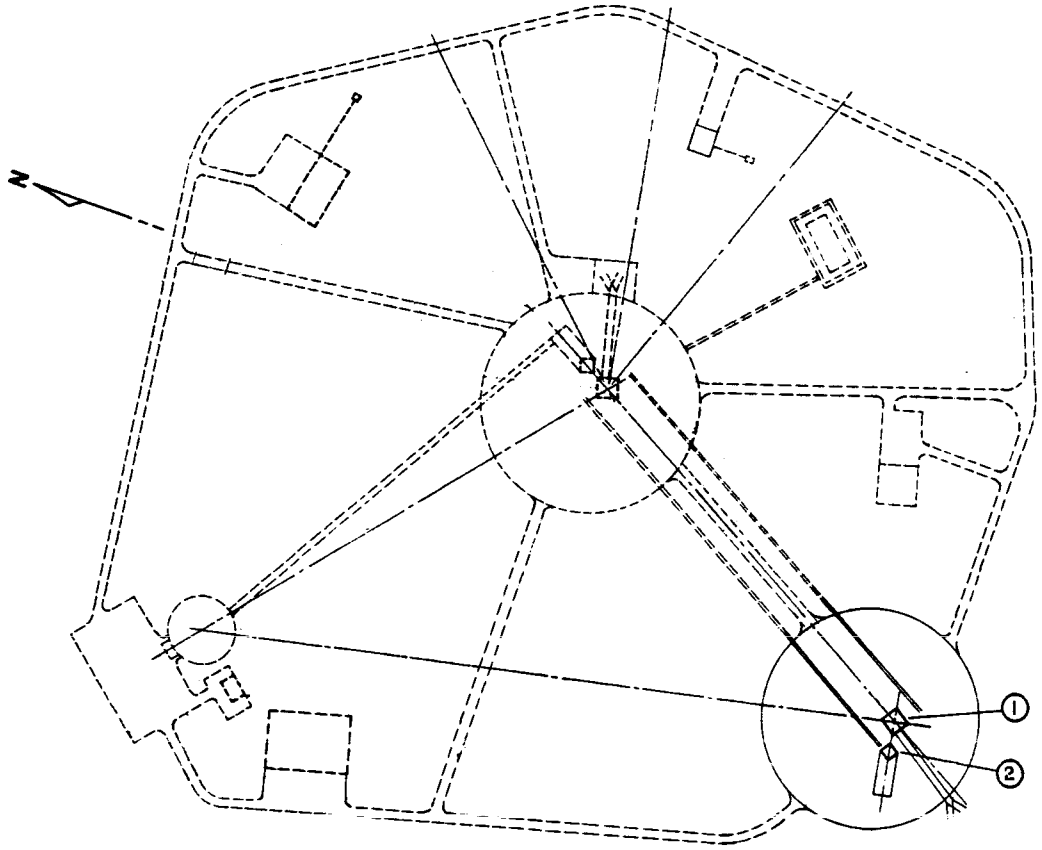
In view of the importance of pursuing these two major programs at the fastest possible rate, it is imperative that a backup Saturn launch pad be provided. Provision of such backup capability is consistent with the current launch pad utilization and backup policy of the Department of Defense and NASA at the Atlantic Missile Range. Accordingly, design of the previously approved complex No. 37 has been modified to permit addition of a second pad to the complex, pad 37B. This design change has been made in such a manner as to afford common use of the gantry and much of the blockhouse equipment by both the original and the proposed complex No. 37 pads.

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO SATURN LAUNCH COMPLEX NO. 37

SITE PLAN



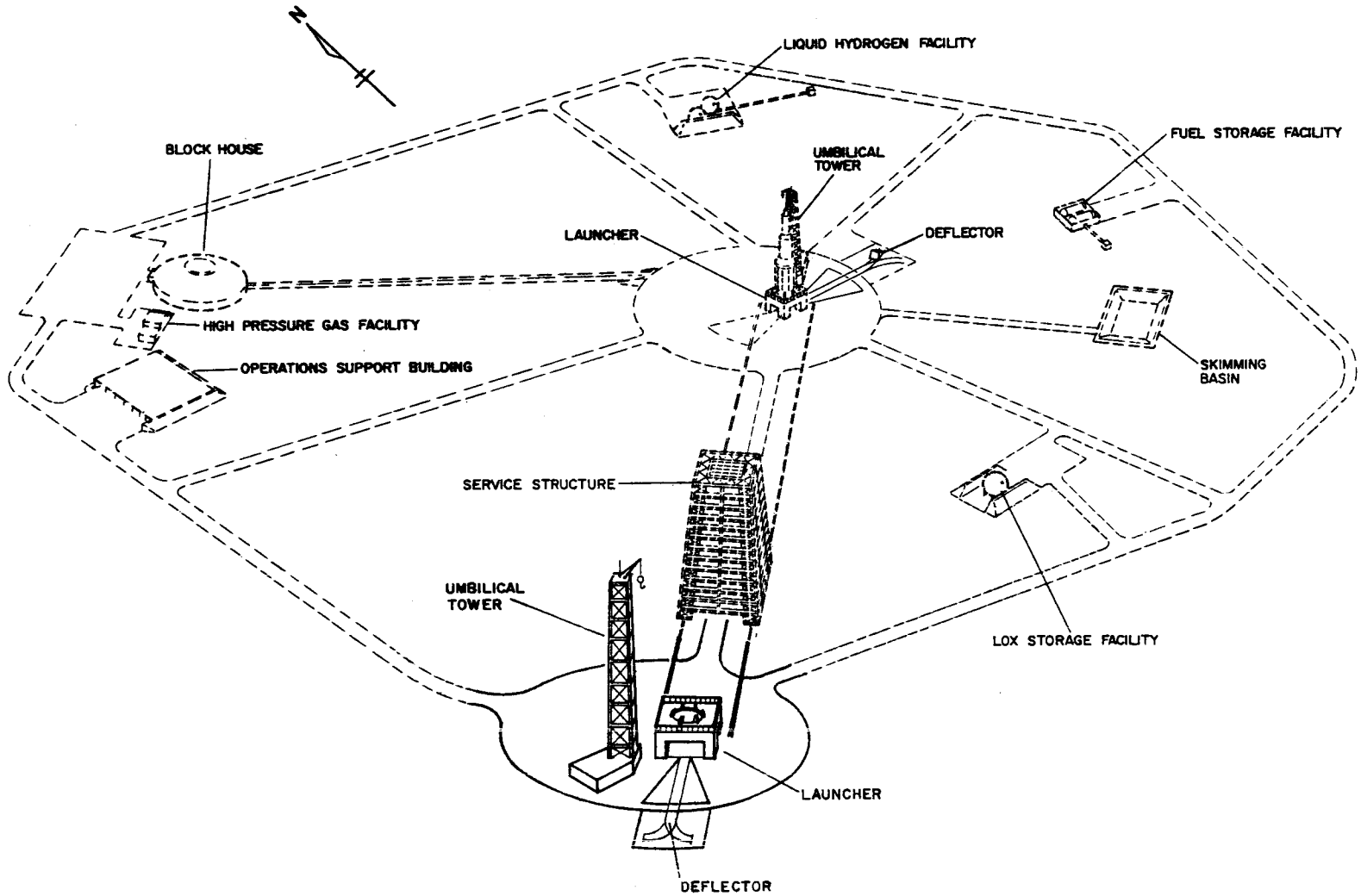
1. BOOSTER PROTECTOR, LAUNCHER, DEFLECTOR, AND ARMS
2. UMBILICAL TOWER

ATLANTIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

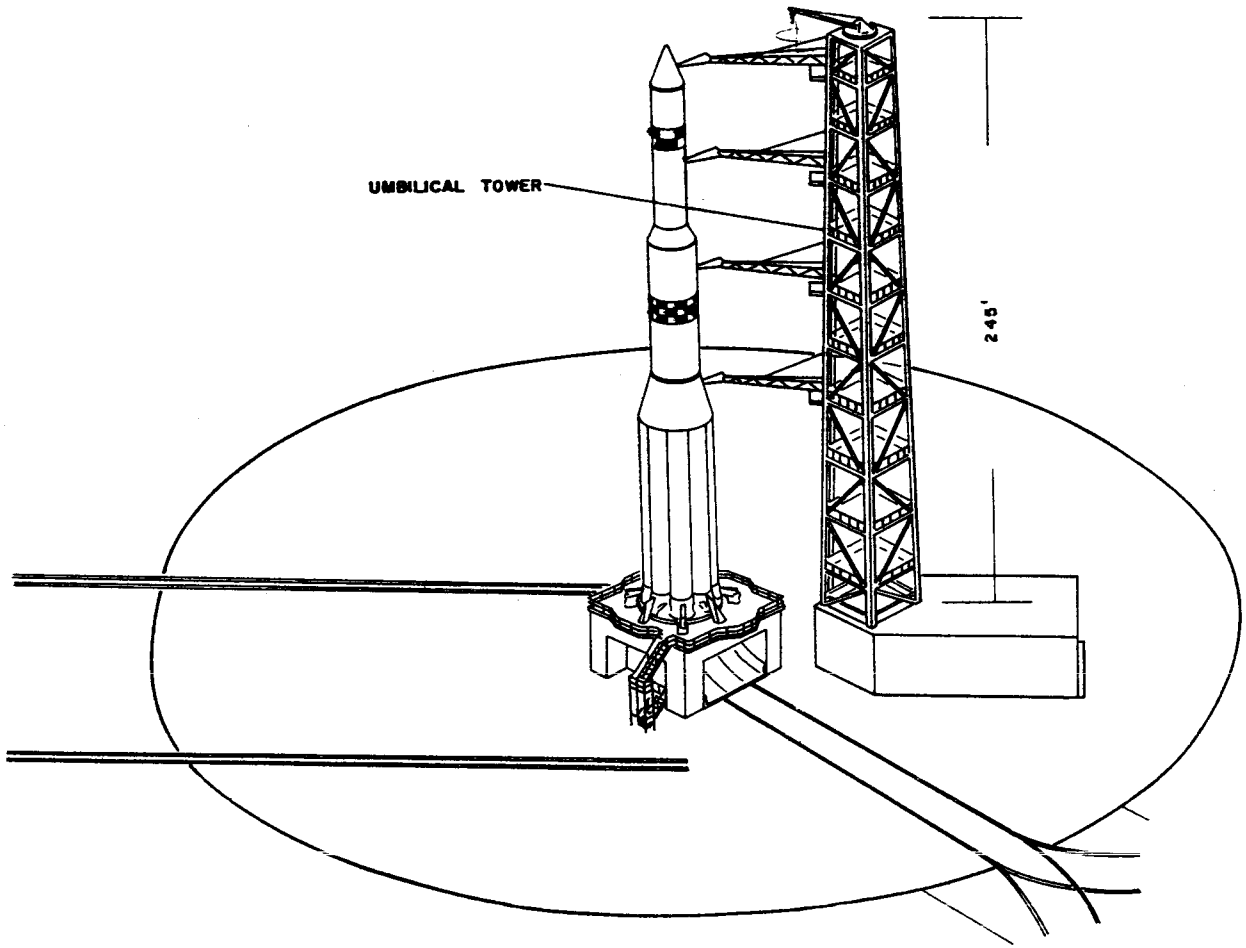
MODIFICATIONS TO SATURN LAUNCH COMPLEX NO. 37

PERSPECTIVE VIEW



ATLANTIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

MODIFICATIONS TO SATURN LAUNCH COMPLEX NO. 37



PERSPECTIVE VIEW

CF8-41

COST ESTIMATE:

Launch pad and area development		$4,150,000
Launch pad	$3,185,000	
Site preparation and roads	245,000	
High-pressure gas system	420,000	
Range utilities	300,000	
Extension of service structure rails		610,000
Umbilical tower		950,000
Propellant servicing equipment		1,500,000
RP-1 fuel and liquid oxygen equipment	$750,000	
Liquid hydrogen equipment	750,000	
Ground support equipment		2,900,000
Launcher and arms	1,550,000	
Deflector	250,000	
Measuring systems support equipment	300,000	
Addition to flight safety presentation system	100,000	
Upper stage telemetry presentation system	300,000	
Instrumentation racks, consoles, and television system	400,000	
Design and engineering services		190,000
Blockhouse modification		700,000
Total estimated cost		$11,000,000

CONSTRUCTION SCHEDULE:

Total estimated completion time	14 months

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

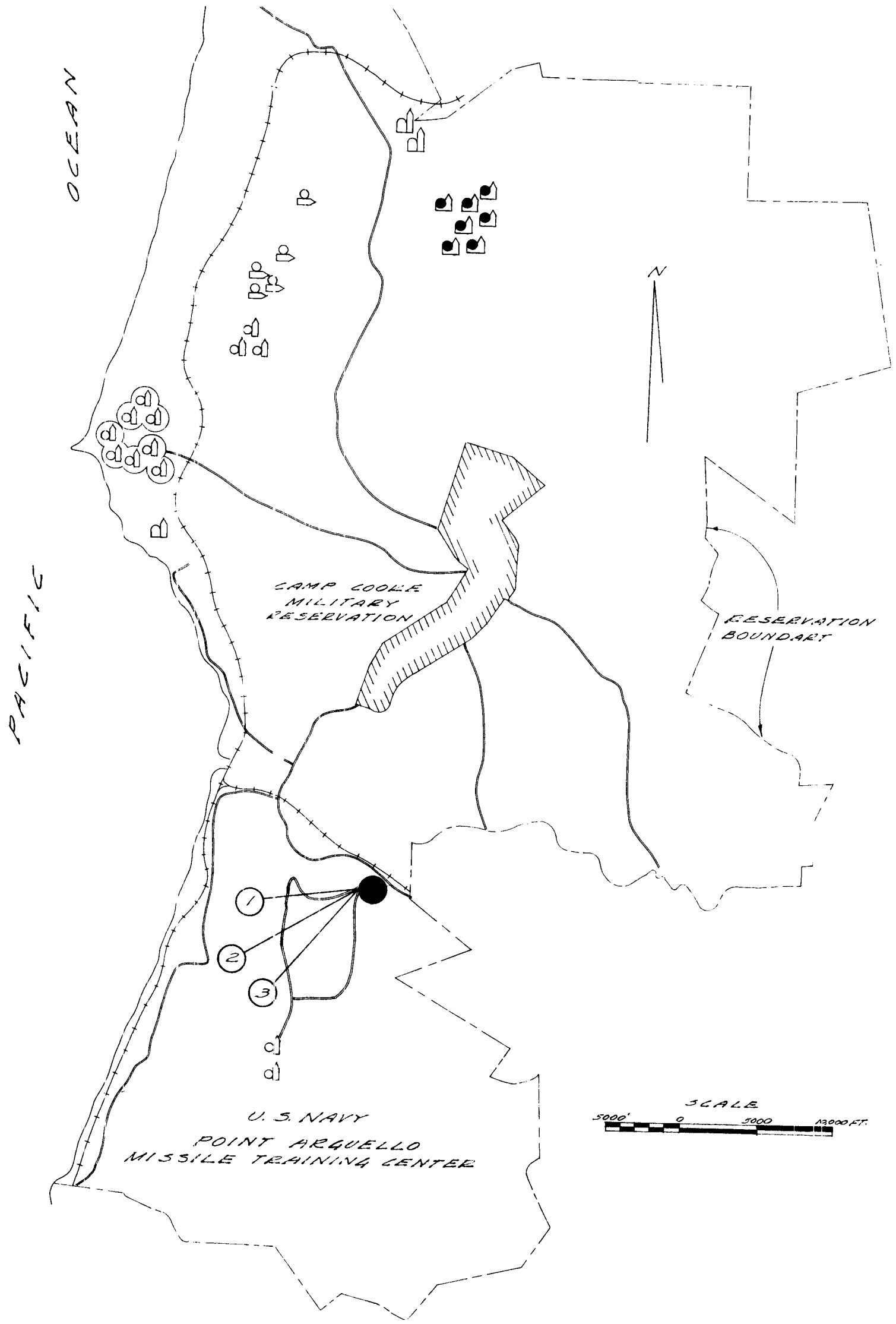
CONSTRUCTION OF FACILITIES - 1962 PROGRAM

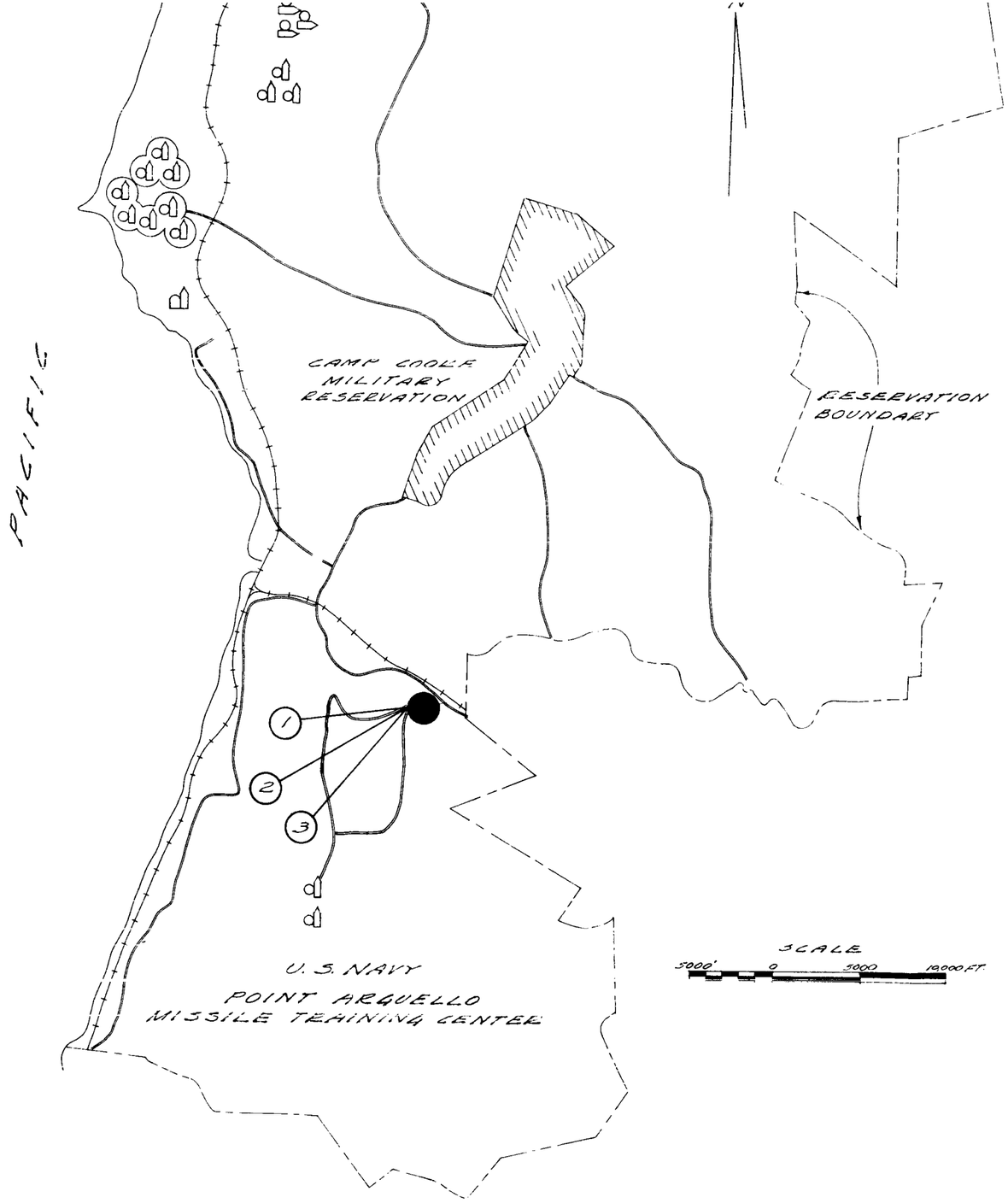
PACIFIC MISSILE RANGE

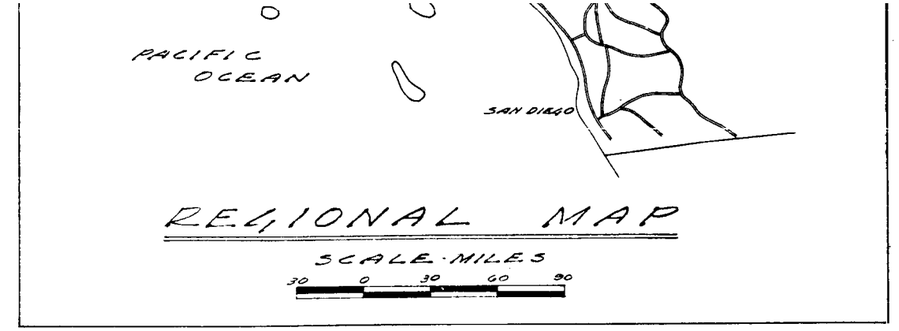
Page No.		
CF9-2	Location plan	
CF9-3	Launch operations facilities.....	$998,000
	TOTAL.....	$998,000

PACIFIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

LOCATION PLAN







LEGEND

EXISTING OR UNDER CONSTRUCTION

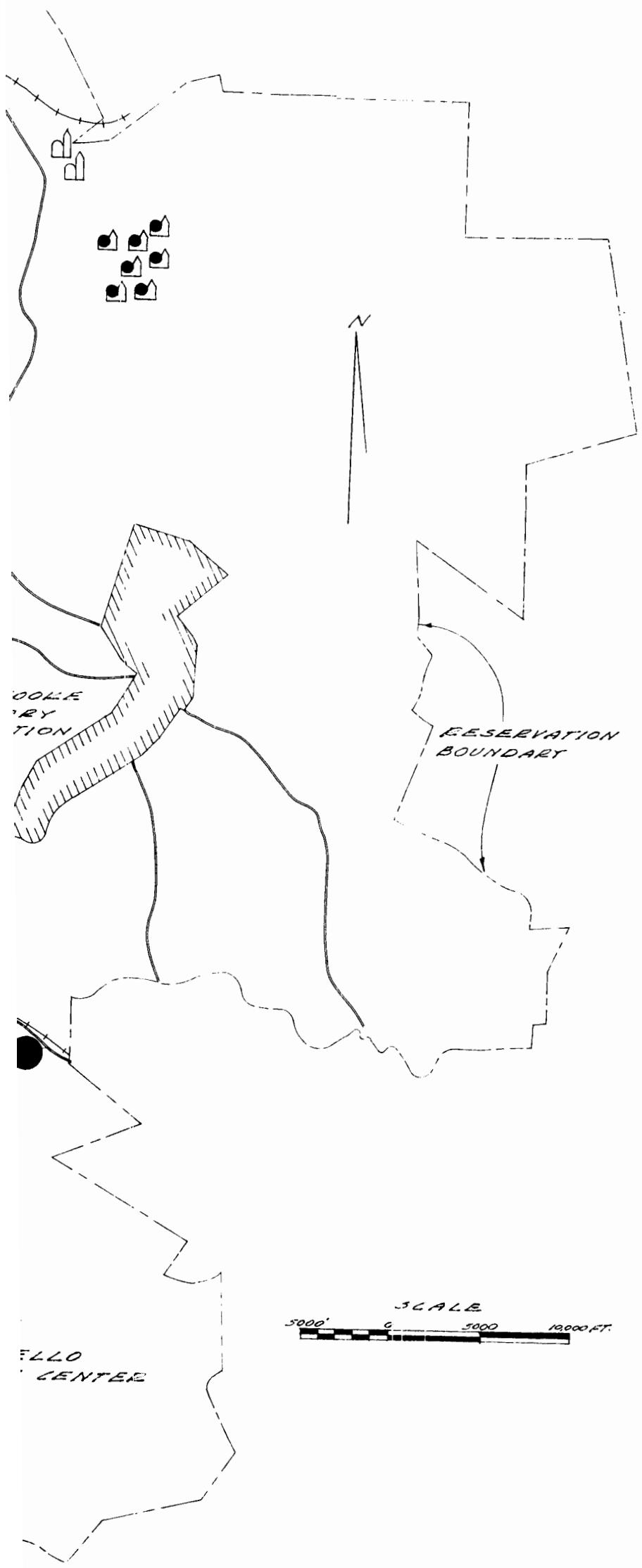
- ATLAS VERTICAL LAUNCH PAD
- ATLAS SILO
- ATLAS HORIZONTAL LAUNCH PAD
- TITAN SILO
- THOR VERTICAL LAUNCH PAD

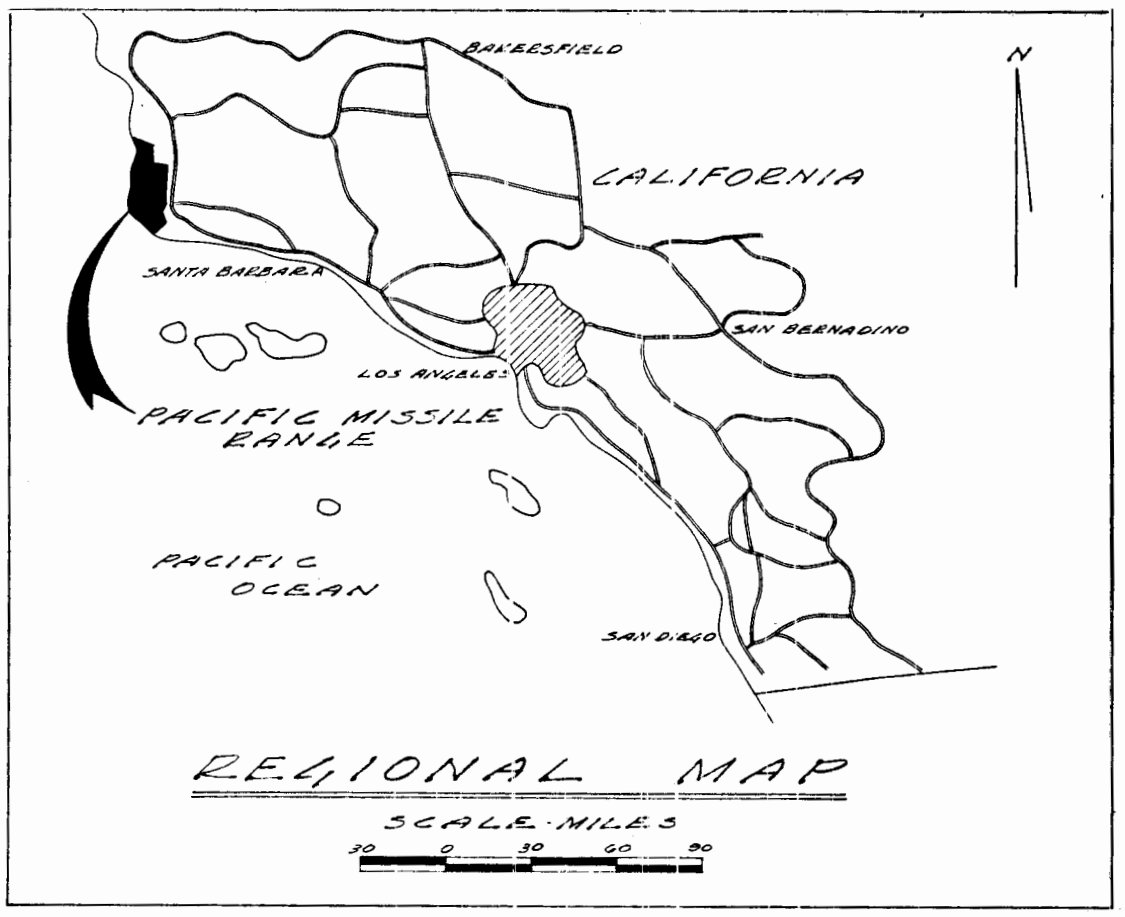
PROPOSED LAUNCH OPERATIONS FACILITIES

1. TELEMETRY BUILDING
2. ENGINEERING HEADQUARTERS BUILDING
3. SUPPLY AND COMPONENTS STORAGE BUILDING

PACIFIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

LOCATION PLAN





LEGEND

EXISTING OR UNDER CONSTRUCTION

- ATLAS VERTICAL LAUNCH PAD
- ATLAS SILO
- ATLAS HORIZONTAL LAUNCH PAD
- TITAN SILO
- THOR VERTICAL LAUNCH PAD

PROPOSED LAUNCH OPERATIONS FACILITIES

1. TELEMETRY BUILDING
2. ENGINEERING HEADQUARTERS BUILDING
3. SUPPLY AND COMPONENTS STORAGE BUILDING

PACIFIC MISSILE RANGE

FISCAL YEAR 1962 ESTIMATES

LAUNCH OPERATIONS FACILITIES

DESCRIPTION:

To support NASA missions at the Pacific Missile Range, Point Arguello, California, the construction of these buildings is required as follows:

1. A telemetry building (4,500 square feet) to accommodate telemetry and tracking equipment.

2. An engineering headquarters building (7,920 square feet) to provide engineering and office space.

3. A supply and components storage building (8,000 square feet).

Sketches of the proposed buildings are shown on the following three pages.

JUSTIFICATION:

Telemetry building: The unique technical requirements of the NASA Agena and Scout missions for the Pacific Missile Range programs require a telemetry facility which will enable day-by-day ground check out and calibration prior to launch, performance evaluation in the shortest possible time, and the collection of special and nonstandard data. These needs cannot be met by the standard range telemetry system which is geared to serving a wide variety of programs and must therefore be capacity limited. The proposed telemetry facility, backed up by the range system, will yield the necessary quality of data in the most efficient manner.

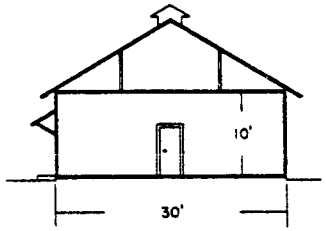
Engineering headquarters building: This facility is required to establish a central NASA engineering headquarters at the Pacific Missile Range for support of the Agena, the Scout, and other NASA programs, and to permit the consolidation of NASA vehicle, spacecraft, and mission operations. The present NASA launch schedule will require the housing of approximately 35 full-time people with peaks of from 10 to 15 transients.

Supply and components storage building: This building will be utilized as a central storage and issue facility for components and accessories required for vehicles, spacecraft, and ground support installations. The building will result in the most economical and orderly method of receiving, inspecting, storing, supplying, and reshipping

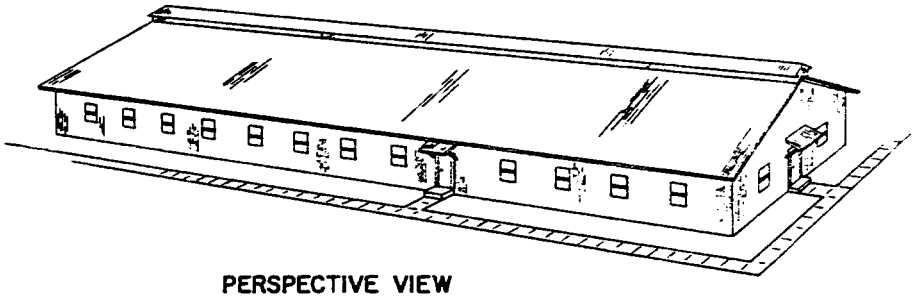
PACIFIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

LAUNCH OPERATIONS FACILITIES

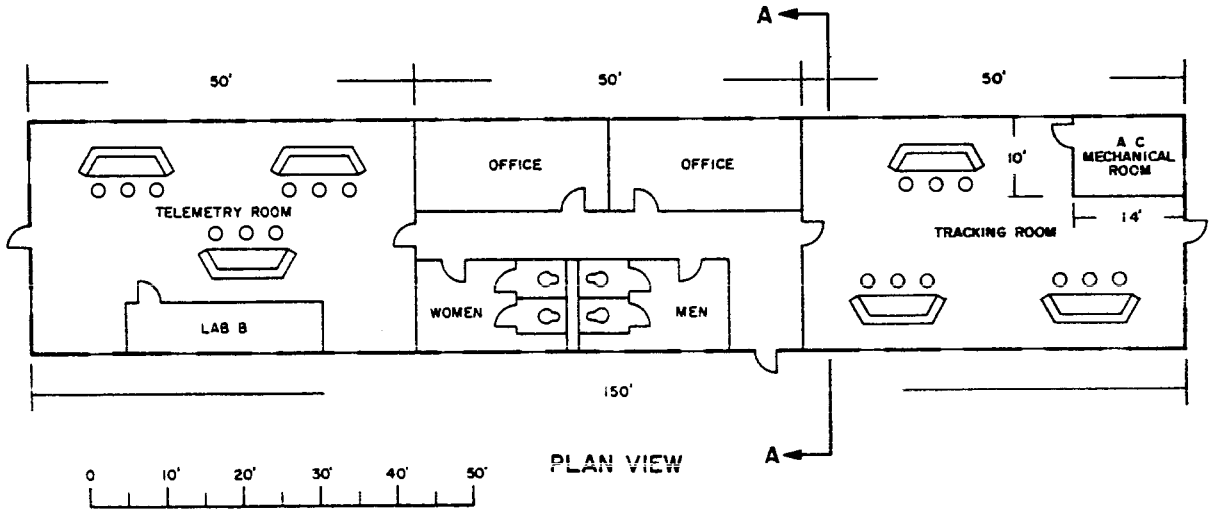
TELEMETRY BUILDING



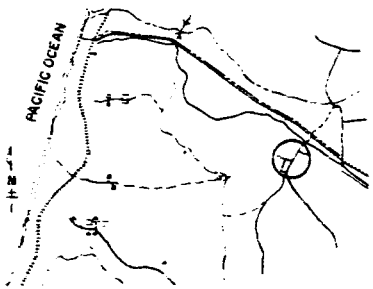
SECTION A-A



PERSPECTIVE VIEW



PLAN VIEW

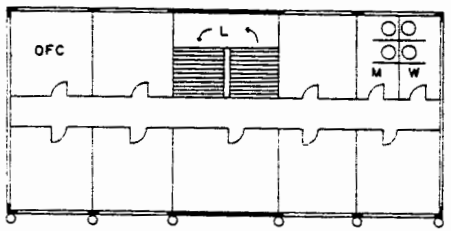


KEY PLAN
EXACT SITE NOT DETERMINED

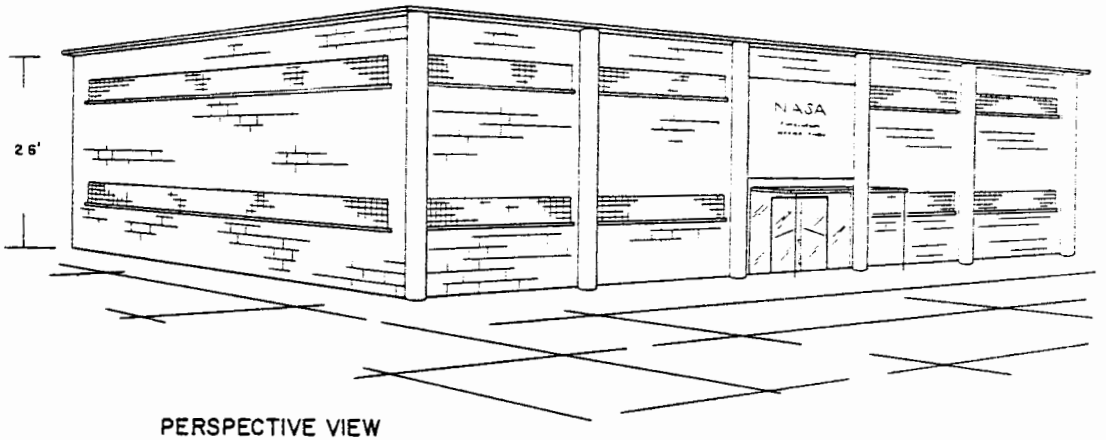
PACIFIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

LAUNCH OPERATIONS FACILITIES

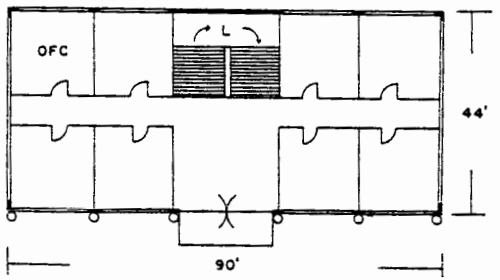
ENGINEERING HEADQUARTERS BUILDING



2nd. FLOOR



PERSPECTIVE VIEW



1st. FLOOR

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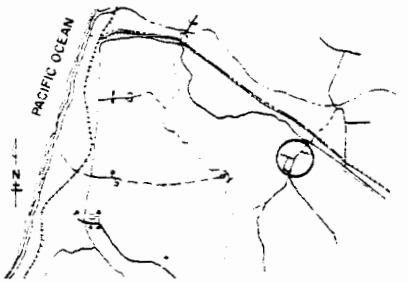
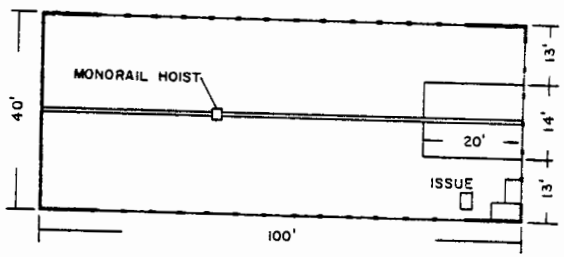


KEY PLAN
EXACT SITE NOT DETERMINED

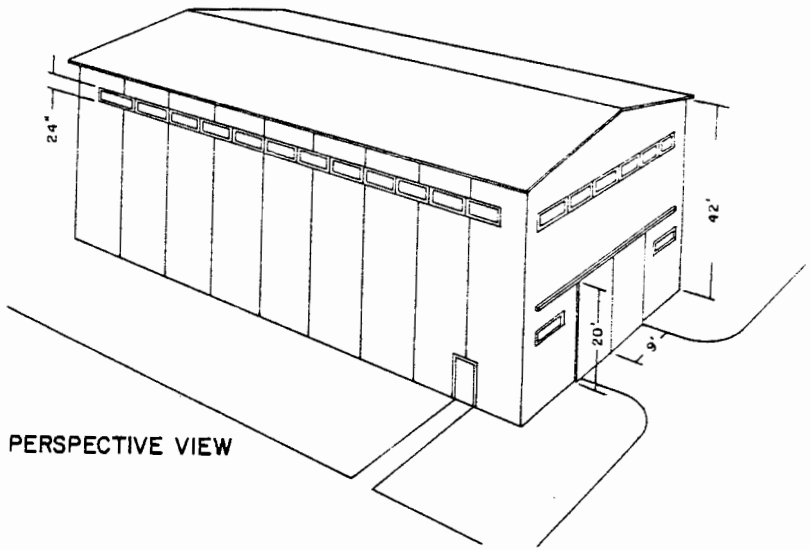
PACIFIC MISSILE RANGE
FISCAL YEAR 1962 ESTIMATES

LAUNCH OPERATIONS FACILITIES

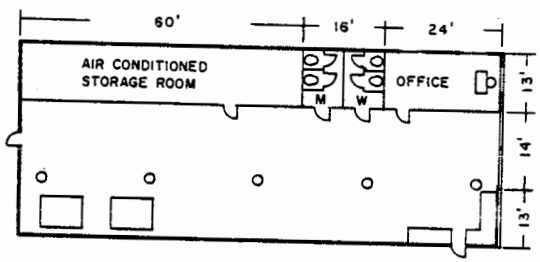
SUPPLY AND COMPONENTS STORAGE BUILDING



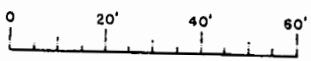
2nd. FLOOR

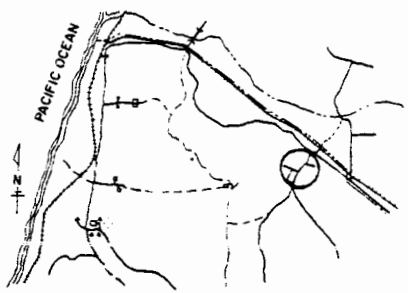


PERSPECTIVE VIEW



1st. FLOOR





KEY PLAN
EXACT SITE NOT DETERMINED

components, accessories, supplies, materials, and equipment. It is required initially in support of the Agena and Scout programs.

COST ESTIMATE:

Telemetry building.....		$645,000
Site preparation and utility connections	$7,000	
Building construction (4,500 square feet @ $26.00 per square foot).....	116,800	
Microlock equipment for satellite tracking including converters, receivers, preamplifiers, and antennas.....	335,000	
Telemetry communications equipment including recorders, receivers, and antennas.....	180,000	
Design and engineering services.....	6,200	
Engineering headquarters building.....		203,000
Site preparation and utility connections	32,000	
Building construction (7,920 square feet @ $19.80 per square foot).....	157,000	
Equipment and furniture.....	5,000	
Design and engineering services.....	9,000	
Supply and components storage building.....		150,000
Site preparation and utility connections	16,000	
Building construction (8,000 square feet @ $15.50 per square foot).....	124,000	
Equipment and furniture.....	3,000	
Design and engineering services.....	7,000	
Total estimated cost...		$998,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 9 months

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

fiscal year 1962 ESTIMATES

CONSTRUCTION OF FACILITIES - 1962 PROGRAM

VARIOUS LOCATIONS

Page No.		
	Tracking facilities:	
CF10-2	Minitrack network.....	$6,260,000
CF10-7	Deep-space network.....	9,501,000
	Propulsion development facilities:	
CF10-17	Facilities for F-1 engine program.....	425,000
CF10-19	Facilities for 200-K engine program.....	750,000
CF10-21	Sounding rocket facilities.....	500,000
CF10-22	Damage repair and special construction.....	750,000
	TOTAL.....	$18,186,000

VARIOUS LOCATIONS

FISCAL YEAR 1962 ESTIMATES

MINITRACK NETWORK

DESCRIPTION:

It is proposed to procure land and to construct a new data acquisition station on the East Coast of the United States. The new station will comprise a large paraboloid antenna with associated receivers and electronics, together with the necessary support buildings, to permit acquisition of wider band-width data from complex satellites. This project also provides for additional data acquisition antennas of medium gain at four of the existing satellite tracking stations and for the modernization of electronic equipment at these stations. At Quito, Ecuador, the ground communication system will be modified to provide a greater capacity and more efficient system for relaying data from South America to the Goddard Center.

JUSTIFICATION:

In the fiscal year 1960, funds were provided for the construction of the four new satellite tracking stations at East Grand Forks, Minnesota; Fairbanks, Alaska; St. John's, Newfoundland; and Winkfield, England; and for the frequency conversion of all stations from 108 to 136-137 megacycles. In the fiscal year 1961, the major expenditure is being devoted to the construction and equipment required for the large data acquisition equipment located at Fairbanks, Alaska to receive information from complex satellite systems, the first of which is the Nimbus meteorological satellite. This equipment will be completed early in 1962. In the fiscal year 1961, modifications and improvements will be made in tracking and timing equipment, including the completion of the 136 megacycle frequency conversion; the installation of permanent operating buildings at the Goldstone, Alaskan, South African and Australian stations; and the introduction of automatic data readout consoles at all the satellite stations to improve the efficiency and accuracy for handling the data which has to be retransmitted to the Goddard control center.

As fiscal year 1962 begins, the thirteen (13) satellite facilities at Blossom Point, Maryland; Goldstone, California; Fort Myers, Florida; Quito, Ecuador; Lima, Peru; Antofagasta, Chile; Santiago, Chile; Island Lagoon, Australia; Hartebeesthoek, South Africa; Fairbanks, Alaska; East Grand Forks, Minnesota; St. John's, Newfoundland; and Winkfield, England will be operational on the new 136-137 megacycles frequency; the fourteenth station at Antigua, West Indies Federation, will be operating as a telemetry and data acquisition station only. The stations will have the capability of tracking satellites and space vehicles in high inclination orbits and polar orbits. Improvements in automatic data readout

equipment will be in effect affording improved speed of data reduction and transmission to the Goddard computation center. The large data acquisition equipment at Fairbanks, Alaska, will be essentially complete and in process of final test and calibration for the Nimbus project.

During the fiscal year 1962, a second large data acquisition system is proposed for construction under this project at an East Coast site to provide additional acquisition capabilities for the orbiting astronomical observatory, the eccentric geophysical satellite, and for the meteorological and communications satellite programs. This new data acquisition station will be the source of the data required for support of these programs on the real-time basis needed for attitude control of the satellites and for generation of directions to the satellite. The requirement for the station was based on a detailed examination of the scheduled usage of the present NASA facilities, from which it was determined that the existing deep space network facilities could not be used effectively without serious disruption of the lunar program schedules. The new station will consist of a large paraboloid antenna, together with supporting electronic systems. Support buildings and operation buildings similar to those provided for the Alaska station will be required. Approximately 80 acres of land will be required for the site, which will be located in some area relatively secluded from man-made electronic noise. A microwave communication link between the station and the Goddard Center will be required in order to transmit the data received at the station to the control center at Goddard. It should be noted that at the present time, NASA makes use of the Department of Defense facilities at Deal, New Jersey, and at San Nicholas Island on a reimbursable basis. Although able to fulfill the earlier requirements of the Tiros satellites, these two stations were not designed nor intended for this use and have been available as interim facilities on a time sharing basis only. They can no longer be counted on to meet NASA's increasing needs in view of other commitments of the Department of Defense programs. The additional station at the East Coast site is required as an added step towards a full-time NASA capability for receiving wide band-width data for the more complex satellite programs.

The modernization program for the fiscal year 1962 also includes the introduction of wider band-width receivers and recorders at various stations, tracking filters for new receivers, modifications to command transmitters, and the improvement of equipment for ground communications from South America (Quito Relay Station) to the Goddard communication center. It is also proposed to introduce some small data acquisition, self-tracking antennas, of about 30 feet in diameter at certain of the existing sites for receiving greater quantities of data at the various frequencies. Four of these antennas are planned to augment the data acquisition capabilities for such satellites as the orbiting astronomical observatory, the orbiting solar observatory, and the eccentric geophysical observatory. The new data acquisition antennas, coupled with improved telemetry receivers and wide band-width data recording and conversion units, will provide the capability of receiving, recording, and transmitting data from the future complex satellite payloads. Command transmitters will be replaced and

updated in all the stations to meet the increased requirement for satellite interrogation and command.

COST ESTIMATE: (See next two pages)

CONSTRUCTION SCHEDULE:

Total estimated completion time for new stations..... 18 months

COST ESTIMATE:

		Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
Station development and construction:				
Development and construction of four new stations.....		$1,561,000		
Construction and site development of Alaska station for 85-foot antenna.....			$750,000	
Electronic equipment for Alaska station.....			2,340,000	
Relocation of three stations to new sites.....			1,000,000	
Construction of U.S. East Coast station.....				$721,000
Land acquisition (80 acres).....	$80,000			
Surveys, clearing, and roads.....	116,000			
Operations building (6,000 square feet @ $35.00 per square foot).....	210,000			
Power building (1,500 square feet @ $20.00 per square foot).....	30,000			
Utilities.....	20,000			
Foundations for antenna.....	80,000			
Diesel generators.....	150,000			
Design and engineering services.....	35,000			
Equipment and electronics for U.S. East Coast station..				3,334,000
Microwave link to Goddard Center.....	300,000			
Parabolic antenna (approximately 85-foot).	700,000			
Antenna feeds and receivers.....	1,049,000			
Parametric amplifier.....	110,000			
Servo and digital data systems.....	500,000			
Collimation tower and test equipment.....	405,000			
Remote control for collimation tower.....	120,000			
Drive tape computer and time standard.....	60,000			
System engineering, and installation.....	90,000			
Total, station development and construction.....		1,561,000	4,090,000	4,055,000

COST ESTIMATE (continued):

	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
Modernization of various stations:			
New electronic equipment (14 stations).....	$1,144,000		
Modification kits (10 stations).....	1,000,000		
Telemetry receivers or recorders (14 stations).....	600,000		
Command transmitters and tracking filters.....		$140,000	
Timing and calibration equipment.....		70,000	
Automatic data readout consoles (14 stations).....		450,000	
Wide band receivers and recorders (various).....			$500,000
Tracking filters for modernized receivers (14 stations).....			330,000
Modifications to command transmitters (14 stations)			260,000
Modernization of receivers and recorders (various).			379,000
Medium gain data acquisition antennas (4 stations).			456,000
Modernization of Quito communications equipment....			280,000
Total, modernization of various stations.....	2,744,000	660,000	2,205,000
Total estimated cost.....	$4,305,000	$4,750,000	$6,260,000

VARIOUS LOCATIONS

FISCAL YEAR 1962 ESTIMATES

DEEP-SPACE NETWORK

DESCRIPTION:

Major improvements are required to be made to the three permanent Deep-Space tracking and telemetering stations (Goldstone, California; Woomera, Australia; and Johannesburg, South Africa) and to a mobile tracking station. The proposed work under this project will consist of providing new receiving capability at Goldstone and transmitting capability at Woomera and South Africa; conversion of the fundamental reception frequency of the tracking stations to the 2290/2300 megacycle band; procurement of portable electronics equipment for use at cooperative stations having large antennas; and equipping the entire net with adequate spares needed to keep the stations operational during the long tracking periods required by the heavy lunar and planetary probe schedules.

JUSTIFICATION:

By the end of the fiscal year 1961 the Deep-Space Network will have attained the capability required by the Ranger lunar program, with a three station network operating at 960 megacycles and providing an adequate capability in receiver bandwidth for the TV pictures.

In the fiscal year 1962 significant changes are required at the three stations to further extend their capabilities to meet the requirements of the more advanced lunar soft landing program and the early requirements of the planetary program. A more powerful transmitter will be installed at Goldstone for more accurate measurement of range at great distances and for command capability in the planetary operation. Smaller transmitters will be added to the overseas stations for command purposes and for doppler measurements in the advanced lunar programs. Data display consoles will be modified for planetary mission requirements. A change in basic operating frequency from 960 megacycles to the new 2300 megacycles is to be accomplished in accordance with international agreement. The new frequency will provide more bandwidth for space research, is more suitable for reception of faint signals, and permits more accurate tracking to the greater ranges required. As a consequence of this change in frequency, the antenna surfaces will have to be refined to the higher optical quality required to optimize the advantages inherent in the higher frequency. The change will also necessitate the purchase of new feeds and receiving equipment for all stations.

Goldstone station:

Modernization of receiving antenna: It is anticipated that research activities programmed for the fiscal year 1961 will result in a design concept for a large reflecting surface, which, when used in conjunction with the present Goldstone 85-foot diameter receiving antenna, will provide a substantial decrease in the "noise temperature" produced by the earth itself. A program is in progress to evaluate the mechanical and radio frequency performance capabilities of the existing Goldstone 85-foot diameter tracking antenna. Based on the results of this evaluation program, modifications will be made to the dish surface and possibly to the supporting structure to improve the high frequency receiving capabilities of the antenna. A right ascension drive system will be built and installed on the receiving antenna. The purpose of this equipment is to provide for higher accuracy antenna tracking, and to improve the accuracy and operational characteristics of the optical and radio star tracking calibration techniques. Optical techniques are utilized for alignment and evaluation of the Goldstone antennas. Existing optical equipment will be replaced with more accurate and more versatile equipment.

Data display and data reduction equipment: The planetary flights will begin before the completion of the Ranger schedule. This overlapping of programs will create a temporary shortage of data display consoles in the check-out areas at the Jet Propulsion Laboratory and the Atlantic Missile Range. Three additional consoles will be fabricated and programmed to the initial planetary flight measurement program. One of these consoles may be moved from location to location to permit the modification of the existing Ranger systems to the planetary configuration. With this approach, the three new data display consoles and the modification of five existing Ranger consoles will meet the needs of the planetary program. Special equipment is also required to convert the check-out station built in the fiscal year 1961 into a full planetary data reduction station. The added equipment will consist of a special digitizing system to convert telemetering data into a format suitable for computer entry. Additional recording equipment will be required. The planetary flight measurement program will change from launch to launch. Decommutation, digitalization, and display equipment will require continuous reprogramming to accommodate the measurement program variations.

Support buildings and utilities: Construction and installation of a permanent power distribution system at Goldstone is required to replace the diesel generators now in use. A permanent 3,700 square foot addition to the tracking station communications and control building will be used to house the high-speed computer required by the tracking and transmitting antenna programs.

Equipment for new frequencies: Antenna feeds, amplifiers, and converters are necessary to extend the operating frequency limits to include the satellite frequencies of 136, 1400, and 1700 megacycles. This will make the station available for specialized satellite data acquisition tasks rather than limiting it to deep space probes only.

Maser/parametric amplifier for antenna: Current receiver systems generate a certain amount of static which can easily mask a faint signal from deep space. This static, or "noise," is defined in terms of temperature or degrees Kelvin: the higher the noise temperature, the more static and the less signal reception. A new subsystem will reduce the effective receiver system noise from 1580° K to less than 300° K. This will allow detection of a signal five times weaker than can presently be heard, will double the range over which any presently audible signal will be received, and will permit tracking to greater distances.

Ground encoder and command equipment: After the Ranger spacecraft series is completed, the ground command equipment will undergo some modification to accommodate the slower command rates applicable to the planetary probes. Other minor modifications will have to be made to accommodate more complex demands by expanding the capabilities of existing equipment.

Atomic clock for timing: The permanent installation of an atomic clock system at the Goldstone station will provide a highly stable frequency standard from which may be derived an improved measurement of station time. Two basic clock mechanisms are required to provide a self-checking feature.

Receiver equipment for transmitter site: A second receiver is required for the reliable tracking of separable spacecraft such as Ranger. The present equipment could collect signals from only the TV "bus" or the survivable lunar capsule but not from both; the dual-receiver system will permit simultaneous tracking of both objects. Ancillary recording equipment for instrumenting the tracking receiver, including oscillograph, tape recorders and signal conditioning equipment is needed to complete the system.

Collimation beacon modifications: Changes in the telemetry encoder and command decoder units used in conjunction with the pole beacon for simulating the spacecraft portion of the communications system are required by the continual development of spacecraft.

Long range antenna range: The antenna range facility which is being constructed at the Jet Propulsion Laboratory is of limited maximum length (about three miles), and therefore will not be able to handle radio patterns and gain measurements on mobile, high-accuracy antennas. A pattern measurements facility with supporting equipment is proposed for construction at Goldstone

to supplement the range at the Jet Propulsion Laboratory. It will be particularly useful in performing high-accuracy measurements on large mobile ground tracking antennas and antennas of the large spacecraft planned for Saturn.

100 kilowatt transmitter: High-powered transmission capability is needed to command and conduct two-way doppler and ranging at planetary distances. The present limit of command is approximately 30 million miles. It is proposed to extend this range to over 100 million miles with the new transmitter.

Woomera and South Africa stations:

Support building: An equipment storage building, including a stockroom, is needed at the Woomera site to house complex and delicate operating spares, replacement units, and alternate subsystems and equipments.

Equipment for new frequencies: Antenna feeds, amplifiers, and converters are required to extend the operating frequency limits for these two stations to those of the Goldstone station.

Second receiving system: A second receiver facility at each station will permit a single antenna to receive transmission from two separate space probe transmitters simultaneously.

Maser/parametric amplifier: This is the same subsystem being requested to reduce the receiver noise that is being procured for the Goldstone station; it will make all three stations parallel in operating capability.

Calibration, display, and command equipment: Command encoders, optical instruments, and test equipments are required similar to those used at Goldstone.

Digital recording and data handling equipment: This equipment will establish the same digital recording and data handling capabilities that will exist at the Goldstone site.

10 kilowatt transmitter with command and doppler: This transmitter subsystem will provide two-way doppler and command capability which is required at both stations.

Equipment modernization: Since the Deep-Space Network is the only facility available to this country for continuous communication with its lunar and deep space probes, extensive tracking periods are required for the recording of scientific data and orbit calculations. It is absolutely essential, therefore, that the equipment be continuously modified and updated to achieve maximum reliability, and requires a high level of maintenance.

Support equipment for standardization and test: Equipment not needed to be continuously in use at any one station will be used for testing and standardization of all three stations.

This procedure avoids the procurement of duplicate test equipment, where only periodic use is required at any one station. Certain critical subsystems must be provided as back up to assure continuous operation of elements difficult to replace in event of failure.

Frequency change from 960 to 2300 megacycles: The Deep-Space Network has from its inception been operating in the 890/960 megacycle frequency bands. These bands are also assigned by the Federal Communications Commission to other uses around the country. The NASA is shifting to the space frequency band of 2290/2300 megacycles in line with the results of the International Geneva Conference on the use of radio frequencies as well as discussions of the U. S. Interdepartmental Radio Advisory Committee on the same subject. The shift will require the purchase, installation, and check out of the 2290/2300 megacycle receiver and associated equipment at each of the deep-space stations, including the mobile tracking station. The work must be accomplished during the fiscal year 1962 in order to cease use of the 960 megacycle band by January of 1963 as required by the Federal Communications Commission.

Portable facilities:

Additional equipment for mobile tracking station: It is proposed to provide the same digital recording capabilities for the mobile station as will exist at the Goldstone site and to provide spare components for the digital recording equipment necessary to maintain the receiving capability of the station. The modification will update the mobile station to be compatible with requirements of the spacecraft flight program.

Transportable receiving station: As presently constituted, the deep-space facilities have no back up stations. A failure at one station during a critical period could result in the loss of significant data and reduce the success of a spacecraft which has accomplished its desired objectives. Secondly, there are certain times in a spacecraft flight that are extremely critical, such as retro fire, separation, terminal maneuver, and impact. During these short periods, it would be desirable to obtain as strong and reliable a signal as possible from the spacecraft. To satisfy the above two requirements, there are several facilities possessing large antennas around the world whose directors have indicated a willingness to cooperate with NASA in acquiring data from space probes during the short periods of critical importance (Jodrell Bank, England - 250-foot antenna; Parkes, Australia - 210-foot antenna; Sugar Grove, West Virginia - 600-foot antenna, etc.). However, none of these facilities have the proper data acquisition and terminal equipment for active participation.

It is proposed to build a transportable station for receiving data from space probes to be placed at the best available antenna location for optimum coverage of the critical periods of various spacecraft flights. The station will be equipped with a 2290/2300 megacycle receiver, and data recording, data display, data handling, data conversion, timing, demodulation, intercommunication and communication terminal equipment. The station will also have some standard antenna feeds, collimation, simulation and test equipment, as well as adequate spare parts. With this equipment, a cooperating station can quickly become a useful participant in the data acquisition network and submit significant telemetry information in the proper format.

COST ESTIMATE: (See next three pages)

COST ESTIMATE:

	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
Goldstone station:			
Road construction	$170,000		
Modernization of receiving antenna			$210,000
Data display and data reduction equipment			140,000
Second receiving system		$200,000	
Ranging equipment for Centaur and Ranger		200,000	
Digital recording and data handling equipment for Centaur and Ranger		250,000	
Technical buildings		800,000	
Support buildings and utilities (1962: Building, 3,700 square feet @ $32.00 per square foot, $118,400; power distribution system, $281,600)		530,000	400,000
Equipment for new frequencies (1,400, 1,700, 136-137 megacycles)		75,000	150,000
Maser/parametric amplifier for antenna (2,300 megacycles)		130,000	130,000
Ground encoder and command equipment for planetary programs		610,000	344,000
Large aperture antenna (200-300 feet)		200,000	
Atomic clock for timing			100,000
Receiver equipment for transmitter site (2,300 megacycles)			300,000
Collimation beacon modifications			60,000
Long distance antenna range			200,000
100 kilowatt transmitter			650,000
Total, Goldstone station	$170,000	$2,995,000	$2,684,000

COST ESTIMATE (continued):

	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
Woomera station:			
Technical buildings	$668,000		
Receiving equipment (960 megacycles)	860,000	$500,000	
Utilities	269,000	301,000	
Control building	178,000	164,000	
Site preparation and roads	485,000	140,000	
Support buildings (1962: One building, 5,000 square feet @ $10.00 per square foot)		400,000	$50,000
Equipment for new frequencies (1,400, 1,700, 136-137 megacycles)			375,000
Second receiving system (2,300 megacycles)			215,000
Maser/parametric amplifier for planetary programs (2,300 megacycles)			130,000
Calibration, display and command equipment for Centaur and Ranger			153,000
Digital recording and data handling equipment			590,000
Transmitter capability, 10 kilowatt command and coherent doppler (890/2,100 megacycles)			250,000
Total, Woomera station	2,460,000	1,505,000	1,763,000
South Africa station:			
Technical buildings		242,000	
Receiving equipment (960 megacycles)	240,000	510,000	
Site preparation and roads	511,500	434,000	
Installation and erection of equipment)		230,000	
Utilities		330,000	
Control building		164,000	
Support buildings		400,000	
Equipment for new frequencies (1,400, 1,700, 136-137 megacycles)		135,000	240,000

COST ESTIMATE (continued):

	Fiscal Year 1960	Fiscal Year 1961	Fiscal Year 1962
Digital recording and data handling.....		$210,000	$250,000
Maser/parametric amplifier.....			130,000
Calibration, display and command equipment.....			113,000
Second receiving system (2,300 megacycles).....			215,000
10 kilowatt transmitter, with command and coherent doppler (890/2,100 megacycles).....			250,000
Total, South Africa station.....	$751,500	$2,655,000	$1,198,000
Equipment modernization:			
Support equipment for standardization and test at all stations.....		687,000	1,006,000
Frequency change from 960 to 2,300 megacycles.....			1,500,000
Total, equipment modernization.....	---	687,000	2,506,000
Portable facilities:			
Additional equipment for mobile tracking station.....		158,000	350,000
Transportable receiving station.....			1,000,000
Total, portable facilities.....	---	158,000	1,350,000
Total estimated cost.....	$3,381,500	$8,000,000	$9,501,000

VARIOUS LOCATIONS

FISCAL YEAR 1962 ESTIMATES

FACILITIES FOR F-1 ENGINE PROGRAM

DESCRIPTION:

The contractor's manufacturing facility at Canoga Park, California, requires additional equipment to meet the needs of the F-1 booster engine development program. Involved are modifications of the thrust chamber brazing furnace, attachments for various machine tools, and additional quality control, laboratory and test equipment. The engine test site at the Edwards Air Force Base, California, requires tools and equipment for the support shops. In addition, test stand 1-B at the Edwards Base must be provided with 1,200 feet of additional conduit for the strain gage system running from the stand to the control center. Stand 1-B also needs a pillbox to permit observation of its second firing position and an elevator for personnel and material to reach its work platforms. The fuel tanks associated with stand 1-B require plastic linings to prevent condensation on the inner walls and contamination of the fuel.

JUSTIFICATION:

The exceptional size of the F-1 engine and its components produces unique and specialized requirements for its fabrication. A number of existing contractor fabrication facilities must be modified to meet the schedule for the manufacture and assembly of parts and the initiation of complete engine tests. A brazing furnace must be provided with controlled environment equipment, safety devices, and precision controls. The size, weight, configuration, materials, and tolerances of the F-1 components make necessary the use of special attachments and auxiliary equipment for use with existing machine tools. To insure quality and greater reliability, larger and more accurate measuring and inspection devices will be required.

With test stand 1-B becoming available for complete engine testing by about May 1961, a number of additions must be provided to assure its maximum utilization. The strain gage system must be completed by installing additional conduit to the control center. Since a second position of stand 1-B will be activated in mid-year 1961, a new observation post is required. Work platforms are located 70 feet and 120 feet above the test shop area. There will be a daily need for personnel to travel between these areas with tools and heavy equipment. An elevator is included in this project to expedite construction, repair, and modification. It will eliminate the need for a heavy boom crane on standby. The fuel tanks of stands 1-A and 2-A have been safeguarded by lining them with plastic to prevent contamination of the fuel. It is proposed to provide similar linings for the stand 1-B tanks. Additional tooling and

equipment is also required to provide an adequate capability for making the on-site repairs and modifications needed by the accelerated test schedule.

COST ESTIMATE:

Manufacturing and quality control equipment.....	$265,000
Test facilities at the Edwards Air Force Base.....	122,000
Design and engineering services.....	38,000
Total estimated cost.....	$425,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 15 months

VARIOUS LOCATIONS

FISCAL YEAR 1962 ESTIMATES

FACILITIES FOR 200K ENGINE PROGRAM

DESCRIPTION:

Modifications to existing contractor facilities are required to provide liquid hydrogen propellant storage and flow systems, and to provide special instrumentation for the measurement of thrust in the 200K engine development program. The following work is proposed:

1. Modifications to the existing stand comprising alterations to the existing test run tank, the addition of tank foundations, tank support structure, power distribution cables, and control center cables.

2. Installation of a liquid hydrogen storage and transfer system for engine testing. The system will include storage, tankage, transfer lines, a fire fighting system, and associated pumping equipment.

3. Installation of a gaseous hydrogen system to pressurize the liquid hydrogen storage vessels and the on-stand run tanks. The system will consist of a liquid hydrogen pump, a heat exchanger for vaporizing liquid, high-pressure gas storage vessels, and transfer lines to the storage vessels and test stand.

4. Additional flow, temperature, and thrust instrumentation for test stand use and suitable high-frequency recording instruments for data recording center.

JUSTIFICATION:

The proposed modifications are required to develop the 200,000 pound thrust hydrogen-oxygen engine. The risk to the successful development of the engine within its projected schedule is high and any testing accident may jeopardize the developing and launching schedule of the Saturn C-2 vehicle. Funding is requested to activate an additional engine test stand by providing a hydrogen storage and feed system for an existing test stand (stand VTS-2 at the contractor's Santa Susana Field Test Laboratory). A suitable oxygen system already exists. The stand will later be used in acceptance testing of production engines.

COST ESTIMATE:

Test stand modification for hydrogen use.....	$350,000
Liquid hydrogen system.....	195,000
Gaseous hydrogen system.....	40,000
Instrumentation.....	90,000
Design and engineering services.....	75,000
Total estimated cost.....	$750,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 15 months

VARIOUS LOCATIONS

FISCAL YEAR 1962 ESTIMATES

SOUNDING ROCKET FACILITIES

DESCRIPTION:

This project provides for the fabrication of a launcher of known design, launcher pad, enclosures for rocket conditioning, and control instrumentation for launch operations at Fort Churchill, Canada. Support facilities such as radar tracking, telemetering, range safety, rocket assembly, and check-out already exist at the site.

JUSTIFICATION:

A high-altitude sounding rocket launch facility at Fort Churchill is required to extend to greater altitudes the research currently being conducted there and to permit correlation with and supplementation of sounding rocket data acquired from other polar regions. Existing launching facilities limit the altitude of suitable probes to under 150 km, whereas the areas of required investigation extend from above 250 km to 1,000 km. The installation of a facility capable of launching both the Journeyman and Javelin vehicles will provide the means for carrying probes up to about 1,000 km. Experiments in the areas of energetic particles, magnetic fields, and ionospheres will be conducted.

COST ESTIMATE:

Journeyman-Javelin launching complex.....	$100,000
Launch instrumentation and control equipment.....	100,000
Movable launch complex enclosure.....	100,000
Insulated and temperature controlled rocket conditioning area (50 feet by 100 feet; 5,000 square feet @ $40.00 per square foot).....	200,000
Total estimated cost....	$500,000

CONSTRUCTION SCHEDULE:

Total estimated completion time..... 9 months

VARIOUS LOCATIONS

FISCAL YEAR 1962 ESTIMATES

DAMAGE REPAIR AND SPECIAL CONSTRUCTION

DESCRIPTION:

This project provides funds to repair damage to launch complex facilities over and above the normal minimum clean up following a launching; damage resulting from storms, and collision by vehicles launched from other complexes; and damage from other unforeseen hazards.

JUSTIFICATION:

Experience has demonstrated that the clean up and restoration of damaged launching areas may be considerably accelerated by the immediate availability of funds. Occasions can arise where the prompt initiation of work can eliminate weeks or months of delay, not only in the repair or reconstruction of a facility, but also in the work involved in protecting or preserving the facility until damages can be assessed. The sum of $750,000 requested in this project is to cover NASA requirements at both the Atlantic and Pacific Missile Ranges. Experience has shown, generally, that initial recovery costs sufficient to start the process of refurbishing average about $250,000 per launch pad. The contemplated launch rate of NASA vehicles, viewed against the number of past catastrophies, indicates an estimated funding requirement for about 3 emergency situations per year.

COST ESTIMATE:

Total estimated cost... $750,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1962 ESTIMATES

ADVANCED FACILITY PLANNING AND DESIGN

DESCRIPTION:

The funds requested under this project are required for advanced facility planning and design on projects for which construction funds may be requested in subsequent budgets.

JUSTIFICATION:

Long-range plans in several program areas must anticipate the need for the construction of facilities beyond the budget year for which estimates are being submitted. A considerable saving in time and an increase in the accuracy of construction cost estimates will result with the availability of an advanced facility planning and design fund which can be used to initiate the design of high-priority facilities prior to the enactment of project authorization and the appropriation of funds. Without this project, the only method by which such advanced design work can be initiated is through the use of the Administrator's emergency authorization requested in the authorization act. However, the amount of emergency authorization requested for the fiscal year 1962 anticipates that advanced planning and design requirements will be provided by this project.

The provision of the separate and identifiable advanced planning and design fund proposed by this project will allow the emergency authorization to be conserved for emergency projects requiring the prompt initiation of construction, and will permit advanced planning and design to be funded without the necessity for reprogramming funds provided for other projects.

COST ESTIMATE:

Total estimated cost..... $5,000,000