National Aeronautics and Space Administration

BUDGET ESTIMATES

FISCAL YEAR 1973

Volume II

CONSTRUCTION OF FACILITIES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

GENERAL STATEMENT

This appropriation provides for contractual services for the design, major rehabilitation, and modification of facilities; the construction of new facilities; minor construction; the purchase of related equipment and advanced design related to facilities planned for future authorization. The principal projects in the 1973 program are described below:

MANNED SPACE FLIGHT: This activity includes funds for space shuttle facilities at various locations.

SCIENTIFIC INVESTIGATIONS IN SPACE: This activity will provide funds for modifications and additions to the spacecraft assembly facilities and modifications of Titan Centaur facilities at the John F. Kennedy Space Center, NASA, Kennedy Space Center, Fla.; and rehabilitation and modification of aeronautical, airborne science and support facilities at the Ames Research Center, Moffett Field, Calif.

SPACE APPLICATIONS: No projects for 1973.

SPACE AND NUCLEAR RESEARCH AND TECHNOLOGY: No projects for 1973.

AERONAUTICAL RESEARCH AND TECHNOLOGY: This activity includes funding for rehabilitation of unitary plan wind tunnel model supports, control systems and model preparation areas at the Ames Research Center; rehabilitation of the full-scale wind tunnel at the Langley Research Center, Hampton, Va.; and modification of high temperature and high pressure turbine and combustor research facility at the Lewis Research Center, Cleveland, Ohio.

SUPPORTING ACTIVITIES: The estimates for this activity provide for rehabilitation and modification of utility systems at the Goddard Space Flight Center, Greenbelt, Md.; rehabilitation and modification of the roadway system at the Jet Propulsion Laboratory, Pasadena, Calif.; modification of central air supply system, and environmental modifications for utility operations at the Langley Research Center; modification of fire protection system at the Manned Spacecraft Center, Houston, Tex.; warehouse replacement at the Wallops Station, Wallops Island, Va.; rehabilitation and modification of facilities not in excess of $500,000 per project and minor construction of new facilities and additions to existing facilities not in excess of $250,000 per project, at various NASA installations and at Government-owned plants operated by contractors; and facility planning and design.

The appropriation for FY 1972 was $52,700,000 and the authorization was $58,400,000. The request for 1973 is $77,300,000, an increase of $24,600,000 from the 1972 appropriation. Total expenditures are estimated to be $60,000,000 in FY 1973, an increase of $17,000,000 from the $43,000,000 estimated for FY 1972.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION LANGUAGE

CONSTRUCTION OF FACILITIES

For advance planning, design, [and] construction, *rehabilitation and modification* of facilities for the National Aeronautics and Space Administration, and for the acquisition or condemnation of real property, as authorized by law, [$52,700,000] *$77,300,000*, [including $6,500,000 for modernization of a forty by eighty foot wind tunnel, $10,700,000 for Centaur modifications to Titan III launch area, $4,500,000 for alterations to launch complex 17, $7,900,000 for rehabilitation and modification of facilities, $600,000 for power plant replacements, $500,000 for relocation of an Applications Technology Satellite transportable ground station, $3,500,000 for facility planning and design, $13,000,000 for space shuttle main engine test facilities and $5,500,000 for space shuttle thermal protection facilities,] to remain available until [June 30, 1974] *expended.* *(42 U.S.C. 2451, et seq.; Department of Housing and Urban Development; Space, Science, Veterans, and Certain Other Independent Agencies Appropriation Act, 1972; additional authorizing legislation to be proposed.)*

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Construction of Facilities

Program and Financing (in thousands of dollars)

Identification code 27-00-0107-0-1-250	Budget plan (amounts for construction of facilities actions programed)			Costs and obligations		
	1971 actual	1972 estimate	1973 estimate	1971 actual	1972 estimate	1973 estimate
Program by activities:						
1. Manned space flight	1,950	18,500	27,900	6,738	18,000	20,000
2. Scientific investigations in space	650	15,200	11,205	2,402	4,500	7,500
3. Space applications	5,250	----------	----------	1,695	2,000	2,000
4. Space and nuclear research and technology	1,250	----------	----------	1,966	1,000	1,000
5. Aeronautical research and technology	1,855	6,500	12,935	3,792	7,500	9,000
6. Supporting activities	17,800	12,500	25,260	27,150	17,000	22,500
Total program costs, funded	28,755	52,700	77,300	43,743	50,000	62,000
Change in selected resources [1]	----------	----------	----------	−3,504	34,000	28,750
10 Total	28,755	52,700	77,300	40,239	84,000	90,750
Financing:						
21 Unobligated balance available, start of year, for completion of prior year budget plans	----------	----------	----------	−67,199	−53,110	−24,415
22 Unobligated balance transferred from other accounts	−2,605	----------	----------	----------	−2,605	----------
24 Unobligated balance available, end of year for completion of prior year budget plans	----------	----------	----------	53,110	24,415	10,965
Budget authority	**26,150**	**52,700**	**77,300**	**26,150**	**52,700**	**77,300**
Budget authority:						
40 Appropriation	24,950	52,700	77,300	24,950	52,700	77,300
42 Transferred from other accounts	1,200	----------	----------	1,200	----------	----------
43 **Appropriation (adjusted)**	**26,150**	**52,700**	**77,300**	**26,150**	**52,700**	**77,300**
Relation of obligations to outlays:						
71 Obligations incurred, net	----------	----------	----------	40,239	84,000	90,750
72 Obligated balance, start of year	----------	----------	----------	52,142	48,640	89,640
74 Obligated balance, end of year	----------	----------	----------	−48,640	−89,640	−120,390
90 Outlays	----------	----------	----------	43,741	43,000	60,000

[1] Selected resources as of June 30 are as follows:

	1970	*1971*	*1972*	*1973*
Unpaid undelivered orders	35,749	32,270	66,270	95,020
Advances outstanding	26	1	1	1
Total selected resources	35,775	32,271	66,271	95,021

Note.—Reconciliation of budget plan to obligations:

	1971 actual	*1972 estimate*	*1973 estimate*
Total budget plan	28,755	52,700	77,300
Deduct portion of budget plan to be obligated in subsequent years	16,885	7,900	10,965
Add obligations of prior year budget plans	28,369	39,200	24,415
Total obligations	40,239	84,000	90,750

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1973 ESTIMATES

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

	Fiscal Year 1971	Fiscal Year 1972	Fiscal Year 1973
1. MANNED SPACE FLIGHT.....	$1,950,000	$18,500,000	$27,900,000
Manned Spacecraft Center.....	450,000	---	---
Marshall Space Flight Center.	1,500,000	---	---
Various Locations.....	---	18,500,000	27,900,000
2. SCIENTIFIC INVESTIGATIONS IN SPACE.....	$650,000	$15,200,000	$11,205,000
Ames Research Center.....	---	---	1,065,000
Jet Propulsion Laboratory....	650,000	---	---
John F. Kennedy Space Center, NASA.....	---	15,200,000	10,140,000
3. SPACE APPLICATIONS.....	$5,250,000	---	---
Goddard Space Flight Center..	1,350,000	---	---
Various Locations.....	3,900,000	---	---
4. SPACE AND NUCLEAR RESEARCH AND TECHNOLOGY.....	$1,250,000	---	---
Jet Propulsion Laboratory....	1,250,000	---	---
5. AERONAUTICAL RESEARCH AND TECHNOLOGY.....	$1,855,000	$6,500,000	$12,935,000
Ames Research Center.....	1,200,000	6,500,000	760,000
Langley Research Center.....	---	---	2,465,000
Lewis Research Center.....	655,000	---	9,710,000

	Fiscal Year 1971	Fiscal Year 1972	Fiscal Year 1973
6. SUPPORTING ACTIVITIES.....	$17,800,000	$12,500,000	$25,260,000
Goddard Space Flight Center..	---	---	590,000
Jet Propulsion Laboratory....	---	---	610,000
John F. Kennedy Space Center, NASA.....	550,000	---	---
Langley Research Center.....	---	---	1,825,000
Manned Spacecraft Center.....	---	---	585,000
Wallops Station.....	---	---	350,000
Various Locations.....	1,250,000	1,100,000	---
Rehabilitation and Modification.....	11,500,000	7,900,000	11,580,000
Minor Construction.....	---	---	1,720,000
Facility Planning and Design.	4,500,000	3,500,000	8,000,000
TOTAL PLAN.....	$28,755,000	$52,700,000	$77,300,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1973 ESTIMATES

SUMMARY OF CONSTRUCTION OF FACILITIES BUDGET PLAN BY LOCATION

Location	Fiscal Year 1971	Fiscal Year 1972	Fiscal Year 1973
Ames Research Center.....	$1,200,000	$6,500,000	$1,825,000
Goddard Space Flight Center.....	1,350,000	---	590,000
Jet Propulsion Laboratory.....	1,900,000	---	610,000
John F. Kennedy Space Center, NASA	550,000	15,200,000	10,140,000
Langley Research Center.....	---	---	4,290,000
Lewis Research Center.....	655,000	---	9,710,000
Manned Spacecraft Center.....	450,000	---	585,000
Marshall Space Flight Center.....	1,500,000	---	---
Wallops Station.....	---	---	350,000
Various Locations.....	5,150,000	19,600,000	27,900,000
Rehabilitation and Modification...	11,500,000	7,900,000	11,580,000
Minor Construction.....	---	---	1,720,000
Facility Planning and Design.....	4,500,000	3,500,000	8,000,000
Total Plan.....	$28,755,000	$52,700,000	$77,300,000

The geographic location of NASA installations is shown on page SUM 10. Installations for which construction projects are requested in the fiscal year 1973 budget are identified thereon.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1973 ESTIMATES

SUMMARY OF CONSTRUCTION OF FACILITIES BUDGET PLAN BY LOCATION

Location	Fiscal Year 1971	Fiscal Year 1972	Fiscal Year 1973
Ames Research Center.....	$1,200,000	$6,500,000	$1,825,000
Goddard Space Flight Center.....	1,350,000	---	590,000
Jet Propulsion Laboratory.....	1,900,000	---	610,000
John F. Kennedy Space Center, NASA.	399,500	15,200,000	10,140,000
Langley Research Center.....	---	---	4,290,000
Lewis Research Center.....	655,000	---	9,710,000
Manned Spacecraft Center.....	450,000	---	585,000
Marshall Space Flight Center.....	1,500,000	---	---
Wallops Station.....	---	---	350,000
Various Locations.....	5,150,000	19,600,000	27,900,000
Rehabilitation and Modification....	11,650,500	7,900,000	11,580,000
Minor Construction.....	---	---	1,720,000
Facility Planning and Design.....	4,500,000	3,500,000	8,000,000
Total Plan.....	$28,755,000	$52,700,000	$77,300,000

The geographic location of NASA installations is shown on page SUM 10. Installations for which construction projects are requested in the fiscal year 1973 budget are identified thereon.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

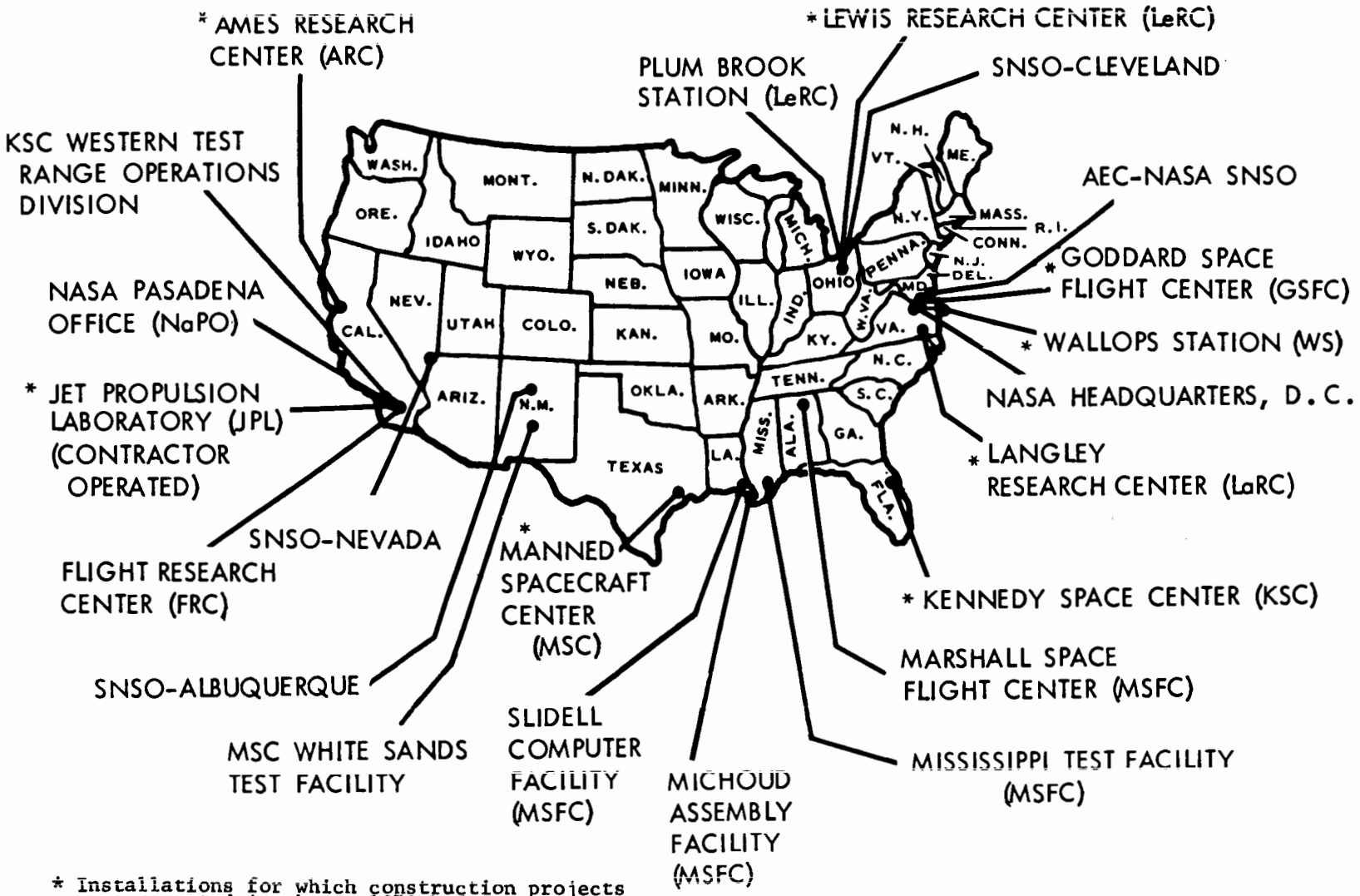
FISCAL YEAR 1973 ESTIMATES

SUMMARY OF CONSTRUCTION OF FACILITIES PROJECTS BY LOCATION

	Fiscal Year 1973
Ames Research Center	$1,825,000
Rehabilitation and modification of aeronautical, airborne science and support facilities	1,065,000
Rehabilitation of unitary plan wind tunnel model supports, control systems and model preparation areas	760,000
Goddard Space Flight Center	590,000
Rehabilitation and modification of utility systems	590,000
Jet Propulsion Laboratory	610,000
Rehabilitation and modification of roadway system	610,000
John F. Kennedy Space Center, NASA	10,140,000
Modifications of and additions to spacecraft assembly facilities	8,100,000
Modifications of TITAN Centaur facilities	2,040,000
Langley Research Center	4,290,000
Rehabilitation of full scale wind tunnel	2,465,000
Modification of central air supply system	1,175,000
Environmental modifications for utility operations	650,000
Lewis Research Center	9,710,000
Modification of high temperature and high pressure turbine and combustor research facility	9,710,000

	Fiscal Year 1973
Manned Spacecraft Center	$585,000
Modification of fire protection system	585,000
Wallops Station	350,000
Warehouse replacement	350,000
Various Locations	27,900,000
Space shuttle facilities	27,900,000
Rehabilitation and modification of facilities	11,580,000
Minor construction of facilities	1,720,000
Facility planning and design	8,000,000
Total Plan	$77,300,000

LOCATION OF NASA MAJOR AND COMPONENT INSTALLATIONS



* Installations for which construction projects are requested in the FY 1973 budget estimates.

RECORDED VALUE OF CAPITAL TYPE PROPERTY
(IN-HOUSE AND CONTRACTOR-HELD)
AS OF JUNE 30, 1971
(DOLLARS IN THOUSANDS)

Reporting Installation	Real Property: Land	Real Property: Buildings	Real Property: Other Structures & Facilities	Real Property: Leasehold Improvements	Real Property: Total	Equipment 2/	Fixed Assets in Progress	Grand Total
OFFICE OF MANNED SPACE FLIGHT	$ 107,472	$ 751,757	$ 775,761	$ 3,523	$ 1,638,513	$ 1,542,960	$ 24,335	$3,205,808
Kennedy Space Center	72,173	290,392	420,793	-	783,358	464,972	8,595	1,256,925
KSC - Florida	72,173	290,392	420,793	-	783,358	92,603	8,595	884,556
Western Test Range Operations Division Lompoc, California	-	-	-	-	-	5,514	-	5,514
Various Locations 1/	-	-	-	-	-	366,855	-	366,855
Manned Spacecraft Center	9,029	173,677	52,534	-	235,240	572,736	13,459	821,435
MSC - Houston, Texas	5,459	140,216	30,224	-	175,899	262,389	13,459	451,747
White Sands Test Facility WSTF - Las Cruces, New Mexico	-	8,691	17,331	-	26,022	35,682	-	61,704
Various Locations 1/	3,570	24,770	4,979	-	33,319	274,665	-	307,984
Marshall Space Flight Center	26,270	287,688	302,434	3,523	619,915	505,252	2,281	1,127,448
MSFC - Huntsville, Alabama	-	111,241	51,639	-	162,880	227,072	2,012	391,964
Michoud Assembly Facility MAF - New Orleans, Louisiana	7,504	64,110	25,487	-	97,101	58,827	-	155,928
Mississippi Test Facility MTF - Bay St. Louis, Mississippi	18,703	81,620	185,390	-	285,713	22,851	269	308,833
Slidell Computer Facility SCF - Slidell, Louisiana	63	4,470	854	-	5,387	18,307	-	23,694
Various Locations 1/	-	26,247	39,064	3,523	68,834	178,195	-	247,029
OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY	6,227	527,093	221,200	139	754,659	429,142	36,085	1,219,886
Ames Research Center	2,372	175,801	3,894	-	182,067	82,684	4,546	269,297
ARC - Moffett Field, California	2,372	175,643	3,894	-	181,909	78,759	4,546	265,214
Various Locations 1/	-	158	-	-	158	3,925	-	4,083
Flight Research Center	-	8,147	2,260	-	10,407	56,198	393	66,998
FRC - Edwards, California	-	8,147	2,260	-	10,407	52,041	393	62,841
Various Locations 1/	-	-	-	-	-	4,157	-	4,157
Langley Research Center	116	126,472	145,887	-	272,475	140,009	13,589	426,073
LaRC - Hampton, Virginia	110	110,994	145,862	-	256,966	128,206	13,589	398,761
Various Locations 1/	6	15,478	25	-	15,509	11,803	-	27,312
Lewis Research Center	3,739	197,673	62,229	139	263,780	122,657	17,557	403,994
LeRC - Cleveland, Ohio	323	114,117	40,499	139	155,078	69,506	13,029	237,613
Plum Brook Station PBS - Sandusky, Ohio	3,317	79,392	18,079	-	100,788	12,889	4,528	118,205
Various Locations 1/	99	4,164	3,651	-	7,914	40,262	-	48,176
Space Nuclear Systems Office	-	19,000	6,930	-	25,930	27,594	-	53,524
SNSO/N - NRDS - Jackass Flats, Nevada	-	19,000	6,930	-	25,930	4,230	-	30,160
SNSO/C - Cleveland, Ohio	-	-	-	-	-	3	-	3
Various Locations 1/	-	-	-	-	-	23,361	-	23,361
OFFICE OF SPACE SCIENCE	3,797	165,845	138,652	555	308,849	728,557	42,821	1,080,227
Goddard Space Flight Center	1,647	88,224	62,027	102	152,000	507,499	8,083	667,582
GSFC - Greenbelt, Maryland	1,308	70,990	13,390	98	85,786	173,095	8,083	266,964
Tracking Stations (Exc. DSN) 3/	339	17,146	48,592	-	66,077	279,242	-	345,319
Various Locations 1/	-	88	45	4	137	55,162	-	55,299
Jet Propulsion Laboratory	1,067	55,821	32,189	453	89,530	173,299	33,472	296,301
JPL - California	1,067	46,289	7,656	453	55,465	114,328	33,472	203,265
Tracking Stations (DSN) 3/	-	9,532	24,533	-	34,065	58,971	-	93,036
Wallops Station	1,083	21,800	44,436	-	67,319	47,759	1,266	116,344
WS - Wallops Island, Virginia	1,083	21,800	44,436	-	67,319	47,529	1,266	116,114
Various Locations 1/	-	-	-	-	-	230	-	230
OTHER	-	-	-	1	1	21,171	-	21,172
NASA Headquarters	-	-	-	1	1	21,171	-	21,172
Washington, D.C.	-	-	-	-	-	5,659	-	5,659
Various Locations 1/	-	-	-	1	1	15,512	-	15,513
GRAND TOTAL	$ 117,496	$1,444,695	$ 1,135,613	$ 4,218	$ 2,702,022	$ 2,721,830	$ 103,241	$5,527,093

1/ Includes Capital Type Property in Possession of Contractors at Various Locations.
2/ Includes Contractor - Held Special Test Equipment ($698,216K).
3/ DSN - Deep Space Network.

SUM 11

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

AMES RESEARCH CENTER

	Page No.
Location plan	CF 1-1
Summary	CF 1-2
Office of Aeronautics and Space Technology Projects:	
Rehabilitation and modification of aeronautical, airborne science and support facilities	CF 1-3
Rehabilitation of unitary plan wind tunnel model supports, control systems and model preparation areas	CF 1-7

AMES RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES
LOCATION PLAN

N-217	MAGNETIC STANDARDS LABORATORY
N-218	14-FOOT TRANSONIC W.T.
N-218A	ELECTRICAL EQUIPMENT BLDG.
N-219	ELECTRICAL SERVICES BLDG.
N-220	TECHNICAL SERVICES BLDG.
N-221	40- BY 80-FOOT W.T.
N-221A	BIOSATELLITE CENTRIFUGE
N-221B	VERTICAL HEIGHT APPARATUS
N-222	2- BY 2-FOOT TRANSONIC W.T.
N-223	HYPERVELOCITY BALLISTIC RANGE
N-224	PAYLOAD INTEGRATION AND TEST FACILITY
N-225	SUBSTATION
N-226	6- BY 6-FOOT SUPERSONIC W.T.
N-227	UNITARY PLAN W.T. BLDG.
N-227A	11-FOOT TRANSONIC W.T.
N-227B	9- BY 7-FOOT SUPERSONIC W.T.
N-227C	8- BY 7-FOOT SUPERSONIC W.T.
N-227D	UNITARY PLAN W.T. AUXILIARIES BLDG.
N-228	42-INCH SHOCK TUNNEL
N-229	3.5-FOOT HYPERSONIC W.T.
N-229A	3.5-FOOT HYPERSONIC W.T. AUXILIARIES BLDG.
N-230	PHYSICAL SCIENCES RESEARCH LABORATORY
N-231	HYPERSONIC HELIUM TUNNEL
N-232	PILOT MODEL OF HFFF
N-233	DATA REDUCTION BLDG.
N-234	GASDYNAMICS LAB.
N-234A	MASS TRANSFER BOILER HOUSE
N-235	CAFETERIA BLDG.
N-236	BIOSCIENCE LAB.
N-237	HYPERVELOCITY FREE FLIGHT FACILITY
N-238	MACH 50 HELIUM TUNNEL
N-239	LIFE SCIENCES RESEARCH LAB.
N-239A	LIFE SCIENCES HIGH BAY
N-240	SPACE ENVIRONMENT RESEARCH FACILITY
N-241	ADMINISTRATIVE MANAGEMENT BUILDING
N-242	STRUCTURAL DYNAMICS LAB.
N-243	FLIGHT AND GUIDANCE SIMULATION LABORATORY
N-243A	SIMULATION EQUIPMENT BLDG.
N-244	SYSTEMS ENGINEERING FACILITY
N-245	SPACE SCIENCE RESEARCH LABORATORY

FISCAL YEAR 1971 PROJECT:

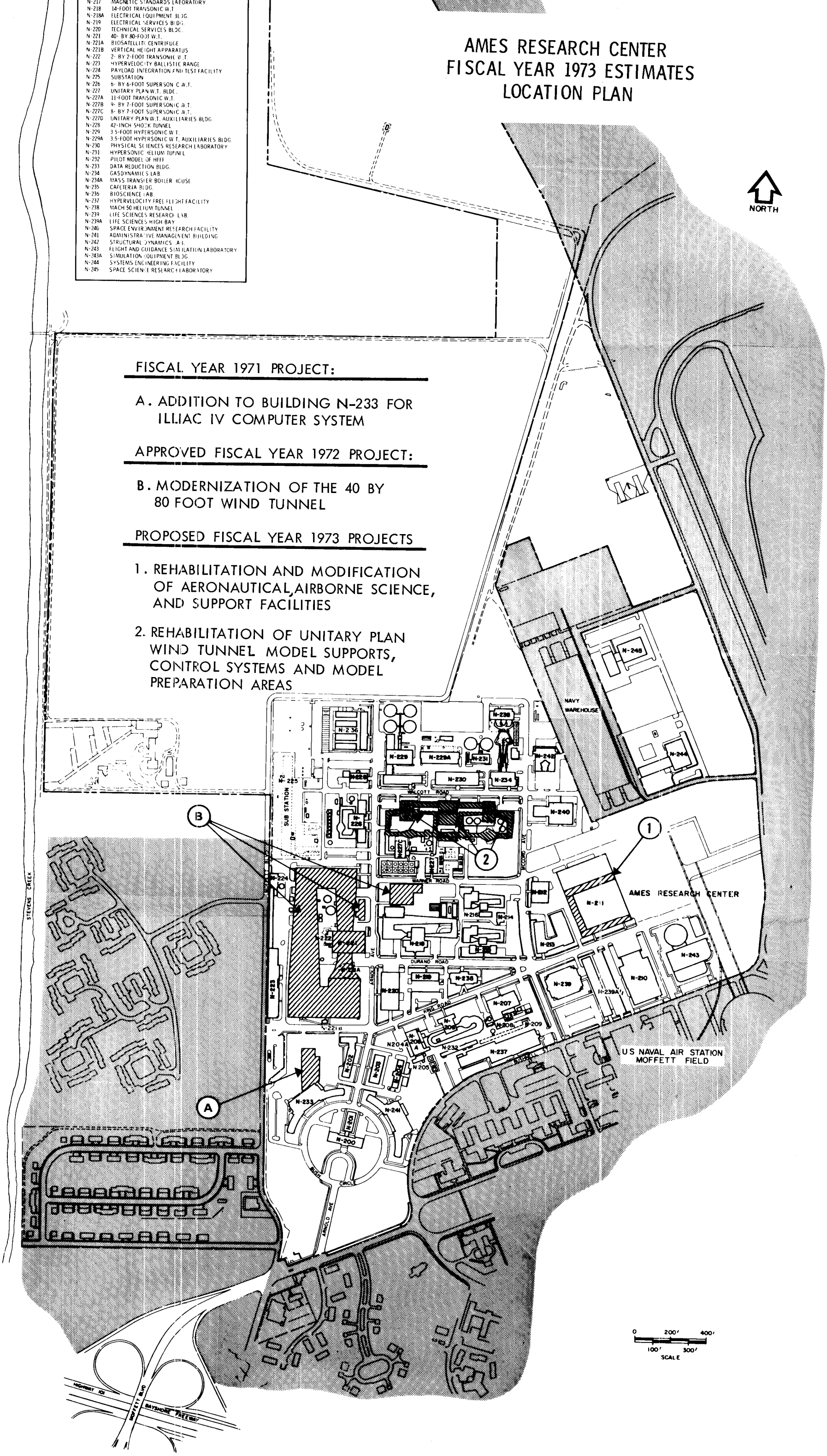
A. ADDITION TO BUILDING N-233 FOR ILLIAC IV COMPUTER SYSTEM

APPROVED FISCAL YEAR 1972 PROJECT:

B. MODERNIZATION OF THE 40 BY 80 FOOT WIND TUNNEL

PROPOSED FISCAL YEAR 1973 PROJECTS

1. REHABILITATION AND MODIFICATION OF AERONAUTICAL, AIRBORNE SCIENCE, AND SUPPORT FACILITIES
2. REHABILITATION OF UNITARY PLAN WIND TUNNEL MODEL SUPPORTS, CONTROL SYSTEMS AND MODEL PREPARATION AREAS



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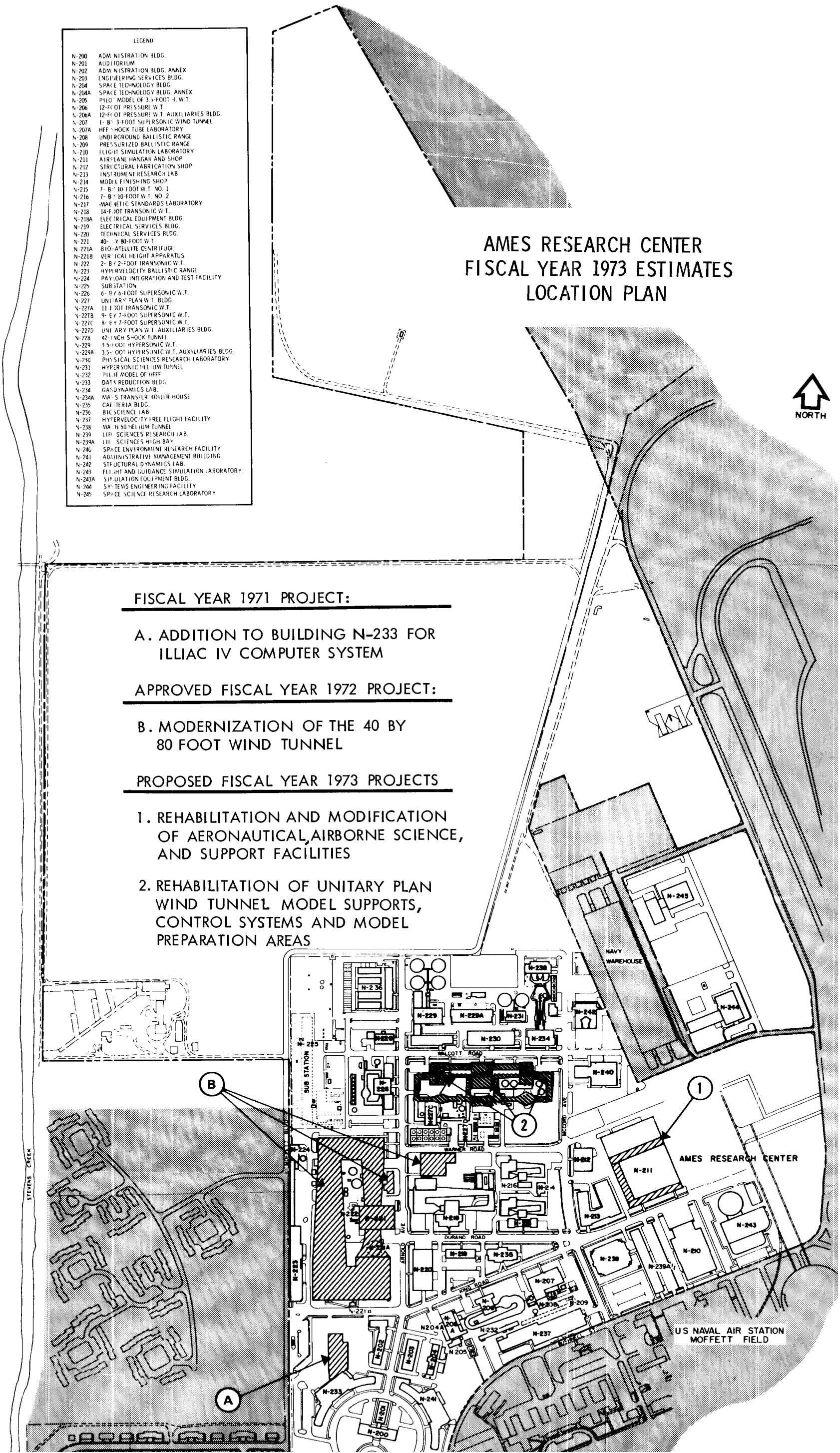
AMES RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES
LOCATION PLAN



LEGEND

N-200	ADMINISTRATION BLDG.
N-201	AUDITORIUM
N-202	ADMINISTRATION BLDG. ANNEX
N-203	ENGINEERING SERVICES BLDG.
N-204	SPACE TECHNOLOGY BLDG.
N-204A	SPACE TECHNOLOGY BLDG. ANNEX
N-205	PILOT MODEL OF 3.5-FOOT H. W.T.
N-206	12-FOOT PRESSURE W.T.
N-206A	12-FOOT PRESSURE W.T. AUXILIARIES BLDG.
N-207	1- BY 3-FOOT SUPERSONIC WIND TUNNEL
N-207A	HFF SHOCK TUBE LABORATORY
N-208	UNDERGROUND BALLISTIC RANGE
N-209	PRESSURIZED BALLISTIC RANGE
N-210	FLIGHT SIMULATION LABORATORY
N-211	AIRPLANE HANGAR AND SHOP
N-212	STRUCTURAL FABRICATION SHOP
N-213	INSTRUMENT RESEARCH LAB
N-214	MODEL FINISHING SHOP
N-215	7- BY 10-FOOT W.T. NO. 1
N-216	7- BY 10-FOOT W.T. NO. 2
N-217	MAGNETIC STANDARDS LABORATORY
N-218	14-FOOT TRANSONIC W.T.
N-218A	ELECTRICAL EQUIPMENT BLDG.
N-219	ELECTRICAL SERVICES BLDG.
N-220	TECHNICAL SERVICES BLDG.
N-221	40- BY 80-FOOT W.T.
N-221A	BIO-SATELLITE CENTRIFUGE
N-221B	VERTICAL HEIGHT APPARATUS
N-222	2- BY 2-FOOT TRANSONIC W.T.
N-223	HYPERVELOCITY BALLISTIC RANGE
N-224	PAYLOAD INTEGRATION AND TEST FACILITY
N-225	SUB STATION
N-226	6- BY 6-FOOT SUPERSONIC W.T.
N-227	UNITARY PLAN W.T. BLDG.
N-227A	11-FOOT TRANSONIC W.T.
N-227B	9- BY 7-FOOT SUPERSONIC W.T.
N-227C	8- BY 7-FOOT SUPERSONIC W.T.
N-227D	UNITARY PLAN W.T. AUXILIARIES BLDG.
N-228	42-INCH SHOCK TUNNEL
N-229	3.5-FOOT HYPERSONIC W.T.
N-229A	3.5-FOOT HYPERSONIC W.T. AUXILIARIES BLDG.
N-230	PHYSICAL SCIENCES RESEARCH LABORATORY
N-231	HYPERSONIC HELIUM TUNNEL
N-232	PILOT MODEL OF HFFF
N-233	DATA REDUCTION BLDG.
N-234	GASDYNAMICS LAB.
N-234A	MAIN TRANSFER BOILER HOUSE
N-235	CAFETERIA BLDG.
N-236	BIOSCIENCE LAB
N-237	HYPERVELOCITY FREE FLIGHT FACILITY
N-238	MACH 50 HELIUM TUNNEL
N-239	LIFE SCIENCES RESEARCH LAB.
N-239A	LIFE SCIENCES HIGH BAY
N-240	SPACE ENVIRONMENT RESEARCH FACILITY
N-241	ADMINISTRATIVE MANAGEMENT BUILDING
N-242	STRUCTURAL DYNAMICS LAB.
N-243	FLIGHT AND GUIDANCE SIMULATION LABORATORY
N-243A	SIMULATION EQUIPMENT BLDG.
N-244	SYSTEMS ENGINEERING FACILITY
N-245	SPACE SCIENCE RESEARCH LABORATORY

FISCAL YEAR 1971 PROJECT:

A. ADDITION TO BUILDING N-233 FOR ILLIAC IV COMPUTER SYSTEM

APPROVED FISCAL YEAR 1972 PROJECT:

B. MODERNIZATION OF THE 40 BY 80 FOOT WIND TUNNEL

PROPOSED FISCAL YEAR 1973 PROJECTS

1. REHABILITATION AND MODIFICATION OF AERONAUTICAL, AIRBORNE SCIENCE, AND SUPPORT FACILITIES
2. REHABILITATION OF UNITARY PLAN WIND TUNNEL MODEL SUPPORTS, CONTROL SYSTEMS AND MODEL PREPARATION AREAS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 73 BUDGET ESTIMATES

(Dollars in thousands)

NASA INSTALLATION		COGNIZANT PROGRAM OFFICE FOR INSTALLATION
Ames Research Center		Aeronautics and Space Technology
LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Moffett Field, California	Santa Clara	Mountain View, California

INSTALLATION MISSION

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

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 19 73 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Rehabilitation and Modification of Aeronautical, Airborne Science and Support Facilities	AST	71	1,065	-0-	1,136
Rehabilitation of Unitary Plan Wind Tunnel Model Supports, Control Systems and Model Preparation Areas	AST	295	760	5,000	6,055
TOTAL			1,825		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Rehabilitation and Modification of Aeronautical, Airborne Science and Support Facilities
LOCATION	Ames Research Center
	FY 1973 CoF ESTIMATE $1,065,000

COGNIZANT INSTALLATION: Ames Research Center

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

COGNIZANT PROGRAM OFFICE: Office of Aeronautics and Space Technology

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$71,000	
Construction	115,000	(CoF investment subsequent to the transfer of the facility to NASA.)
Total FY 1972 and Prior Years	$186,000	

SUMMARY PURPOSE AND SCOPE:

This project is necessary to rehabilitate a 26-year old hangar to (1) provide special laboratories, shops and offices in support of the Airborne Science Office presently housed in temporary structures inside the hangar, (2) replace all temporary structures with permanent facilities to minimize the interference with aircraft operations, and (3) improve the efficiency of utilization and safety of existing permanent structures.

PROJECT JUSTIFICATION:

The requirement is for special laboratories, shops, and offices to replace the Airborne Science Office facilities presently housed in temporary structures in the hangar. The special purpose features include a data facility for the Earth Resources Aircraft Program (ERAP), optical and electronic laboratories, telescope-experiment interface mockup room, airborne experiments assembly room, mission and flight planning room, and airborne data systems and delicate instrument storage rooms.

The urgent requirements of the proposed modification program include the following:

1. Adequate working conditions for the installation into aircraft of instruments and large, complex, and delicate equipment in connection with astronomy and earth observations experiments;

2. Adequate working conditions, day or night, in making modifications to the airframe, as required by a particular experiment; and

3. Scientific laboratory and small shop facilities in close proximity to the aircraft for assembly, test, and final checkout of airborne experiments.

The old hangar was built in 1945 without a fire protection system for its wooden roof or for the aircraft housed within the structure. Shortly after the start of the space program in 1958, wooden temporary structures were built inside the hangar to accommodate new programs. As new buildings were obtained some of these structures were removed but many remain. With the shift back to aeronautical research, there is still a requirement for a large number of people and aircraft to be housed in the facility (at least 150 personnel of which about 70 require office space). Removal of these temporary structures will reduce the fire hazard but will require a renovation of existing space to increase the efficiency of utilization. To protect against aircraft fire, studies have indicated that a deluge sprinkler system and heat and gas detectors are required.

A recent study of the condition of the Center's buildings has rated the hangar as one of the most urgent buildings to rehabilitate. Much of the electrical switch gear and lighting of all areas is inadequate or obsolete.

PROJECT DESCRIPTION:

This project consists of reorganizing the space in the south wing and center wing into more logically sized useful rooms for offices, shops and laboratories by revising and adding partitions and doors. The electrical, mechanical and plumbing system will be completely updated. New and adequate lighting will be provided for the hangar as well as a deluge fire protection system.

Additional space is being provided to accommodate the activities in the temporary structures being removed. This is as follows: A small flight operations center of approximately 5,100 square feet (includes storage on the 3rd deck) will be built in the southeast corner of the hangar; the new west wing, approximately 15,000 square feet with a 5,000 square foot 3rd deck being for storage. The rest being special laboratories, shops, offices (approximately 2,200 square feet), etc. This 20,100 square feet of permanent fire resistant structure will replace approximately 25,000 square feet of temporary structures. Also included in this project is the removal of the hangar doors of the west end.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,065,000
Rehabilitation and modification of south wing	SF	14,000	$13.36	187,000
Construction of operations center	SF	5,100	19.61	100,000
Rehabilitation and modification of center wing	SF	10,400	13.46	140,000
Construction of laboratory, shop and office area on west side of hangar	SF	15,000	21.67	325,000
Provision of fire protection system	SF	122,000	1.68	205,000
Rehabilitation of hangar and removal of west doors	LS	---	---	108,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$1,065,000

This project does not involve any additional equipment or property required for initial operational use other than that reflected in the above estimated cost data.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

For presently planned usage there are no currently foreseen future funding requirements necessary to complete this project.

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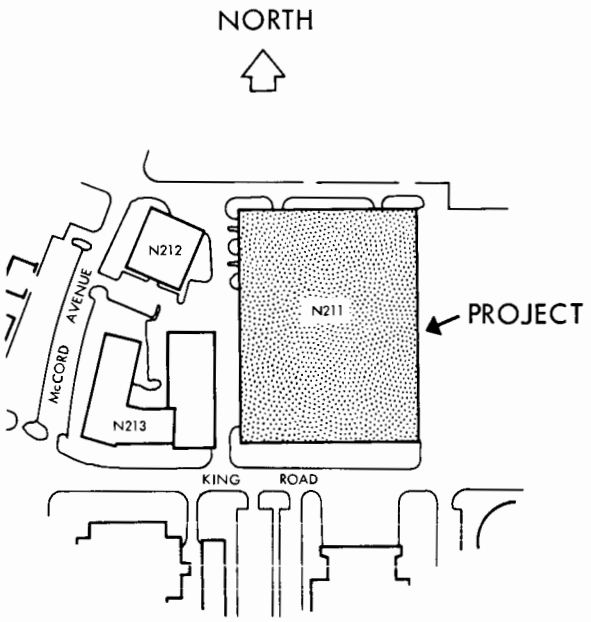
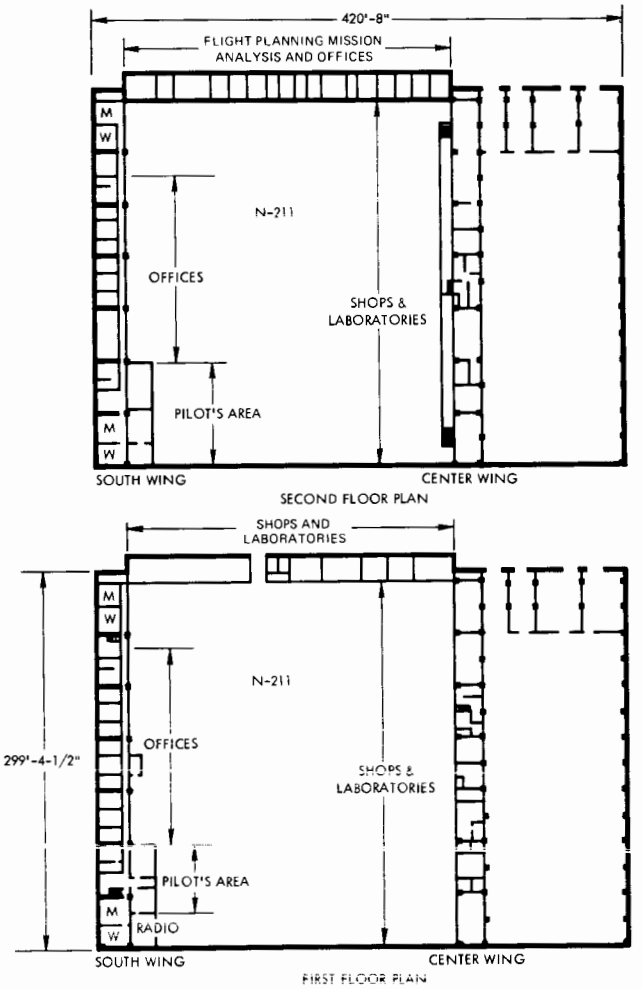
AMES RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

REHABILITATION AND MODIFICATION OF AERONAUTICAL, AIRBORNE SCIENCE AND SUPPORT FACILITIES



SITE PLAN



PROPOSED MODIFICATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Rehabilitation of Unitary Plan Wind Tunnel Model Supports, Control Systems and Model Preparation Areas
LOCATION	Ames Research Center
	FY 1973 CoF ESTIMATE $760,000

COGNIZANT INSTALLATION: Ames Research Center

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

COGNIZANT PROGRAM OFFICE: Office of Aeronautics and Space Technology

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$45,000	
Construction	250,000	(CoF investment subsequent to the transfer of the facility to NASA.)
Total FY 1972 and Prior Years	$295,000	

SUMMARY PURPOSE AND SCOPE:

The Unitary Plan Wind Tunnel model support systems, associated control systems, and the compressor drive motor speed control system are to be rehabilitated, primarily to renew strength and safety of the support systems and to renew reliability and accuracy of the control systems. During the rehabilitation, improvements will be incorporated which will increase model support system capability, improve reliability and accuracy of controls, and increase operational efficiency. In addition, the rehabilitation is to include partitioning and enclosing areas within the Unitary building's central shop to provide permanent laboratory and model preparation space.

PROJECT JUSTIFICATION:

Experimental investigations are conducted in the Unitary Wind Tunnels in support of general aeronautical research and development programs. Near future planned efforts include continuing support of inhouse research programs, support of the Langley Advanced Transport Technology (ATT) program, support of the joint NASA/Air Force/General Dynamics Transonic Aircraft Technology (TACT) program, support of the Space Shuttle program, and support of the

Department of Defense aircraft development and improvement programs, such as S-3A, F-14A, F-14B, AX, B-1, F-15, F-4 and F-5. In response to current requests, the Unitary facilities are normally operated 24 hours per day. Requests for experimental investigations in these facilities have increased to such an extent that many important tests considered technically necessary and appropriate for the facilities (i.e. requiring the high Reynolds number and/or the large model size capability of the facilities), cannot be accepted or are subject to unacceptable scheduling delays due to other test commitments. Gradual deterioration of the facility increased scheduling problems and reduced productivity.

This deterioration or wear has resulted in lowering or downrating the maximum allowable model support system loading. Because of these strength limitations, it is sometimes not possible to fully accomplish test objectives and/or fully utilize the high Reynolds number capability of the facility.

The accuracy and response limitations of the drive motor speed control used for Mach number control in the 11-by-11 Foot Wind Tunnel, make Mach number setting and adjustment a time consuming process, further indirectly contributing to scheduling problems.

Users of the unitary facilities require laboratory or shop space, primarily for preparation and checkout of models and specialized instrumentation prior to installation in one of the facilities. Presently much of such work is accomplished in one or the other of the wind tunnel test chambers with the ever present problems of security, not enough space, high noise levels, and often lack of adequate equipment. As a result, final test set ups are occasionally delayed, and often require additional time which could more effectively be used for testing. Permanent laboratory and shop space are essential to provide security, an acceptable working environment, and adequate space and equipment to better prepare and check out models and instrumentation prior to wind tunnel occupancy.

Based on past experience, and present known requirements, it is apparent that the Unitary facilities will continue to be in exceptionally high demand for many years in support of major aircraft programs of high national interest. With continued good maintenance and rehabilitation this continuously used facility should be good for another 16 or more years.

PROJECT DESCRIPTION:

This Unitary Plan Wind Tunnel rehabilitation project involves rehabilitation and improving the model support system and the compressor drive motor speed control system. In addition, the project includes partitioning and enclosing areas within the building's central shop area to provide permanent laboratory and model preparation shops for facility users.

Rehabilitation of the model support will provide increased load carrying capability, increased reliability and safety, and capability of driving a model to the desired angles-of-attack and angles-of-yaw at higher rates than

is now possible. The increased load capacity of the structural components will be accomplished by using higher strength alloy steels. Minor size changes will have to be made to the universal joints, chains, gear boxes, hydraulic motors and hydraulic supply system to provide increased torque capacity and higher output velocity. The slowness in moving from one data point to the next (driving rate) can be overcome in part by increasing the output capabilities of the hydraulic-mechanical drive system, and matching the output capabilities to the demand signal from the control system. Further improvements in the driving rate will be effected by upgrading and improving the servo control system. The model support positioning system controls will be improved by replacing the present indexing table with a mini-computer or by building a new indexing table.

The compressor drive motor speed control system is to be improved by instituting set-point capability on the commanded speed and by modernizing its electronic components. This will also result in improving the long term drift, the short time accuracy and the response time of the compressor drive motor speed control system.

Permanent laboratory and shop areas for facility users will be provided by partitioning and enclosing areas within the central shop area of Bldg. N-227. Walls and ceilings will be acoustically treated to reduce noise levels from the wind tunnel circuits on either side. Fluorescent lighting, heating, air conditioning, instrument power circuits, 220 volt, 3-phase circuits and one-ton cranes will be provided in all shops. One centrally located 440 volt, 3-phase circuit will be installed. Additional permanent model supports will be installed in two of the shops.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$161,000
Rehabilitation and modification of laboratory and model preparation shop	SF	9,200	$17.50	161,000
Equipment				599,000
Model support fabrication, hardware and hydraulic power supply	Each	2	93,900	187,800
Model support position control system	Each	2	54,400	108,800
Drive motor speed control system	Each	1	302,400	302,400
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$760,000

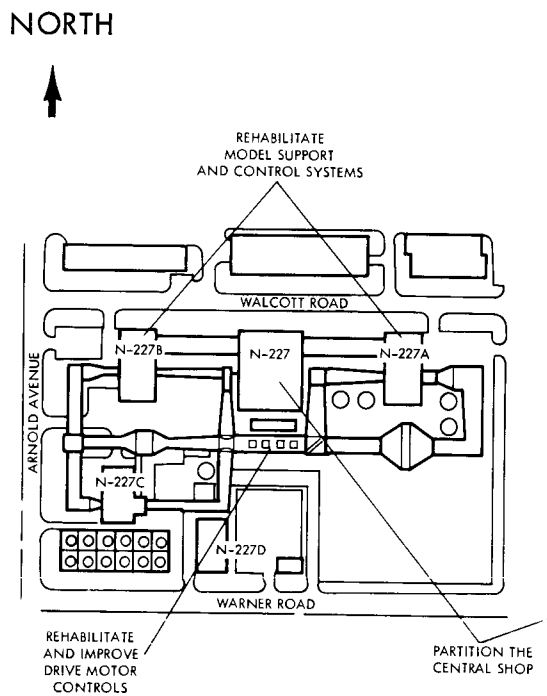
This project does not involve any additional equipment or property required for initial operational use other than that reflected in the above estimated cost data.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

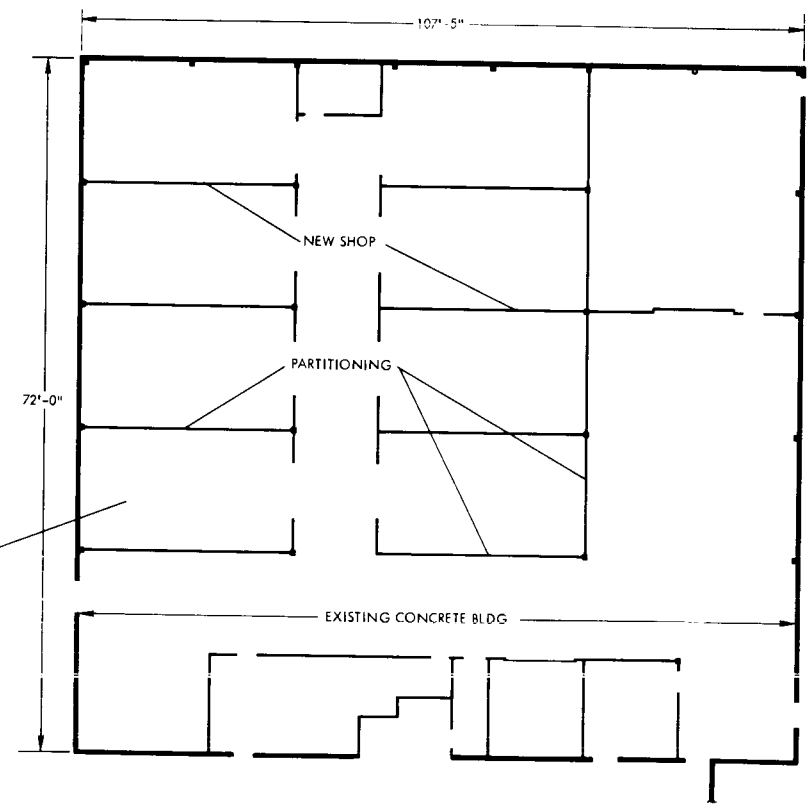
Depending on future program and intensity of usage an additional $4-5 million may be required in future years to further improve this facility.

AMES RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

REHABILITATION OF THE UNITARY PLAN WIND TUNNEL MODEL SUPPORTS, CONTROL SYSTEMS AND MODEL PREPARATION AREAS



SITE PLAN



SHOP PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

GODDARD SPACE FLIGHT CENTER

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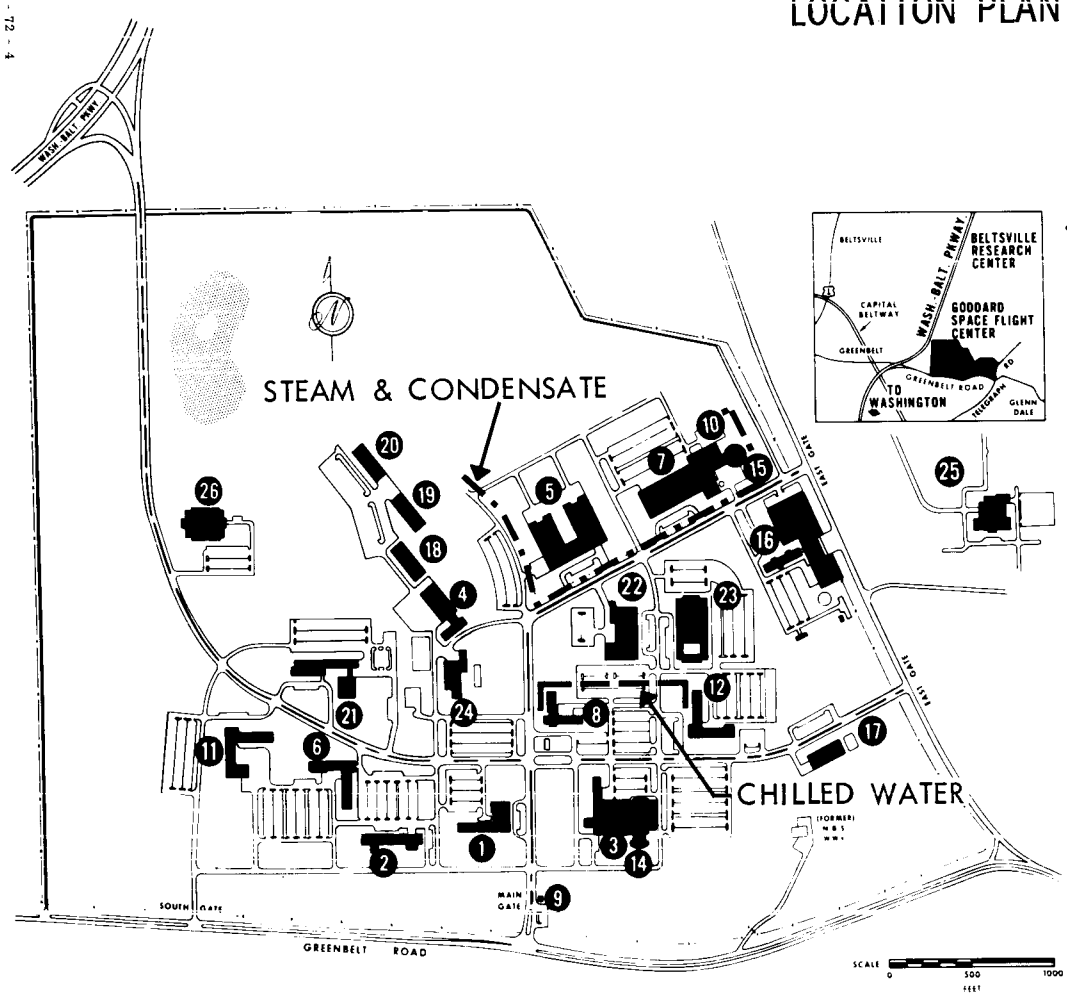
Office of Space Science Project:	
Rehabilitation and modification of utility systems	CF 2-3

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1973 ESTIMATES

LOCATION PLAN



- *1 SPACE PROJECTS BUILDING
- 2 RESEARCH PROJECTS LABORATORY
- 3 CENTRAL FLIGHT CONTROL AND RANGE OPERATIONS BUILDING
- 4 GENERAL PURPOSE FACILITY BUILDING
- 5 INSTRUMENT CONSTRUCTION AND INSTALLATION LABORATORY
- 6 SPACE SCIENCES LABORATORY
- 7 PAYLOAD TESTING FACILITY
- 8 SATELLITE SYSTEMS BUILDING
- 9 MAIN GATE HOUSE
- 10 ENVIRONMENTAL TESTING LABORATORY
- 11 APPLIED SCIENCES LABORATORY
- *12 TRACKING AND TELEMETRY LABORATORY
- 14 SPACECRAFT OPERATIONS FACILITY
- 15 LAUNCH PHASE SIMULATOR
- 16 DEVELOPMENT OPERATIONS BUILDING
- *17 MULTI-PURPOSE BUILDING
- *18 BUSINESS OPERATIONS BUILDING
- *19 MULTI-PURPOSE BUILDING
- *20 GEOCHEMISTRY BUILDING
- *21 METEOROLOGICAL SYSTEMS DEVELOPMENT LABORATORY
- 22 MECHANICAL TEST FACILITY AND QUALITY ASSURANCE LABORATORY
- 23 DATA INTERPRETATION LABORATORY
- **24 CENTRAL HEATING AND REFRIGERATION PLANT
- *25 NETWORK TRAINING & TEST FACILITY
- 26 NASA SPACE SCIENCE DATA CENTER

EXISTING FACILITIES

FY 73 PROJECT LEGEND

- STEAM AND CONDENSATE
- CHILLED WATER
- * BUILDING LOAD CENTERS
- ** STEAM GENERATOR

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 73 BUDGET ESTIMATES

(Dollars in thousands)

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

INSTALLATION MISSION

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

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 19 73 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Rehabilitation and Modification of Utility Systems	OSS	41	590	1,500	2,131
TOTAL			590		

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NASA-HQ

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Rehabilitation and Modification of Utility Systems	
LOCATION	Goddard Space Flight Center	
	FY 1973 CoF ESTIMATE	$590,000

COGNIZANT INSTALLATION: Goddard Space Flight Center

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

COGNIZANT PROGRAM OFFICE: Office of Space Science

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$41,000
Construction	*
Total FY 1972 and Prior Years	*

*Utility Systems were included in major construction activities and are not separately identifiable.

SUMMARY PURPOSE AND SCOPE:

This project provides for major rehabilitation and modification to electrical, steam, and chilled water utility systems on the Center's main site. It includes replacement of a deteriorated steam generator, restoration of corroded chilled water and steam distribution conduits, and upgrading the electrical distribution system.

PROJECT JUSTIFICATION:

Major rehabilitation of the Center's utility systems are required to replace deteriorated portions of the steam and chilled water systems, and to upgrade the electrical distribution system.

Of the Center's five existing steam generators, the oldest has been in service for over ten years. Repair and maintenance cost of this steam generator has progressively increased over the past three years. It is now economically desirable to replace the existing unit with a new one of higher capacity. Reduced maintenance cost will result and the additional capacity will facilitate the handling of increased demands for steam.

Portions of the existing chilled water and steam distribution conduits have corroded and must be replaced. If these lines are not replaced, an eventual interruption to the Center's chilled water supply and steam distribution will result.

There is a need for increased capacity, improved reliability and provision of better maintenance methods for the existing electrical load centers in eight buildings. The proposed changes will meet the capacity and reliability requirements and provide systems which can be tested and maintained without disruption of normal operations. A new 34.5KV feeder will be installed by the utility company to meet Center requirements. The Center must provide the terminal facility for this feeder.

PROJECT DESCRIPTION:

A new steam generator of 33,000 pounds per hour steam capacity will replace the existing 24,000 pounds per hour steam generator. Restoration will be made to approximately 3,200 linear feet of steam and condensate piping, and 2,400 linear feet of chilled water conduit.

Improvements will be made to load centers in Buildings 1, 12, 17, 18, 19, 20, 21 and 25. These improvements range from modifications to complete replacements of load centers. Electrically operated drawout main and tie breakers will replace bolted-in molded case or other types to facilitate testing and maintenance. Terminal facilities at the main substation for a new 34.5KV feeder will be included.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$500,000
Steam and condensate conduit	LF	3,200	$59.38	190,000
Chilled water conduit	LF	2,400	31.25	75,000
Building load center modification	LS	---	---	220,000
Substation terminal	LS	---	---	15,000

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment				$90,000
Steam generator replacement	Each	1	$90,000	90,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$590,000

This project does not involve any additional equipment or property required for initial operational use other than that reflected in the above estimated cost data.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

There will be a continuing requirement to replace portions of the steam and chilled water systems, and the replacement of the remaining steam generators. It is estimated that about $1.2 - 1.5 million will be required in subsequent years to meet this requirement.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

JET PROPULSION LABORATORY

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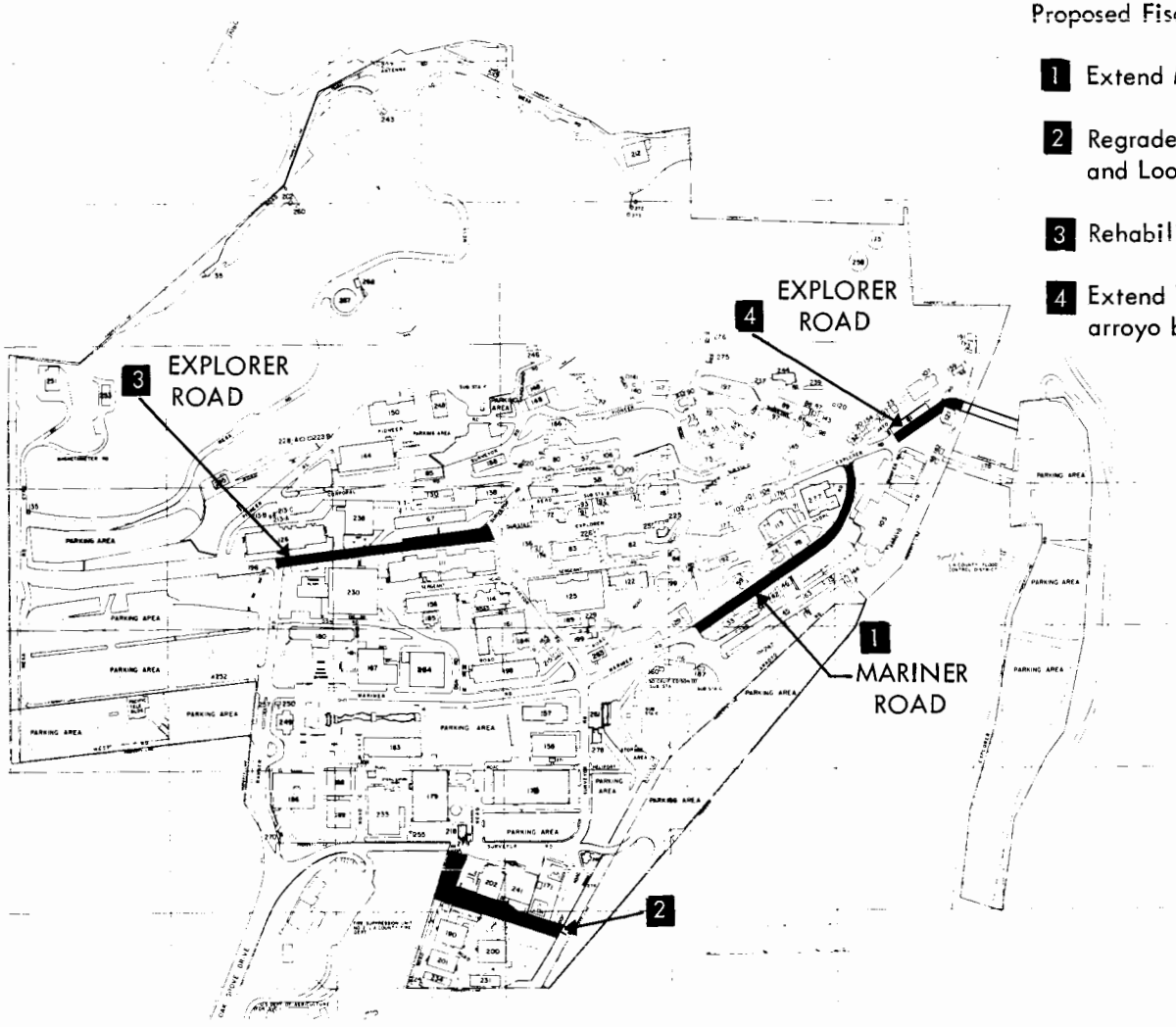
Office of Space Science Project:	
Rehabilitation and modification of roadway system.....	CF 3-3

JET PROPULSION LABORATORY
FISCAL YEAR 1973 ESTIMATES

REHABILITATION AND MODIFICATION OF ROADWAY SYSTEM



Proposed Fiscal Year 1973 Projects

1. Extend Mariner Road
2. Regrade and repave Road "A" and Loop Road
3. Rehabilitate Explorer Road
4. Extend Explorer Road to new arroyo bridge

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0 100 300 600

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 BUDGET ESTIMATES

(Dollars in thousands)

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION
Jet Propulsion Laboratory	Space Science

LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Pasadena, California	Los Angeles	Pasadena

INSTALLATION MISSION

The Jet Propulsion Laboratory (JPL) is a government-owned research and development facility, operated by the California Institute of Technology under a contract with the National Aeronautics and Space Administration. The laboratory carries out research programs and unmanned lunar and planetary space projects for NASA, and conceives and executes advanced development and experimental engineering investigations to further the technology required for the nation's space program.

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 1973 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Rehabilitation and Modification of Roadway System	OSS	36	610	500	1,146
TOTAL			610		

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NASA-HQ
CF 3-2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Rehabilitation and Modification of Roadway System
LOCATION	Jet Propulsion Laboratory
	FY 1973 CoF ESTIMATE $610,000

COGNIZANT INSTALLATION: Jet Propulsion Laboratory

LOCATION OF PROJECT: Pasadena, Los Angeles County, California

COGNIZANT PROGRAM OFFICE: Office of Space Science

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$36,000
Construction	*
Total FY 1972 and Prior Years	*

*The roadway system was included in major construction activities and is not separately identifiable.

SUMMARY PURPOSE AND SCOPE:

This project is required to improve the on-site road network by: rehabilitating the existing main east-west arterial road; completing a second major traffic artery along the central and south easterly portions of the Laboratory; refurbishing deteriorated sections of the roadway at the south side of the Laboratory; adding some parking facilities at the east end of the property; and improving several road access deficiencies.

PROJECT JUSTIFICATION:

Explorer Road is presently the only main arterial road connecting the main entrance on the southwest to the east side of the Laboratory. This road becomes extremely congested and it is very difficult for through traffic to flow because of the large number of Laboratory deliveries arriving during the work day hours. In order to alleviate the existing congestion, certain modifications of Explorer Road are necessary as well as the provision of an alternate route and off-street parking:

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1. The deteriorated portion of Explorer Road from the intersection of Ranger Road to Surveyor Road will be rehabilitated, and the road will be extended about 225 feet to the Arroyo Bridge at the east end of the Laboratory.

2. Mariner Road, which parallels Explorer Road, will likewise be extended about 900 feet to provide an alternate route of access to the east side of the Laboratory and to the Arroyo Bridge.

3. A parking area for approximately 200 cars will be provided along the Mariner Road extension.

Road "A" and Loop Road on the south side of the Laboratory also receive a continuous and heavy volume of traffic associated with the central shipping and receiving and plant maintenance activities located in this area. As a result, both roads are deteriorating rapidly due to the heavy usage and now require rehabilitation.

PROJECT DESCRIPTION:

Rehabilitation and paving of approximately 2,000 square yards of Explorer Road will be confined primarily to the heavily used portion between Ranger Road and Surveyor Road. The 225 foot extension of Explorer Road will tie this artery directly to the Arroyo Bridge at the eastern end of the site. Standard street lighting and utilities will be installed as a part of this project.

Mariner Road will be extended approximately 900 feet to the intersection at Explorer Road. The construction will entail the necessary grading of undeveloped right-of-way areas and some existing intersecting roads. Site preparation for paving will include a substantial amount of excavation and fill, and some retaining wall construction. The roads will have two vehicular traffic lanes, curbs, gutters, sidewalks and street lighting. Concurrently, underground power and communication conduits, and air, gas, water and other utility mains "cross-overs" will be installed. The utilities presently serving the area within the right-of-way also will be lowered, modified or relocated as necessary to maintain service to existing buildings.

A 6,510 square yard parking area will provide approximately 200 parking spaces.

Road repairs will include regrading and repaving about 250 linear feet of Road "A" and Loop Road, and the installation of associated street lighting, sidewalks, retaining walls and utilities.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Explorer Road				$104,625
Site preparation	LS	---	---	3,000
Road paving	SY	2,750	$7.50	20,625
Street lighting	Each	8	1,000.00	8,000
Power and communication conduit	LF	500	100.00	50,000
Air and gas	LF	500	36.00	18,000
Storm drains	LS	---	---	5,000
Mariner Road				411,800
Site preparation	LS	---	---	95,000
Paving	SY	3,000	7.50	22,500
Lighting	Each	20	1,000.00	20,000
Power and communication conduit	LF	1,600	100.00	160,000
Electric substation relocation	LS	---	---	19,700
Air, gas, and water	LF	900	73.00	65,700
Sewers, sidewalks, and storm drains	LS	---	---	28,900
Parking Lot				59,825
Site preparation	LS	---	---	11,000
Paving	SY	6,510	7.50	48,825
Loop Road and Road "A"				33,750
Site preparation	LS	---	---	15,000
Road paving	SY	900	7.50	6,750
Street lighting	Each	12	1,000.00	12,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$610,000

This project does not involve any additional equipment or property required for initial operational use other than that reflected in the above estimated cost data.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

There will be a continuing requirement to rehabilitate and improve portions of the roadway system due to future deterioration caused by normal use. It is estimated that this rehabilitation will involve a total of an additional $400,000 to $500,000 over the next three to five years.

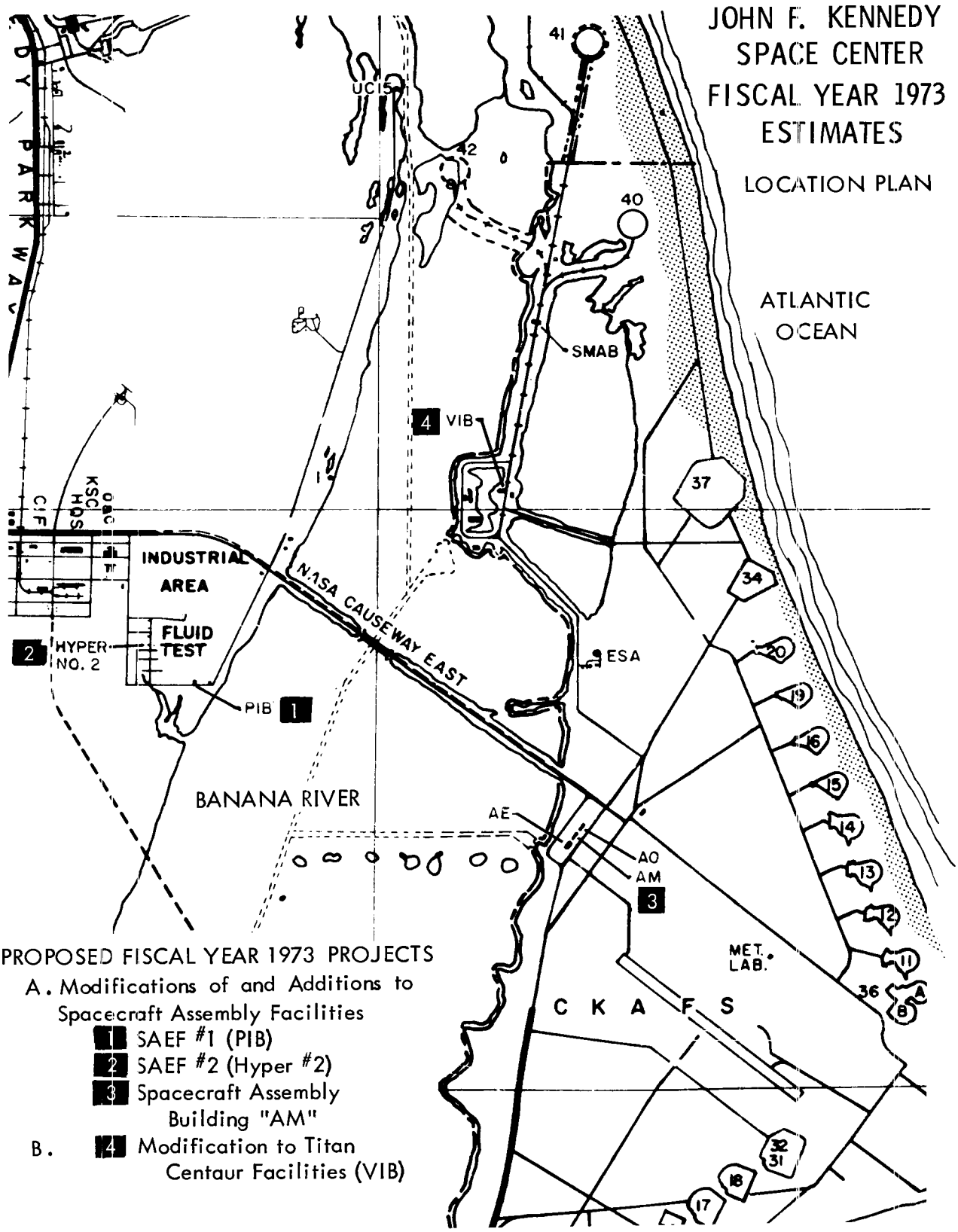
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

JOHN F. KENNEDY SPACE CENTER, NASA

	Page No.
Location plan	CF 4-1
Summary	CF 4-2
Office of Space Science Projects:	
Modifications of and additions to spacecraft assembly facilities	CF 4-3
Modifications of Titan Centaur facilities	CF 4-9


JOHN F. KENNEDY
SPACE CENTER
FISCAL YEAR 1973
ESTIMATES
LOCATION PLAN
ATLANTIC
OCEAN
DY PARKWAY
UC
41
42
40
SMAB
4 VIB
37
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C.I.F.
KSC HQS
INDUSTRIAL
AREA
NASA CAUSEWAY EAST
FLUID
TEST
2 HYPER
NO. 2
PIB 1
ESA
20
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14
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36
A
B
BANANA RIVER
AE
AO
AM
3
MET.
LAB.
C K A F S
32
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17
PROPOSED FISCAL YEAR 1973 PROJECTS
A. Modifications of and Additions to
Spacecraft Assembly Facilities
1 SAEF #1 (PIB)
2 SAEF #2 (Hyper #2)
3 Spacecraft Assembly
Building "AM"
B. 4 Modification to Titan
Centaur Facilities (VIB)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 BUDGET ESTIMATES

(Dollars in thousands)

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

INSTALLATION MISSION

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

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 1973 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Modifications of and Additions to Spacecraft Assembly Facilities	OSS	4,211	8,100	-0-	12,311
Modifications of Titan Centaur Facilities	OSS	11,050	2,040	-0-	13,090
TOTAL			10,140		

NASA FORM 1029 JUN 69 PREVIOUS EDITIONS ARE OBSOLETE.

NASA-HQ
CF 4-2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Modifications of and Additions to Spacecraft Assembly Facilities
LOCATION	John F. Kennedy Space Center
	FY 1973 CoF ESTIMATE $8,100,000

COGNIZANT INSTALLATION: John F. Kennedy Space Center

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

COGNIZANT PROGRAM OFFICE: Office of Space Science

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$585,000
Construction	3,625,689
Total FY 1972 and Prior Years	$4,210,689

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to add to and modify three existing facilities to make them suitable for the assembly, encapsulation and sterilization of spacecraft for the Viking Program. Two of the buildings to be modified are the Pyrotechnic Installation Building (PIB) and the Hypergolic Test Building No. 2 (Hypergol #2) which are located on Merritt Island. They will be used for checkout, sterilization, assembly, and encapsulation of the Viking Lander and Orbiter Spacecraft. Building "AM" located on Cape Kennedy Air Force Station will be modified for use as laboratory space in support of the Viking Lander.

PROJECT JUSTIFICATION:

The two Viking spacecraft to be launched in Calendar Year 1975 from Launch Complex 41 require that two critical tasks be performed. These tasks involve: (1) the assembly, checkout, encapsulation, and sterilization of the spacecraft, and (2) their launching within a 38-day period. A very complex requirement of this program is preparing a sterilized spacecraft for its planned landing on the surface of Mars. International agreements have established a quarantine policy requiring that no act be performed that will irretrievably contaminate a planet as a base for scientific investigation. In order to comply with established policies and

the accepted contamination probability level (1×10^{-3}), these three facilities must be modified to assure the capability for sterilization and encapsulation in accordance with planetary quarantine standards. The lander payload of biological and molecular analysis experiments also has stringent requirements for clean assembly and sterilization. As a result, these facilities will be upgraded to provide the controlled clean environment required for assembly, checkout, propellant loading, Radioisotope Thermoelectric Generators (RTG) installation, sterilization, and lander/orbiter assembly.

Two separate buildings are required to satisfy safety requirements for prelaunch final assembly of the spacecraft. This would insure that in the event of a catastrophic failure of one spacecraft, the other spacecraft would be safe, and conditions permitting, checkout would continue. In addition, the brief launch period requires that both spacecraft be assembled and checked out simultaneously.

Minor modifications are also required to Building "AM" to provide suitable laboratory space for the Viking Lander during subsystems checkout prior to final assembly with the Orbiter system.

PROJECT DESCRIPTION:

This project will provide a 1,400 square foot addition (forty feet wide by thirty-five feet long with a ceiling height of approximately fifty-five feet) and modification of the PIB which has been redesignated as Spacecraft Assembly and Encapsulation Facility No. 1 (SAEF #1). It will also provide a new addition of approximately 11,000 square feet (100 feet wide by 102 feet long with a high bay ceiling height of approximately 70 feet) and modification of the Hypergolic Test Building Number 2, which has been redesignated as Spacecraft Assembly and Encapsulation Facility No. 2 (SAEF #2). The additions and modifications will provide a Class 100,000 clean room environment for spacecraft assembly and checkout and necessary lighting, cranes, sterilization ovens and related equipment.

It will also provide for modification of a portion of Spacecraft Assembly Building "AM", including a Class 100,000 clean room of approximately 1,400 square feet for the bio-assay laboratory, which will be temperature and humidity controlled.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$7,064,400
Spacecraft Assembly and Encapsulation Facility #1 (SAEF #1)				3,908,100
Architectural	LS	---	---	(854,500)
Mechanical	LS	---	---	(2,632,100)
Electrical	LS	---	---	(421,500)
Spacecraft Assembly and Encapsulation Facility #2 (SAEF #2)				2,737,200
Architectural	LS	---	---	(826,200)
Mechanical	LS	---	---	(1,472,000)
Electrical	LS	---	---	(439,000)
Alterations to Building "AM"				57,000
Architectural	LS	---	---	(7,000)
Mechanical	LS	---	---	(40,000)
Electrical	LS	---	---	(10,000)
Utilities and Site Work				362,100
SAEF #1	LS	---	---	(215,200)
SAEF #2	LS	---	---	(146,900)
Equipment				1,035,600
Sterilization ovens	Each	2	$250,000	500,000
Instrumentation/communication	LS	---	---	440,600
Electrical	LS	---	---	55,000
Mechanical	LS	---	---	40,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$8,100,000

Approximately $600,000 of miscellaneous existing equipment will be utilized in SAEF #1 and #2 and some additional existing equipment will also be reassigned to Building "AM".

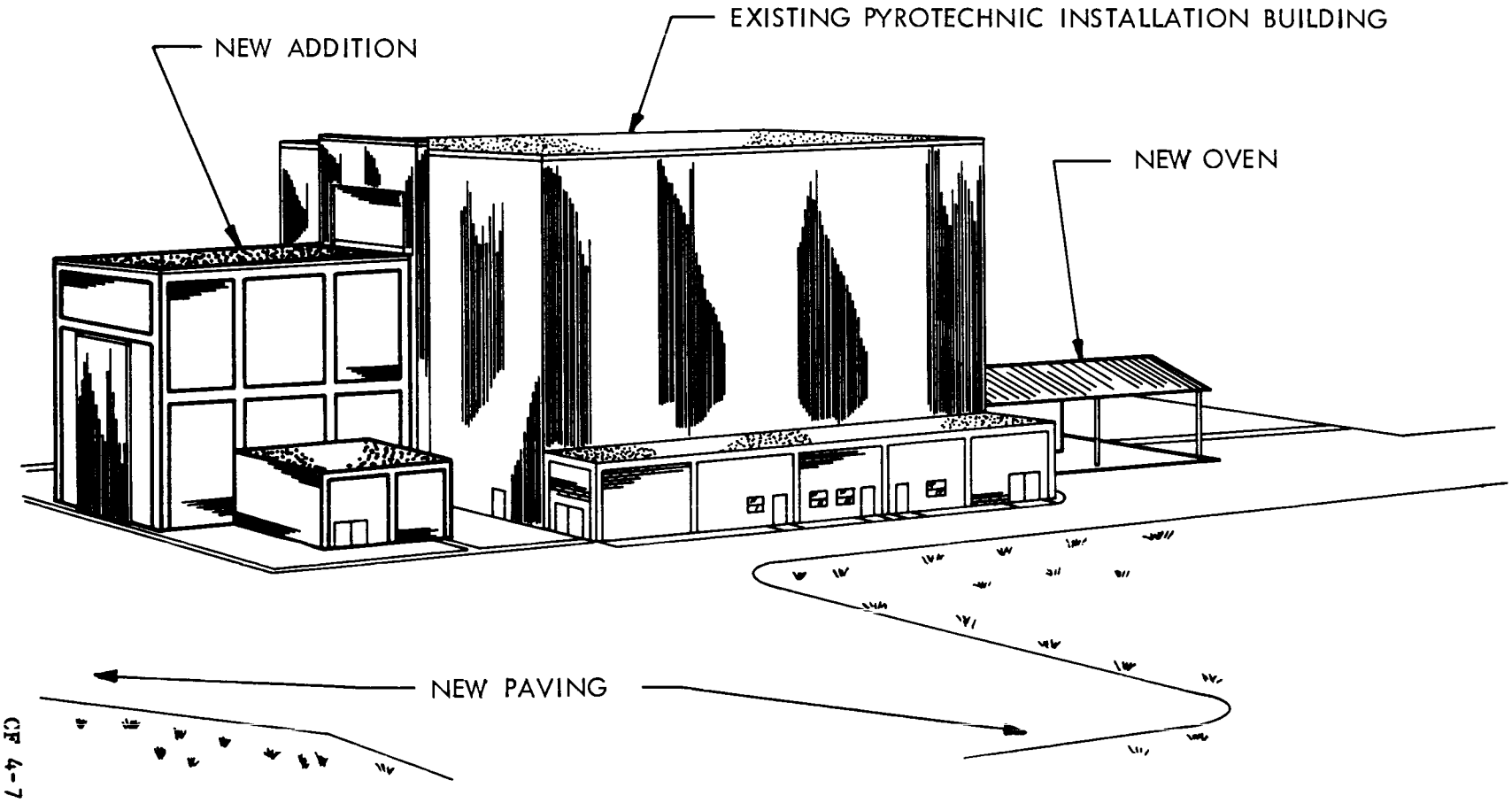
FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

For presently planned usage there are no currently foreseen future funding requirements necessary to complete this project.

KENNEDY SPACE CENTER
FISCAL YEAR 1973 ESTIMATES

MODIFICATIONS OF AND ADDITIONS TO SPACECRAFT ASSEMBLY FACILITIES

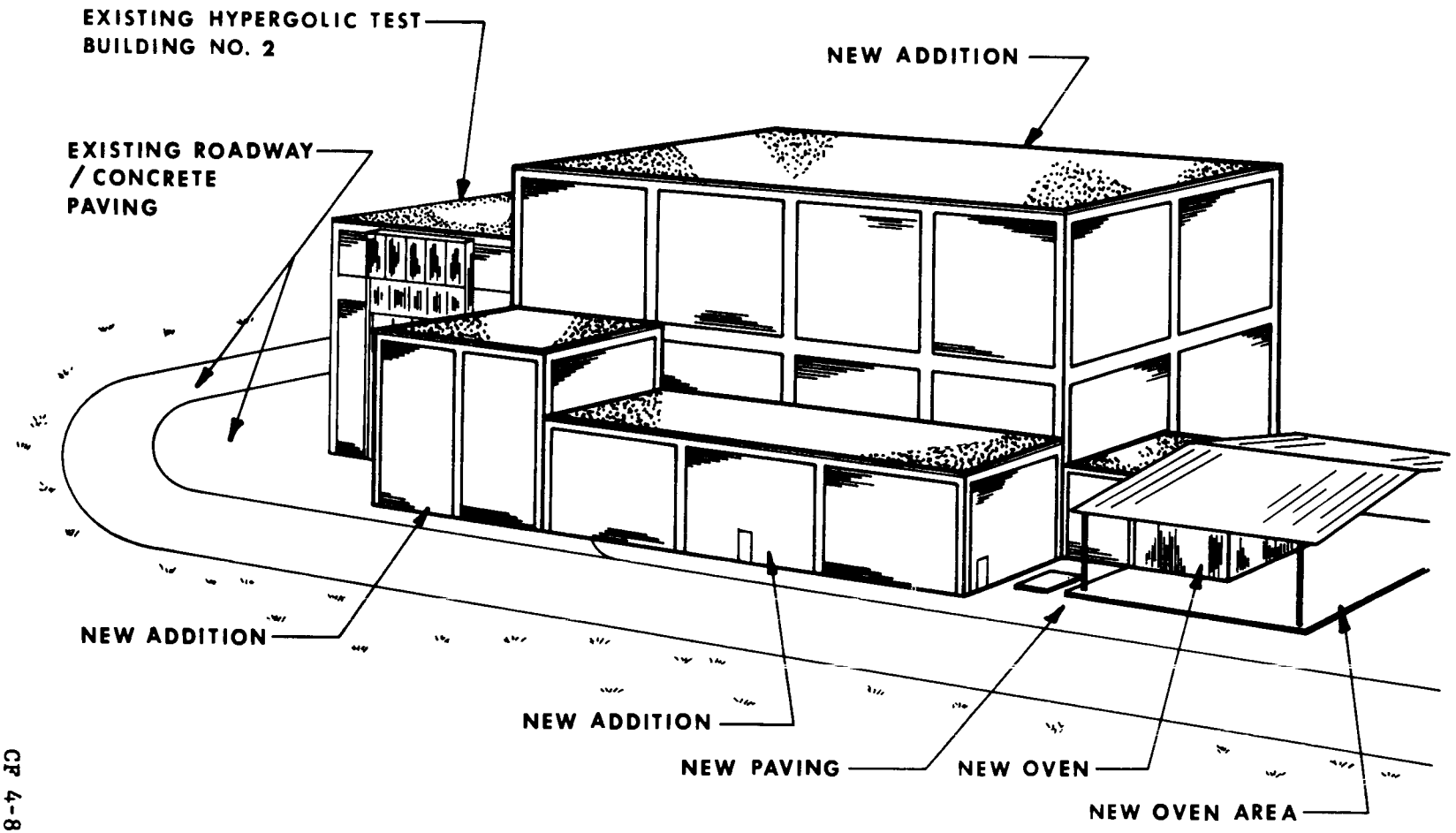
FACILITY NO. 1



KENNEDY SPACE CENTER
FISCAL YEAR 1973 ESTIMATES

MODIFICATIONS OF AND ADDITIONS TO SPACECRAFT ASSEMBLY FACILITIES

FACILITY NO. 2



CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Modifications of Titan Centaur Facilities
LOCATION	John F. Kennedy Space Center
	FY 1973 CoF ESTIMATE $2,040,000

COGNIZANT INSTALLATION: John F. Kennedy Space Center

LOCATION OF PROJECT: Cape Kennedy Air Force Station, Brevard County, Florida

COGNIZANT PROGRAM OFFICE: Office of Space Science

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$350,000
Construction	10,700,000
Total FY 1972 and Prior Years	$11,050,000

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to expand the existing launch control and monitoring capability of the Integrated Transfer Launch Facility (ITL) at the Eastern Test Range (ETR). This will be accomplished through the addition of common instrumentation equipment which can support both launch complexes, Complex 40 and Complex 41, and the test cells of the Vertical Integration Building (VIB). This additional equipment, when integrated with existing equipment, will make possible the concurrent testing and checkout of two launch vehicles at the ITL complex, thereby, minimizing potential interference during the prelaunch preparation, countdown, and launch of missions from each complex.

PROJECT JUSTIFICATION:

Two Viking spacecraft are scheduled to be launched during a 38 day window during August - September 1975. Any delays occurring during the final preparation and checkout of the related launch vehicles could result in missing this 1975 launch opportunity and introduce a 25 month delay in

schedule until the next available Martian launch opportunity. For this reason, it is necessary that maximum efforts be expended to assure meeting the established schedules at the ITL.

Two situations are possible which could significantly affect such schedules. The first situation is the possible requirement for the Air Force to be able to launch a priority mission from Complex 40 during the critical checkout and launch period of the Viking schedule using Complex 41. The second is the requirement for the Viking project to occupy the ITL facility from November 1974 until August 1975. These situations and possibly others generate potential conflicts with vehicle checkout schedules because there is now only one instrument room to support the four bay ITL Complex. Presently, any change from one test bay or complex to any other requires, at minimum, disconnecting the test instruments and repatching to another patch panel, thereby generating electrical discontinuity and violating electrical ground power and instrumentation integrity. The procedures which have evolved for the final checkout, countdown, and launch of the Titan vehicle require no disruption to the electrical power and instrumentation connections between the vehicle and the ground checkout and monitoring equipment for approximately 10 days prior to scheduled launch. In order to maintain this electrical integrity concept for simultaneous prelaunch preparation with priority Air Force missions, additional ground data handling and recording equipment will be required. This project will permit retention of electrical integrity of any system while other tests are being run at other stations and insure that simultaneous confidence checks may be accomplished without compromising their reliability.

PROJECT DESCRIPTION:

A new instrumentation system will be provided and will be located within the VIB adjacent to the existing instrumentation complex. Necessary structural modifications will be made to accommodate the additional instrumentation. Modifications to the existing instrumentation system and its associated wiring and electrical patch panels will be made to consolidate it with the new system. A combined system checkout including both Complex 40 and 41, as well as the two VIB test cells, and the two associated control rooms will also be included.

Instrumentation and electrical patch panel design will provide for interchangeability and use of either system for any of four testing locations. This will permit maximum flexibility in scheduling not presently available with the single instrumentation facility now existing.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,050,000
Electrical modifications	LS	---	---	980,000
Structural modifications	LS	---	---	70,000
Equipment				990,000
Recorders	Each	3	$59,000	177,000
Decommutator	Each	1	165,000	165,000
Receiver	Each	1	9,000	9,000
Patch panels	Each	3	33,000	99,000
Data transmission system	LS	---	---	540,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$2,040,000

This project does not involve any additional equipment or property required for initial operational use other than that reflected in the above estimated cost data.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

This project will complete the modifications presently planned for the Titan Centaur Program. Future requirements will be dependent upon future launch vehicle configurations, spacecraft unique prelaunch checkout requirements, and schedules.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

LANGLEY RESEARCH CENTER

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Rehabilitation of full scale wind tunnel	CF 5-4
Modifications of central air supply system	CF 5-11
Environmental modifications for utility operations	CF 5-15

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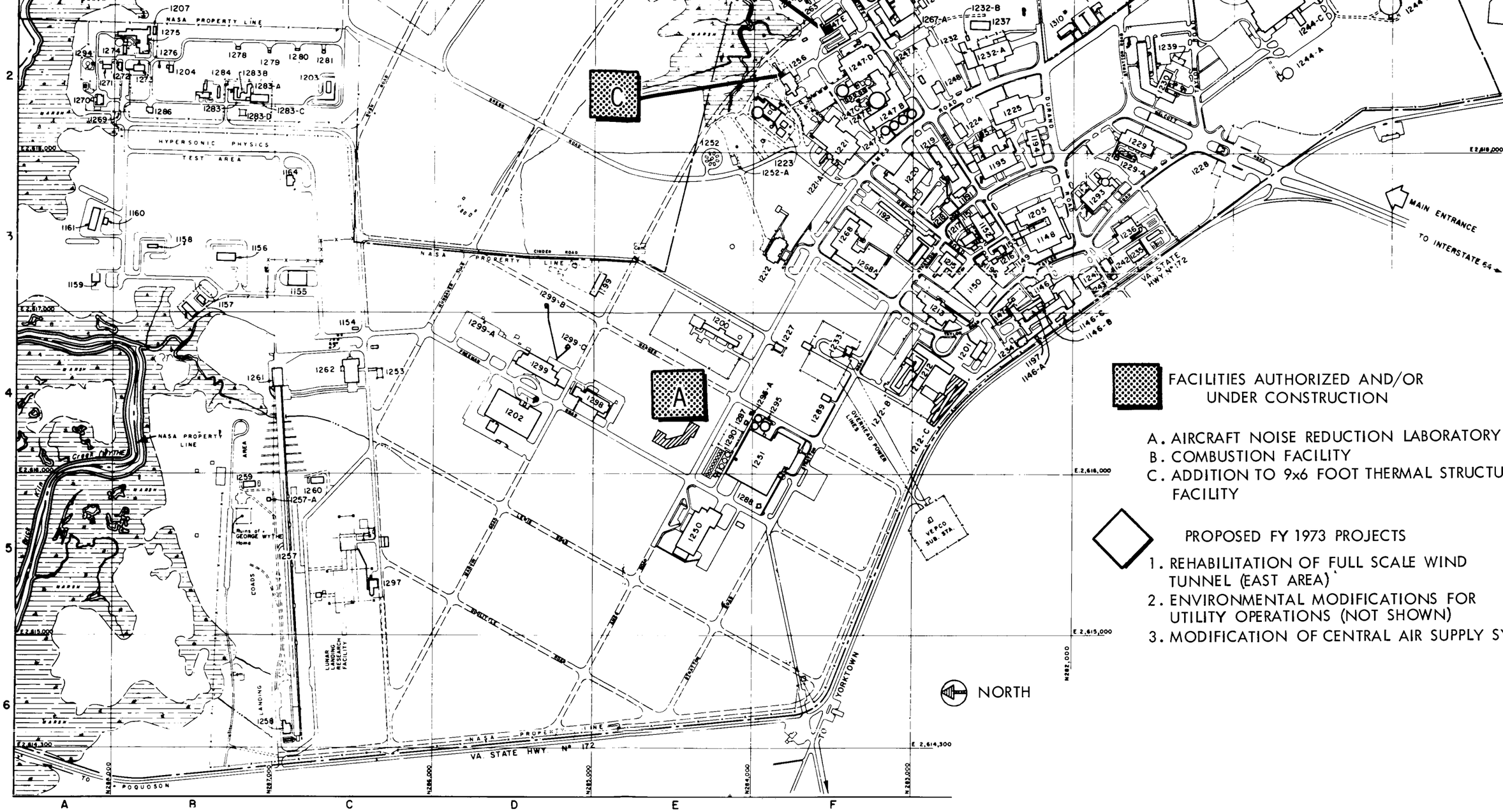

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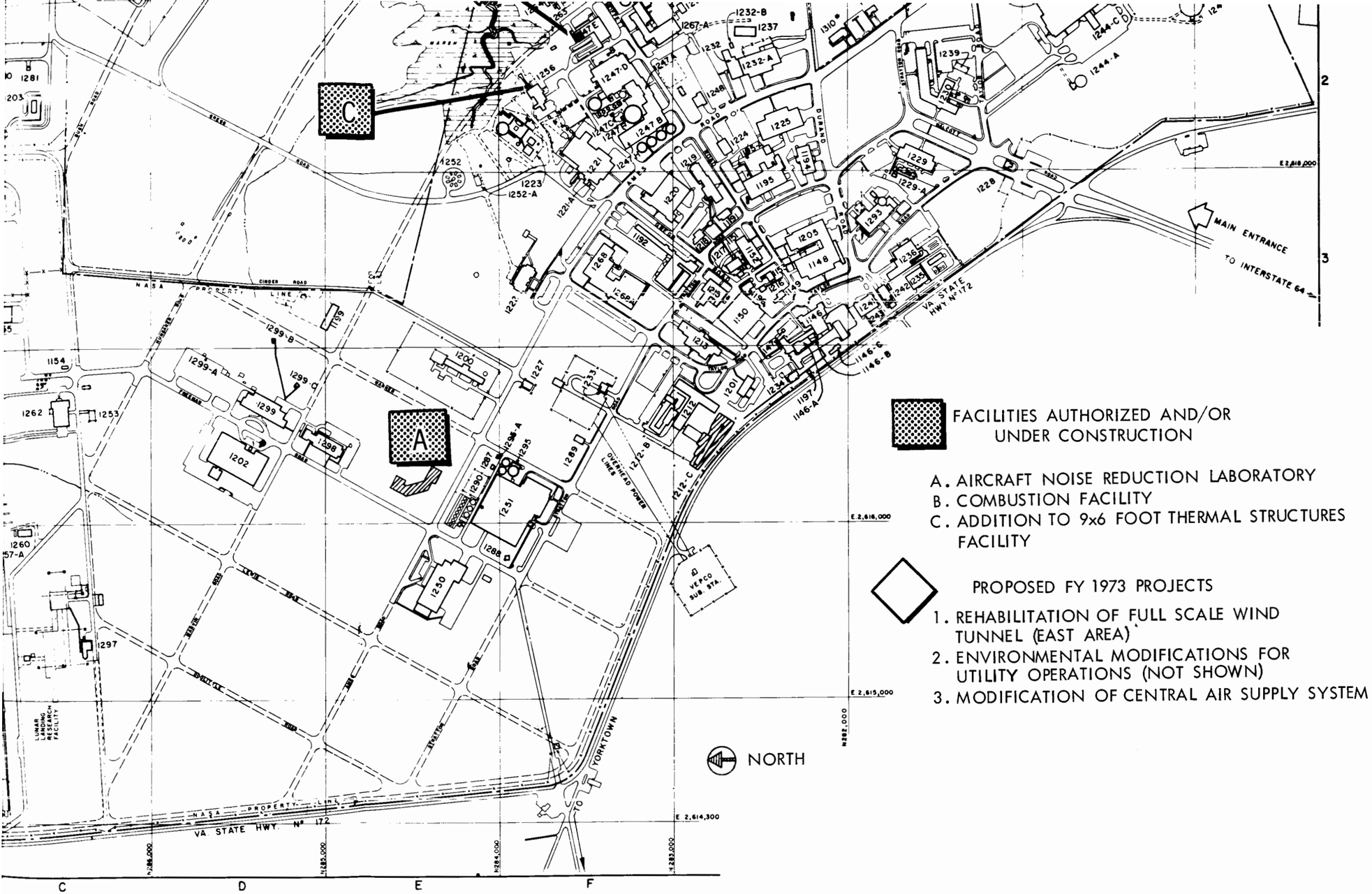


FACILITIES AUTHORIZED AND/OR UNDER CONSTRUCTION

A. AIRCRAFT NOISE REDUCTION LABORATORY
B. COMBUSTION FACILITY
C. ADDITION TO 9x6 FOOT THERMAL STRUCTURES FACILITY

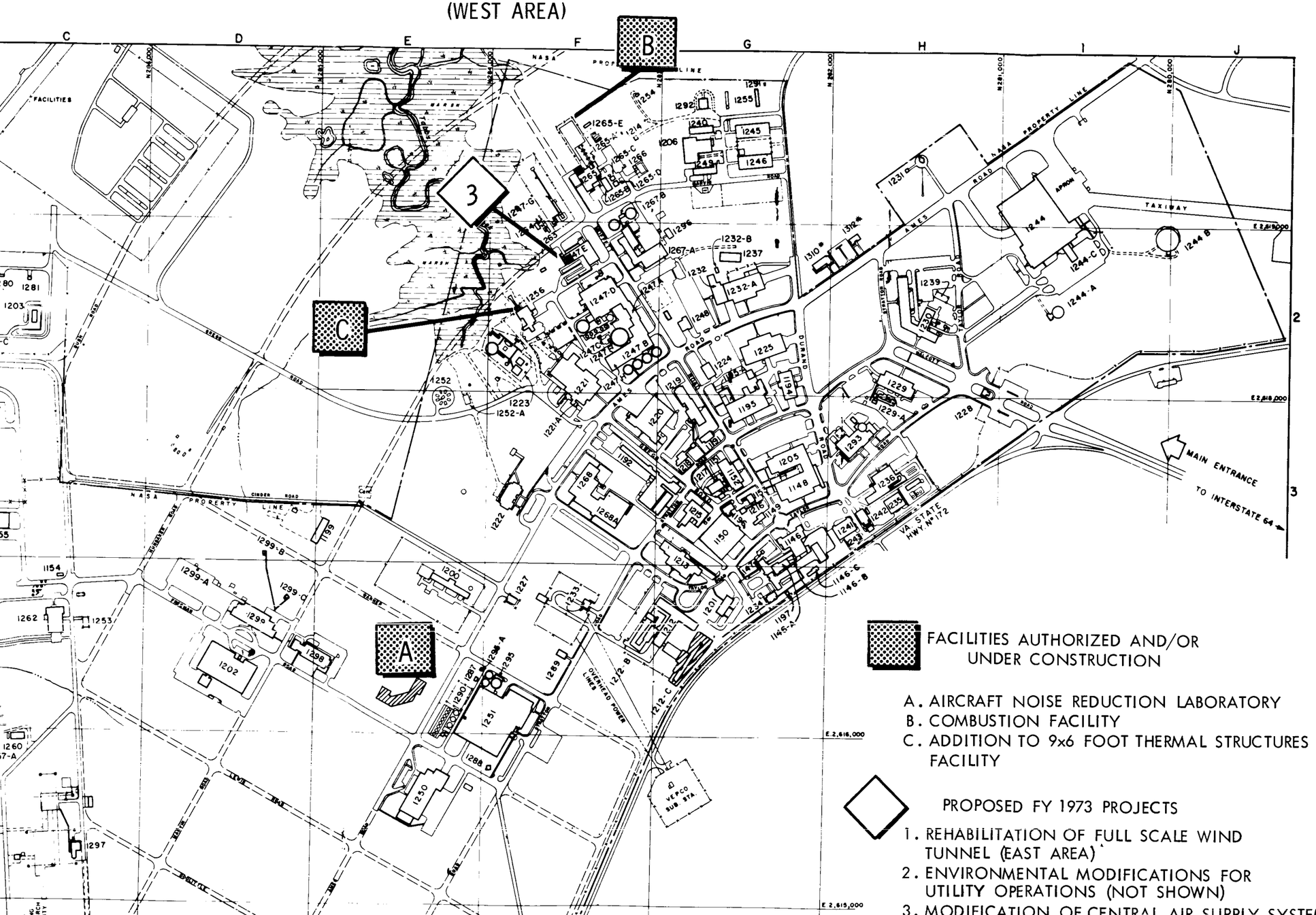
PROPOSED FY 1973 PROJECTS

1. REHABILITATION OF FULL SCALE WIND TUNNEL (EAST AREA)
2. ENVIRONMENTAL MODIFICATIONS FOR UTILITY OPERATIONS (NOT SHOWN)
3. MODIFICATION OF CENTRAL AIR SUPPLY SYSTEM

1212-C	V/STOL TUNNEL
1213	WEST CAFETERIA
1214	TRANSPORTATION STORAGE
1215	WEST HEATING PLANT
1216	CHEMICAL MILLING
1217	PAPER SHREDDER
1218	HEADQUARTERS ANNEX
1218-A	ANECHOIC NOISE FACILITY
1219	LRC HEADQUARTERS
1220	SIMULATION RESEARCH LABORATORY
1221	HIGH INTENSITY NOISE FACILITY
1221-A	LOW-FREQUENCY NOISE FACILITY
1222	ACTIVITIES BUILDING
1223	SEWAGE DISPOSAL PLANT
1224	LUMBER STORAGE BUILDING
1225	EXPERIMENTAL MACHINE SHOP
1227	SUBSTATION - DL
1228	MAIL GATE HOUSE
1229	LOADS DIVISION
1229-A	BLOWDOWN TUNNEL (PILOT MODELS)
1230	INSTRUMENT RESEARCH LABORATORY
1231	ROTOR TEST TOWER
1232	SPACE TECHNOLOGY DIVISION
1232-A	FABRICATION SHOP
1233	STRATTON ROAD SUBSTATION
1234	JET EXIT TEST FACILITY
1235	FREQUENCY CONVERTER BUILDING
1236	4- BY 4-FOOT SUPERSONIC PRESSURE TUNNEL
1237	RESEARCH MODEL SUPPORT SHOP
1239	WARNER ROAD SUBSTATION
1240	READY ISSUE STORES BUILDING
1241	DRIVE CONTROL BUILDING
1242	PROPELLER STATIC TEST STAND
1243	YORKTOWN ROAD SUBSTATION
1244	HANGAR
1244-A	WATER TANK NO. 2
1244-B	VIKING LANDER IMPACT TEST FACILITY
1245	GENERAL STORAGE BUILDING
1246	GENERAL STORAGE BUILDING
1247-A	AERO-PHYSICS LABORATORY CENTER
1247-B	AERO-PHYSICS LABORATORY WEST WING
1247-C	AERO-PHYSICS LABORATORY COOLING TOWER
1247-D	AERO-PHYSICS LABORATORY EAST WING
1247-E	HIGH PRESSURE AIR FACILITY
1247-F	AMES ROAD SUBSTATION
1247-G	EXPANSION TUBE (PILOT MODEL)
1248	PLANT SAFETY BUILDING
1249	VEHICLE SERVICE BUILDING
1251	UNITARY PLAN WIND TUNNEL
1252	WATER TANK NO. 1
1252-A	TRANSPORTATION DISPATCHING OFFICE
1253	SUBSTATION - S2
1254	RADIATION WASTE STORAGE
1255	GENERAL STORAGE BUILDING
1256	9- BY 6-FOOT THERMAL STRUCTURES TUNNEL
1257	LANDING LOADS TRACK
1257-A	PAVED TEST STRIP
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
1265-A	OPERATIONS BUILDINGS
1265-B	OPERATIONS BUILDINGS
1265-C	OPERATIONS BUILDINGS
1265-D	OPERATIONS BUILDINGS
1265-E	OPERATIONS BUILDINGS
1266	MOFFETT ROAD SUBSTATION
1267	ENTRY STRUCTURES FACILITY
1267-A	ENTRY STRUCTURES SHOP
1267-B	CLOSED RAW WATER COOLING SYSTEM
1268	DATA REDUCTION CENTER
1269	GATE HOUSE (HYPERSONIC PHYSICS TEST AREA)
1270	ROCKET PROPULSION STATIC TEST FACILITY, HPTA
1271	DATA REDUCTION AND ACQUISITION FACILITY, HPTA
1272	HEATING PLANT, HPTA
1273	OPERATIONS CENTER, HPTA
1274	HIGH ENTHALPY ARC TUNNEL, HPTA
1275	IMPACT AND ARC TUNNELS FACILITY, HPTA
1276	IGNITER ASSEMBLY BUILDING, HPTA
1277	STORAGE A, HPTA
1278	EXPLOSIVE STORAGE, HPTA
1279	INERT ROCKET MATERIAL STORAGE NO. 1, HPTA
1280	HIGH EXPLOSIVE STORAGE, HPTA
1281	INERT ROCKET MATERIAL STORAGE NO. 2, HPTA
1282	STORAGE F, HPTA
1283	MATERIALS RADIATION LABORATORY
1284	PROPELLANT MIXING FACILITY, HPTA
1285	STORAGE H, HPTA
1286	ROCKET ASSEMBLY AND PROPELLANT ALTERATION BUILDING
1287	41-FOOT VACUUM SPHERE SHOP
1288	SOLAR-ENERGY COLLECTOR
1289	CUSTODIAL CONTRACTOR BUILDING
1290	SUBSTATION - UPWT
1291	PUMP STATION
1292	CONSTRUCTION AND REPAIR SHOP
1293-A	ATTITUDE CONTROL SIMULATOR FAC.
1293-B	DYNAMICS RESEARCH LABORATORY
1294	ROCKET MOTOR TEST FACILITY
1295	SHOP AND INSTRUMENTATION FOR 60-FOOT SPHERE
1295-A	PUMP HOUSE
1296	CERAMIC SPRAY SHOP
1297	LUNAR LANDING RESEARCH FACILITY
1298	STABILIZATION AND CONTROL LABORATORY
1299	VEHICLE ANTENNA TEST FACILITY
1299-A	OPERATIONS BUILDINGS
1299-B	OPERATIONS BUILDINGS
1299-C	OPERATIONS BUILDINGS

LANGLEY RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

LOCATION PLAN
(WEST AREA)



FACILITIES AUTHORIZED AND/OR UNDER CONSTRUCTION

A. AIRCRAFT NOISE REDUCTION LABORATORY
B. COMBUSTION FACILITY
C. ADDITION TO 9x6 FOOT THERMAL STRUCTURES FACILITY

PROPOSED FY 1973 PROJECTS

1. REHABILITATION OF FULL SCALE WIND TUNNEL (EAST AREA)
2. ENVIRONMENTAL MODIFICATIONS FOR UTILITY OPERATIONS (NOT SHOWN)
3. MODIFICATION OF CENTRAL AIR SUPPLY SYSTEM

FACILITY LEGEND

FACILITY NO.	DESCRIPTION
1146	16-FOOT TRANSONIC TUNNEL
1147	TAYLOR ROAD SUBSTATION
1148	STRUCTURES RESEARCH LABORATORY
1149	DISPENSARY
1150	MODEL SHOP
1151	MANAGEMENT SUPPORT BUILDING
1152	PUBLICATIONS BUILDING
1153	METAL FINISHING SHOP
1154	GATE HOUSE CMTA
1155	CHEMICAL MAGAZINE, CMTA
1156	HYDRAZENE MAGAZINE, CMTA
1157	HYDROGEN PEROXIDE MAGAZINE, CMTA
1158	ROCKET MAGAZINE, CMTA
1159	ROCKET ASSEMBLY BUILDING, CMTA
1160	ROCKET TEST CONTROL BUILDING, CMTA
1161	ROCKET TEST CELLS, CMTA
1164	NITROGEN TETROXIDE MAGAZINE, CMTA
1191	1-FOOT HYPERSONIC ARC TUNNEL
1192	PHOTOGRAPHIC LABORATORY
1192-C	VIKING PROJECT OFFICE
1194	LIBRARY
1195	FISCAL AND PROCUREMENT BUILDING
1195-A	FISCAL AND PROCUREMENT BUILDING ANNEX
1196	FOUNDRY
1199	PLANT SUPPORT FACILITY
1201	MICROMETEOROID IMPACT SIMULATOR
1202	FLIGHT INSTRUMENTATION LABORATORY
1203	CHEMICAL STORAGE HPTA
1204	PYROTECHNIC RESEARCH LABORATORY
1205	FATIGUE RESEARCH LABORATORY.
1206	SHIPPING AND RECEIVING BUILDING
1207	GENERAL STORAGE (PARTS) HPTA
1212	SUBSONIC TUNNELS LABORATORY
1212-B	HIGH-SPEED 7- BY 10-FOOT TUNNEL
1212-C	V/STOL TUNNEL
1213	WEST CAFETERIA
1214	TRANSPORTATION STORAGE
1215	WEST HEATING PLANT
1216	CHEMICAL MILLING
1217	PAPER SHREDDER
1218	HEADQUARTERS ANNEX
1218-A	ANECHOIC NOISE FACILITY
1219	LRC HEADQUARTERS
1220	SIMULATION RESEARCH LABORATORY
1221	HIGH INTENSITY NOISE FACILITY
1221-A	LOW-FREQUENCY NOISE FACILITY
1222	ACTIVITIES BUILDING
1223	SEWAGE DISPOSAL PLANT
1224	LUMBER STORAGE BUILDING
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1232-A	FABRICATION SHOP
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1234	JET EXIT TEST FACILITY
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1236	4- BY 4-FOOT SUPERSONIC PRESSURE TUNNEL
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1256	9- BY 6-FOOT THERMAL STRUCTURES TUNNEL
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1257-A	PAVED TEST STRIP
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1265	8-FOOT HIGH-TEMPERATURE STRUCTURES TUNNEL
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1265-B	OPERATIONS BUILDINGS
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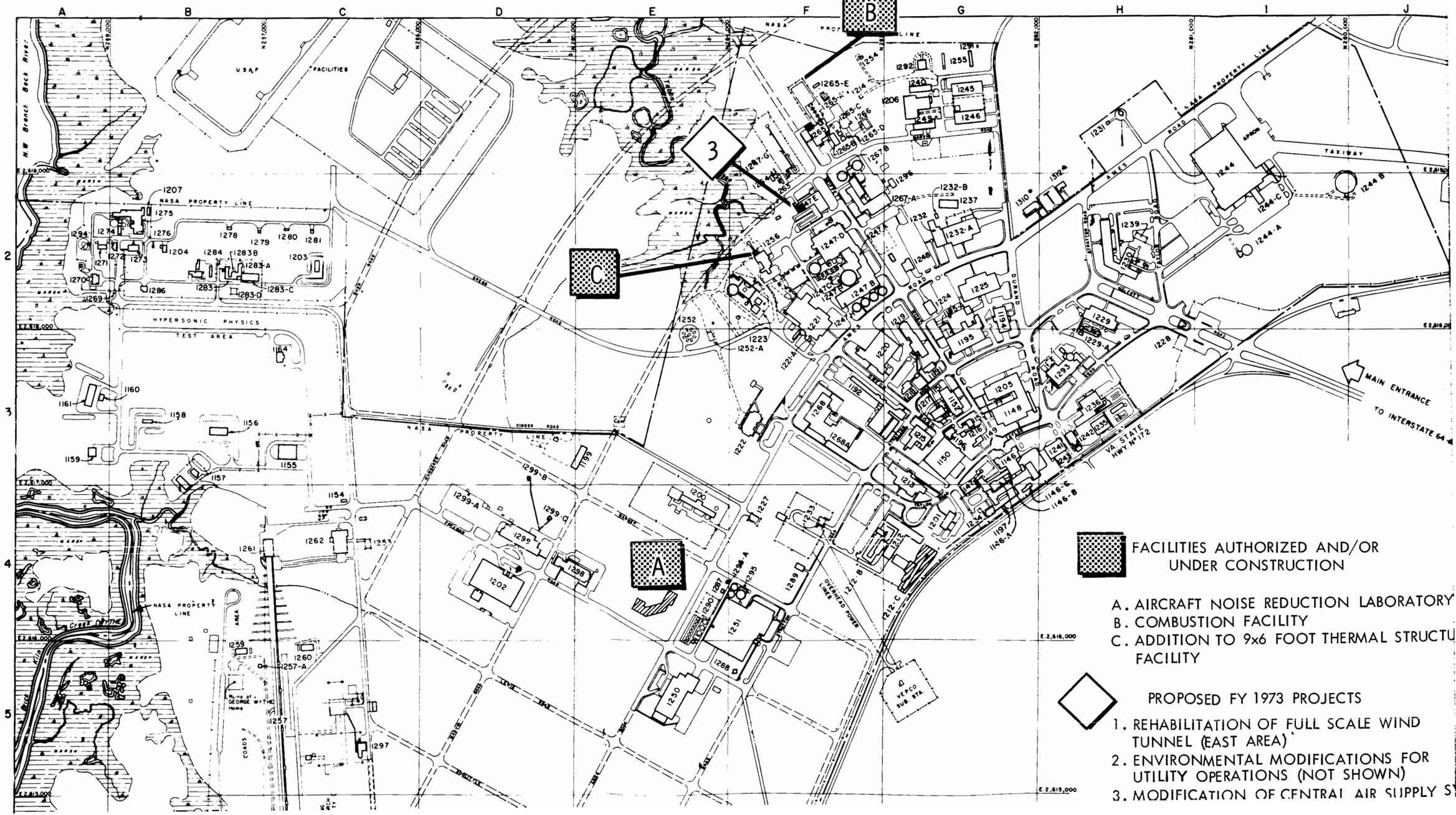
1267	ENTRY STRUCTURES FACILITY
1267-A	ENTRY STRUCTURES SHOP
1267-B	CLOSED RAW WATER COOLING SYSTEM
1268	DATA REDUCTION CENTER
1269	GATE HOUSE (HYPERSONIC PHYSICS TEST AREA)
1270	ROCKET PROPULSION STATIC TEST FACILITY, HPTA
1271	DATA REDUCTION AND ACQUISITION FACILITY, HPTA
1272	HEATING PLANT, HPTA

LANGLEY RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

LOCATION PLAN
(WEST AREA)



FACILITIES AUTHORIZED AND/OR UNDER CONSTRUCTION

A. AIRCRAFT NOISE REDUCTION LABORATORY
B. COMBUSTION FACILITY
C. ADDITION TO 9x6 FOOT THERMAL STRUCTU FACILITY

PROPOSED FY 1973 PROJECTS

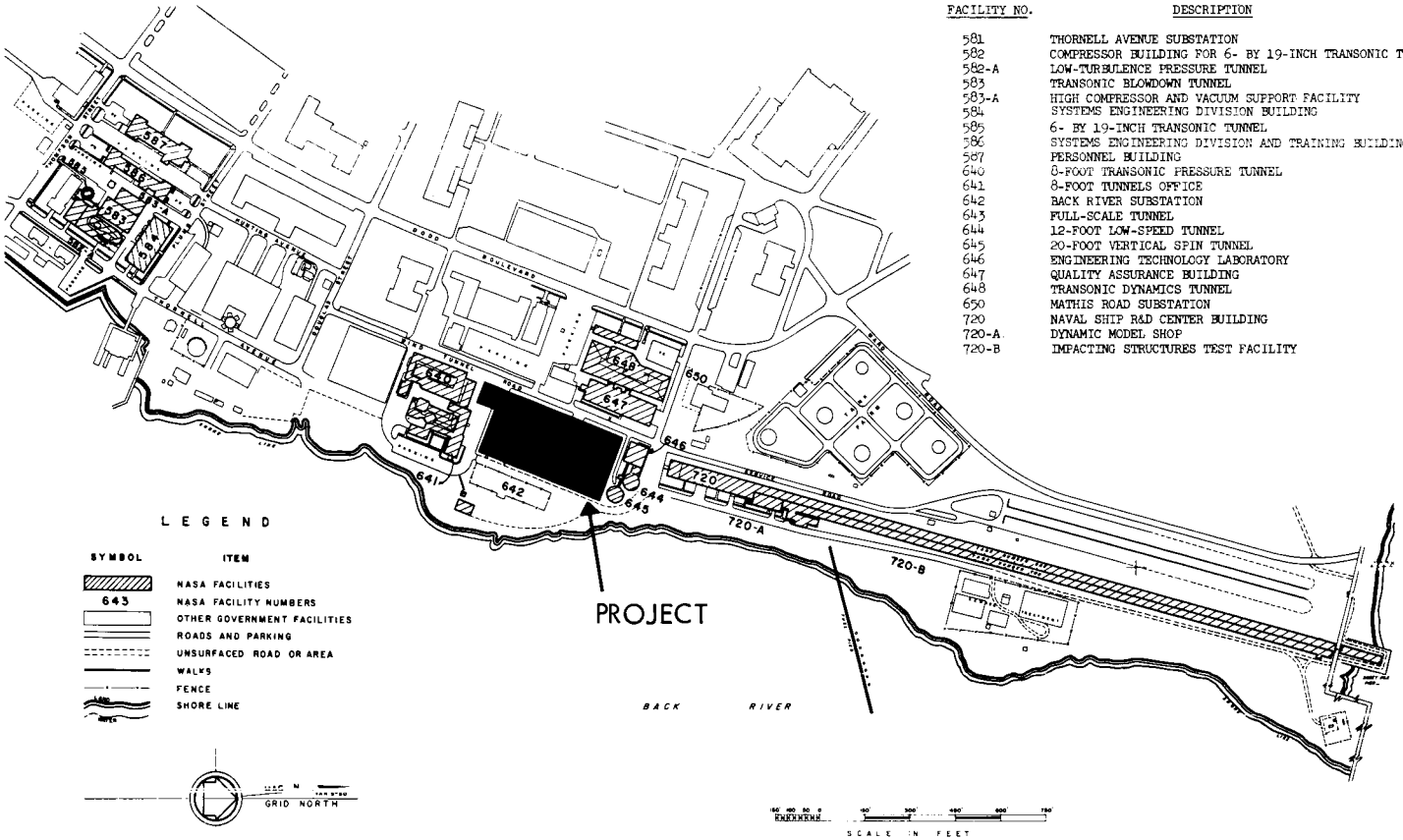
1. REHABILITATION OF FULL SCALE WIND TUNNEL (EAST AREA)
2. ENVIRONMENTAL MODIFICATIONS FOR UTILITY OPERATIONS (NOT SHOWN)
3. MODIFICATION OF CENTRAL AIR SUPPLY S

LANGLEY RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

LOCATION PLAN

(EAST AREA)

FACILITY NO.	DESCRIPTION
581	THORNELL AVENUE SUBSTATION
582	COMPRESSOR BUILDING FOR 6- BY 19-INCH TRANSONIC TUNNEL
582-A	LOW-TURBULENCE PRESSURE TUNNEL
583	TRANSONIC BLOWDOWN TUNNEL
583-A	HIGH COMPRESSOR AND VACUUM SUPPORT FACILITY
584	SYSTEMS ENGINEERING DIVISION BUILDING
585	6- BY 19-INCH TRANSONIC TUNNEL
586	SYSTEMS ENGINEERING DIVISION AND TRAINING BUILDING
587	PERSONNEL BUILDING
640	8-FOOT TRANSONIC PRESSURE TUNNEL
641	8-FOOT TUNNELS OFFICE
642	BACK RIVER SUBSTATION
643	FULL-SCALE TUNNEL
644	12-FOOT LOW-SPEED TUNNEL
645	20-FOOT VERTICAL SPIN TUNNEL
646	ENGINEERING TECHNOLOGY LABORATORY
647	QUALITY ASSURANCE BUILDING
648	TRANSONIC DYNAMICS TUNNEL
650	MATHIS ROAD SUBSTATION
720	NAVAL SHIP R&D CENTER BUILDING
720-A	DYNAMIC MODEL SHOP
720-B	IMPACTING STRUCTURES TEST FACILITY



PROPOSED FY 1973 PROJECT ■

REHABILITATION OF FULL SCALE WIND TUNNEL

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 73 BUDGET ESTIMATES

(Dollars in thousands)

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

INSTALLATION MISSION

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

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 19 73 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Rehabilitation of Full Scale Wind Tunnel	AST	170	2,465	-0-	2,635
Modification of Central Air Supply System	AST	83	1,175	-0-	1,258
Environmental Modifications for Utility Operations	AST	46	650	-0-	696
TOTAL			4,290		

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NASA-HQ
CF 5-3

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Rehabilitation of Full Scale Wind Tunnel	
LOCATION	Langley Research Center	
	FY 1973 CoF ESTIMATE	$2,465,000

COGNIZANT INSTALLATION: Langley Research Center

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT PROGRAM OFFICE: Office of Aeronautics and Space Technology

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$170,000
Construction	*
Total FY 1972 and Prior Years	$170,000

* No CoF investment subsequent to the transfer of the facility to NASA.

SUMMARY PURPOSE AND SCOPE:

This project provides for major repairs and some alterations to the Full Scale (30x60 foot) Wind Tunnel to provide reliable capability in order to meet current and future research requirements. The work involved consists of reducing drive fan vibration, building new drive motor nacelle fairings, modernizing the main drive motor control system, rewinding the drive motors, increasing the compressed air supply, installing flow screens in the tunnel circuit, expanding the model shop, improvements to the test chamber, and repairs to the roof.

PROJECT JUSTIFICATION:

There is a pressing need for large scale, subsonic aerodynamic testing to solve problems that can not be modeled properly at small scale, or would involve prohibitive costs to model, or can be solved more expeditiously by testing the full scale aircraft. The need for facilities

to do this work is evidenced by the fact that both of this country's large low speed full scale tunnels (the Ames 40x80 foot and the Langley 30x60 foot) have been utilized for several years on at least a double shift basis.

The Langley full scale wind tunnel has been used in support of a number of important research programs such as development of the basic aerodynamic technology for external-blown jet-flap STOL and lift-fan V/STOL transports, the study of means for improving the high angle-of-attack characteristics of fighter airplanes, and the study of full scale general aviation airplanes with the aim of improving their handling qualities. It is anticipated that there will be a continuing requirement for use of these facilities at essentially the same level of use in the foreseeable future.

Considerable time is now lost from the wind tunnel schedule because of shutdowns for repairs and maintenance due to age (40 years old) and intensive use over the past years. Records show that the tunnel is inoperative for about six weeks each year because of planned as well as "emergency" repairs and maintenance. Also, failures have occurred that have greatly restricted the capability of the tunnel. For example, in 1968 one of the main electrical cables shorted out resulting in the tunnel being limited to half speed for approximately six months until new cable was procured and installed. With a facility this old there always exists the threat of a major failure at a time that would have a serious impact on important research programs. Updating of the following critical items is necessary to insure continued operation of the tunnel.

Increased Air Supply

There are many research programs being conducted in the full scale wind tunnel to provide basic information for use in the development of an externally-blown jet-flap STOL transport airplane using high bypass ratio-turbofan engines and lift-fan V/STOL transport airplanes. The Full Scale Wind Tunnel is located in the "East Area" of Langley AFB and provisions do not now exist for central air generation and supply. Consequently, air requirements are met by integral facility compressors. The existing compressed air system is so limited in both mass flow and pressure that the work to date has been conducted with relatively small models at low tunnel speeds and the quantitative application of the data is subject to question. The proposed increased compressed air supply included in this project would provide the capability for conducting future programs at that higher scale required to provide more realistic data.

Reduce Drive Fan Vibration and Build New Nacelles

The high vibration level now experienced at the drive motors causes fatigue cracking of various components and results in a shutdown for repairs. Corrective actions are required on the motor mounts to reduce

the vibration level. The nacelle fairings are now a constant source of trouble and a complete redesign of the nacelles is necessary to greatly reduce the maintenance problem and improve the flow characteristics of the tunnel. The redesign of the nacelles will incorporate means for providing cooling air to the motors so they will not overheat while operating for long periods at low tunnel speeds as required during testing of STOL configurations. A fire suppression system will also be installed in the nacelles to provide a quick means for controlling possible motor fires.

Reduce Malfunction of Main Drive Control System

The main drive control system is now 40 years old and must be replaced by a new system. Off-the-shelf replacement parts for the breakers are no longer available with the result that there are unnecessarily long periods of shutdown for repairs. The new system will be capable of providing drive motor speed control necessary to facilitate testing of V/STOL configurations as well as conventional aircraft. The new system will eliminate the shock and fire hazard associated with the open breakers of the present control panel.

Rewind Drive Motors

The original drive motors are still in use and there is evidence that the winding has deteriorated to a significant degree, with real possibility of a motor failure at any time. The motors must be overhauled and rewound to insure continued motor operation.

Screens to Improve the Tunnel Air Flow

The tunnel air flow in the test section has large turbulence, angularity, and excessive variation in velocity with position in the test section. The poorer quality of the airflow in the test section has added to the difficulty of flight testing dynamic models and has introduced irregularities in the force data obtained on large scale models. The installation of screens in the plenum chamber ahead of the test section, and in the diffusers behind the drive fans, would provide considerable improvement in the flow characteristics.

Shop Expansion

The present shop facilities are inadequate for model preparation. The new shop will provide needed preparation space and the floor will be at the same level as that in the test chamber, thereby, providing for easy transfer of models with increased safety.

Improvements to Test Section

The Full Scale Tunnel has an open throat test section which is extremely drafty and difficult to heat and cool. Air conditioning the test chamber will improve the environment for the tunnel technicians while installing and altering test models. A foam deluge system will be installed in the test chamber to provide a quick response capability in case of fire in a test model or equipment.

Repair Building Roof

The original corrugated cement-asbestos roof is still on most of the building. The roof has deteriorated over the years to the point that there has been a roof failure because of excessive snow loads. Such a failure over a critical area could result in possible injury to personnel or major damage to equipment. This particular incident resulted in a two week shutdown while repairs were made. Repairs are no longer feasible; a completely new roof is necessary.

PROJECT DESCRIPTION:

This project will consist of rehabilitation of the existing wind tunnel Building 643 to improve performance and the addition of a new 14,000 standard cubic feet per minute, 350 pounds per square inch gauge minimum, dry compressed air system and a 35,000 gallons per minute cooling tower and distribution systems in an area adjacent to the existing structure. The new compressed air system will be housed in existing Building 646.

The rehabilitations of and the modifications to the existing facility consist of the following:

1. Replace the two existing fan drive motor nacelles and fairings, add air straighteners and provide ventilation for the motors.

2. Modernize the existing two antiquated drive motor speed control systems and supply one main power circuit breaker.

3. Refurbish the existing 500/4,000 horsepower main drive motors.

4. Install screens in the air stream to improve flow characteristics and provide means to clean these screens.

5. Provide a model shop in the existing structure approximately 4,500 square feet in area. The shop would be fire retardant, treated wood frame, dry wall construction with acoustical tile ceiling. The existing concrete floor would be repaired as necessary.

6. Comfort heating, ventilation and air conditioning will be provided for the model shop and test areas. Motor operated louvers will be installed near the roof line in the "test area" to replace the existing sliding panels which do not operate properly.

7. Repair the existing roof.

8. Provide a fire protection system in test section.

The electrical work will include the addition of two new 7.2 kilovolt, 3 phase, air circuit breakers to the existing 6.6 kilovolt switchgear at substation structure 642. One breaker to feed the new 5,000 horsepower compressor motor and the other to feed a new 1,000 kilovoltampere substation for the 480 volt power required for the other new equipment.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,831,000
Site development	LS	---	---	43,000
Modification to Building 646	LS	---	---	21,500
Rehabilitate nacelles and fairings	LS	---	---	156,000
Flow improvement screens	LS	---	---	83,000
Refurbish motors	LS	---	---	246,000
Modification to model preparation area	SF	4,500	30.00	135,000
Heating, ventilating and air conditioning for model shop and test areas	LS	---	---	78,000
Roof repairs	SF	20,000	1.88	37,500
Test chamber deluge system	LS	---	---	31,000
Piping	LS	---	---	275,000
Electrical	LS	---	---	725,000
Equipment				634,000
Cooling towers and pumps	LS	---	---	62,000
Air compressor and auxiliaries instrumentation	LS	---	---	520,000
Air dryer	LS	---	---	52,000
Fallout Shelter (Not Feasible)		---	---	---
		TOTAL		$2,465,000

This project does not involve any additional equipment or property required for initial operational use other than that reflected in the above estimated cost data.

FUTURE COF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

For presently planned usage there are no currently foreseen future funding requirements necessary to complete this project.

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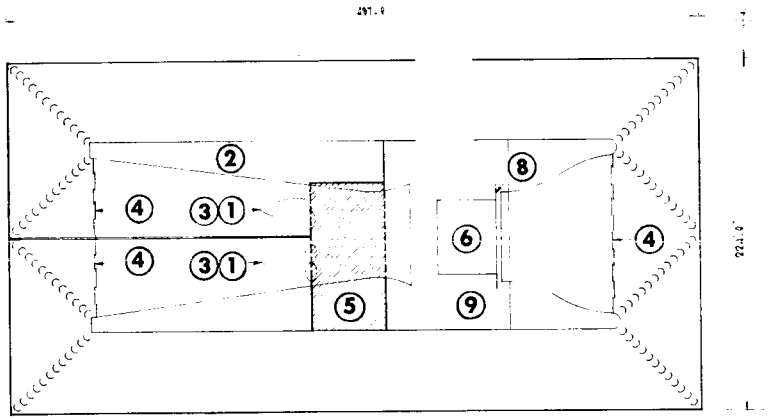
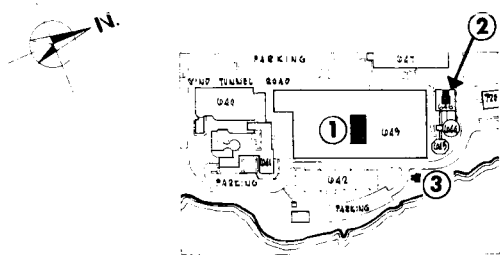
LANGLEY RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

REHABILITATION OF FULL SCALE WIND TUNNEL



PLAN BUILDING NO. 643

0' 50' 100'



KEY PLAN

1. MODIFICATIONS TO EXISTING FACILITIES
2. NEW COMPRESSOR IN BUILDING NO. 646
3. NEW COOLING TOWER AND PUMPS

1. DRIVE MOTOR NACELLE
2. MOTOR CONTROL SYSTEM
3. DRIVE MOTOR
4. SCREEN
5. MODEL SHOP
6. COMFORT CONDITIONING
7. REPAIR ROOF
8. DRAFT CURTAIN
9. FIRE PROTECTION SYSTEM

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Modification of Central Air Supply System	
LOCATION	Langley Research Center	
	FY 1973 CoF ESTIMATE	$1,175,000

COGNIZANT INSTALLATION: Langley Research Center

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT PROGRAM OFFICE: Office of Aeronautics and Space Technology

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$169,559
Construction	1,040,808
Total FY 1972 and Prior Years	$1,210,367

SUMMARY PURPOSE AND SCOPE:

This project is required to provide additional air pumping and drying capacity to the central air plant to meet the large and widespread research needs for high pressure air throughout the West Area of Langley Research Center. Air storage valving will be modified so that pumping and stored air utilization can be more closely matched to facility requirements.

PROJECT JUSTIFICATION:

The central air plant building (1247-E) supplies high pressure air to research facilities in the West Area of Langley Research Center. The facility consists of four 5,000-6,000 pounds per square inch air compressors with a total capacity of approximately 15 pounds of air per second, three dual tower-dry desiccant absorption type dryers, air storage bottle fields and interconnecting piping.

From its initial function of supplying air to a few contiguously located specific facilities, the air system usage has grown so that it presently supplies air to some 25 research facilities scattered throughout Langley's West Area.

Experiments in a growing number of research areas and projects are compromised by the increasingly limited air supply. These include heat transfer and force measurements for shuttle configurations; lifting entry studies related to aerothermal scramjet; combustion studies; high Reynolds number basic hypersonic aerodynamic studies; jet engine simulation for configuration tests (including military); V/STOL studies and noise studies.

Continuing user surveys, trade-off studies and operational experience over the past several years have yielded the minimum acquisition and modification requirements to approach satisfying the increased air demand. The project objective is twofold: First is to provide additional air pumping and air drying capacity at the central air plant for the large and widespread research needs throughout the West Area of Langley; Second is to modify the air storage isolation capability so that pumping and stored air utilization can be more closely matched to facility requirements.

PROJECT DESCRIPTION:

This proposed project will provide for the installation of a new 600 pounds per square inch air compressor, air dryer, and auxiliary equipment in the central air plant. Also included is the modification of the air storage valving and tank isolation capability so that pumping and stored air utilization can be more closely matched to facilities requirements. The compressor will be designed to deliver 8.0 pounds per second of dry air at 6,200 pounds per square inch gauge and 100°F. The dryer will be designed to dry the air to approximately 80°F dewpoint at 6,000 pounds per square inch gauge. The compressor cooling water will be obtained from an existing cooling water system which is adequate for the additional load. Valving modifications will be made utilizing motor operated valves.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$165,000
Alteration to existing building	LS	---	---	34,000
Electrical	LS	---	---	131,000

	Unit of Measure	Quantity	Unit Cost	Total Cost
Equipment				$1,010,000
Compressor	LS	---	---	740,000
Dryer	LS	---	---	170,000
Auxiliary equipment (valves, piping, filters, etc.)	LS	---	---	100,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$1,175,000

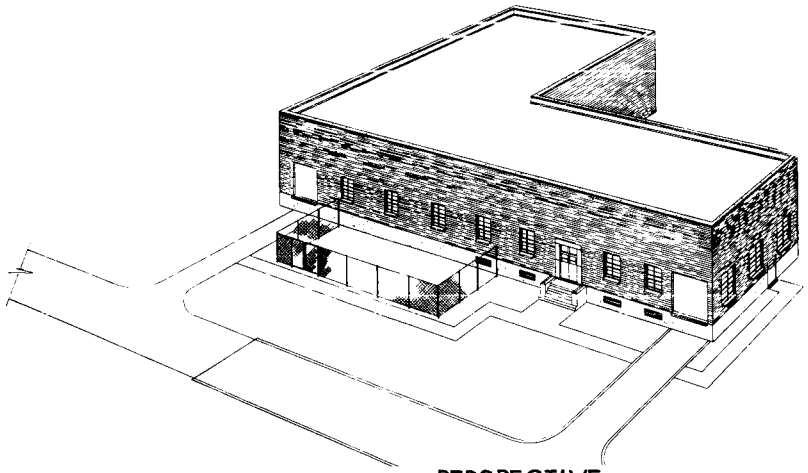
This project does not involve any additional equipment or property required for initial operational use other than that reflected in the above estimated cost data.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

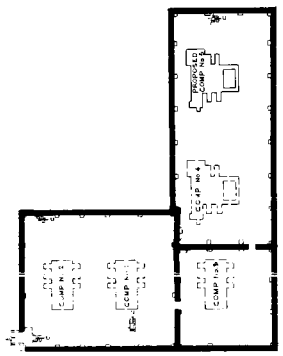
For presently planned usage there are no currently foreseen future funding requirements necessary to complete this project.

LANGLY RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

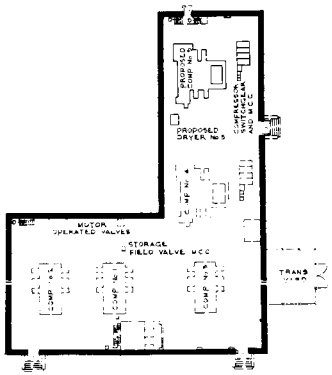
MODIFICATION OF CENTRAL AIR SUPPLY SYSTEM



PERSPECTIVE
EXISTING CENTRAL AIR PLANT
BUILDING NO. 1247-E

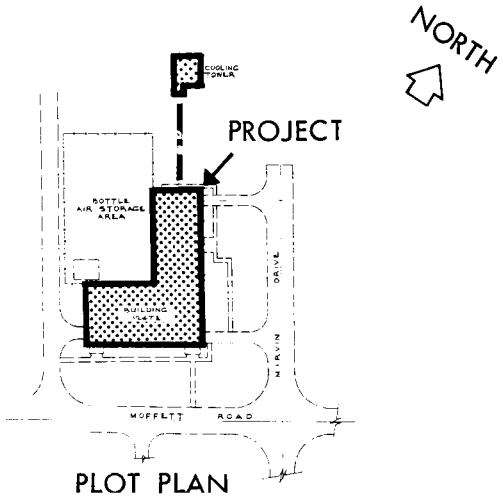


BASEMENT PLAN



FIRST FLOOR PLAN

0 20 40
10 10 30



PLOT PLAN

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Environmental Modifications for Utility Operations
LOCATION	Langley Research Center
	FY 1973 CoF ESTIMATE $650,000

COGNIZANT INSTALLATION: Langley Research Center

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT PROGRAM OFFICE: Office of Aeronautics and Space Technology

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$46,000
Construction	1,522,161*
Total FY 1972 and Prior Years	$1,568,161

*CoF investment subsequent to the transfer of the facility to NASA.

SUMMARY PURPOSE AND SCOPE:

This project is necessary to comply with Executive Order 11514 "Protection and Enhancement of Environmental Quality". It provides a means so that the exhaust of pollutants such as carbon monoxide, hydrocarbons, nitrogen oxides, sulphur oxides and particulate matters from the heating plant may be minimized. It also reduces the discharge of toxic and corrosive fumes from the Metal Finishing Shop and provides a more comprehensive control of the addition of chemicals to cooling towers and treatment of cooling water, waste water and boiler blowdown water. In addition, this project decreases pollutant into area tidewater and will provide means for assessment of area tidewater pollutants through the storm sewer system. It also will provide instrumentation for determining air quality by monitoring the levels of concentration of pollutants at any location at Langley Research Center.

PROJECT JUSTIFICATION:

The proposed measures for prevention of air and water pollution will significantly enhance the quality of air and water at and around Langley Research Center. The proposed monitoring devices will allow for future assessment of environmental pollution problems, demonstrate compliance with existing standards and assist in determining whether additional corrective measures should be taken.

PROJECT DESCRIPTION:

Various improvements to Langley support facilities and equipment systems are proposed. The boilers in the West Area Heating Plant will be modified to include gas firing capability as well as the present oil capability. Boiler stacks will be modified so that levels of concentrations of pollutants will be lower and boiler blowdown water will be treated for chemical removal.

The waste water from the major cooling towers in the East and West Areas will be treated prior to releasing the water into the storm sewer system. In addition, automated chemical feed control systems will be installed at several towers to minimize the amount of chemicals used. Scrubbers will be installed in the ventilation systems of the metal finishing shop to remove toxic gases and corrosive fumes. Earth and concrete dikes will be installed at several above the ground fuel storage tanks to prevent inadvertent dumping of fuels to the storm sewer system in the event of leaks in the tanks. A skimming basin will be constructed at one of the major storm sewer outfalls to more accurately assess inputs into the system and to establish whether additional skimming basins are desirable.

This project will also provide for sampling and monitoring devices to be strategically located to measure concentration and quality of air emissions and water effluents. This sampling equipment will serve as the basic tools to measure the effectiveness of operational conditions at the various facilities, and provide sufficient information in order that whatever corrective action may be required to reduce the concentration of pollutants can be taken.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$225,000
Site work	LS	---	---	44,700
Chromate treatment addition, East and West Areas	LS	---	---	28,000
Electrical (outside 5-foot line)	LS	---	---	12,400
Piping underground	LS	---	---	72,500
Mechanical	LS	---	---	67,400
Equipment				425,000
Electrical controls	LS	---	---	146,000
Miscellaneous equipment	LS	---	---	279,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$650,000

This project does not involve any additional equipment or property required for initial operational use other than that reflected in the above estimated cost data.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

For presently planned usage there are no currently foreseen future funding requirements necessary to complete this project.

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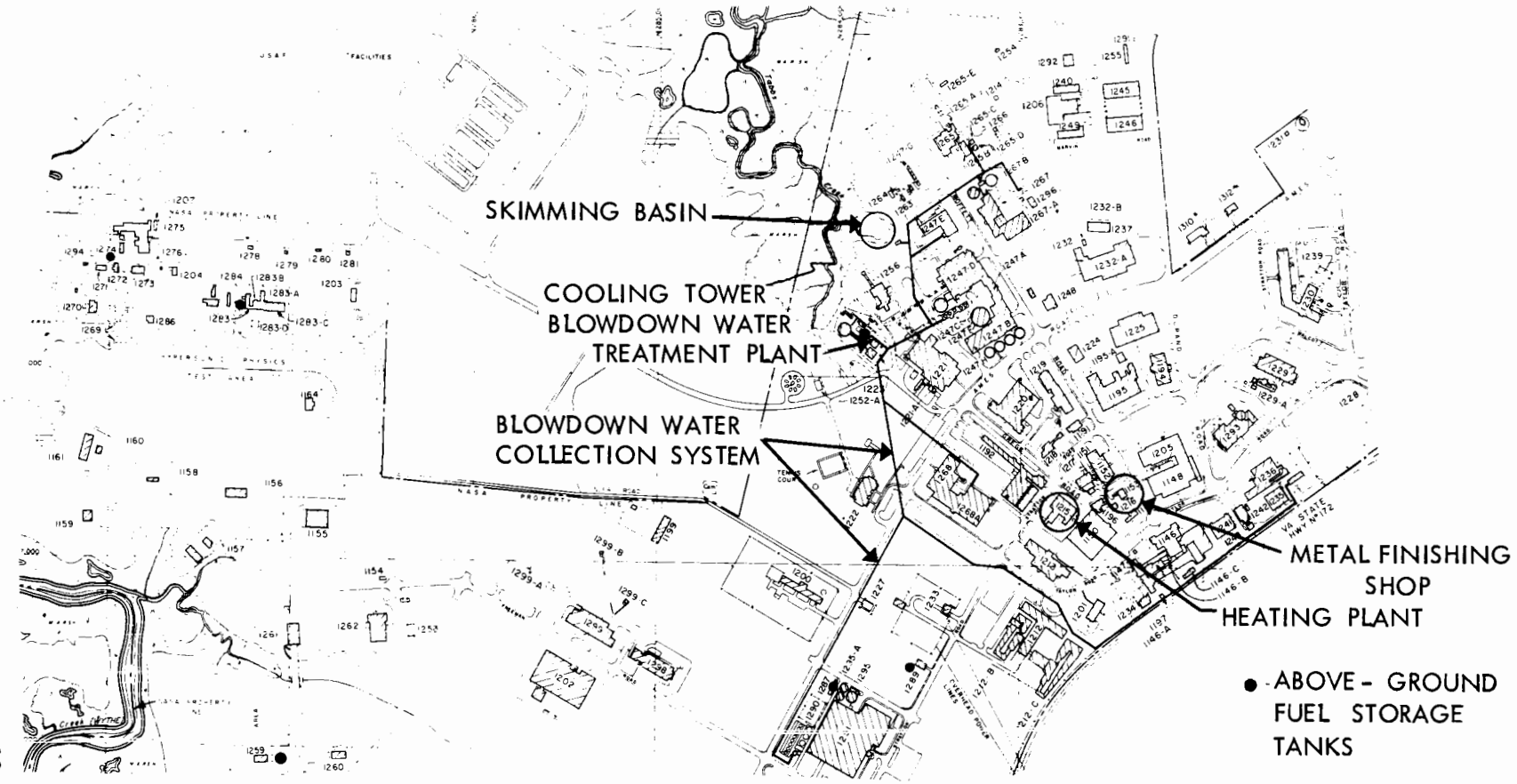
LANGLEY RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

ENVIRONMENTAL MODIFICATIONS FOR UTILITY OPERATIONS



WEST AREA

NOTE: EAST AREA IMPROVEMENTS NOT SHOWN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

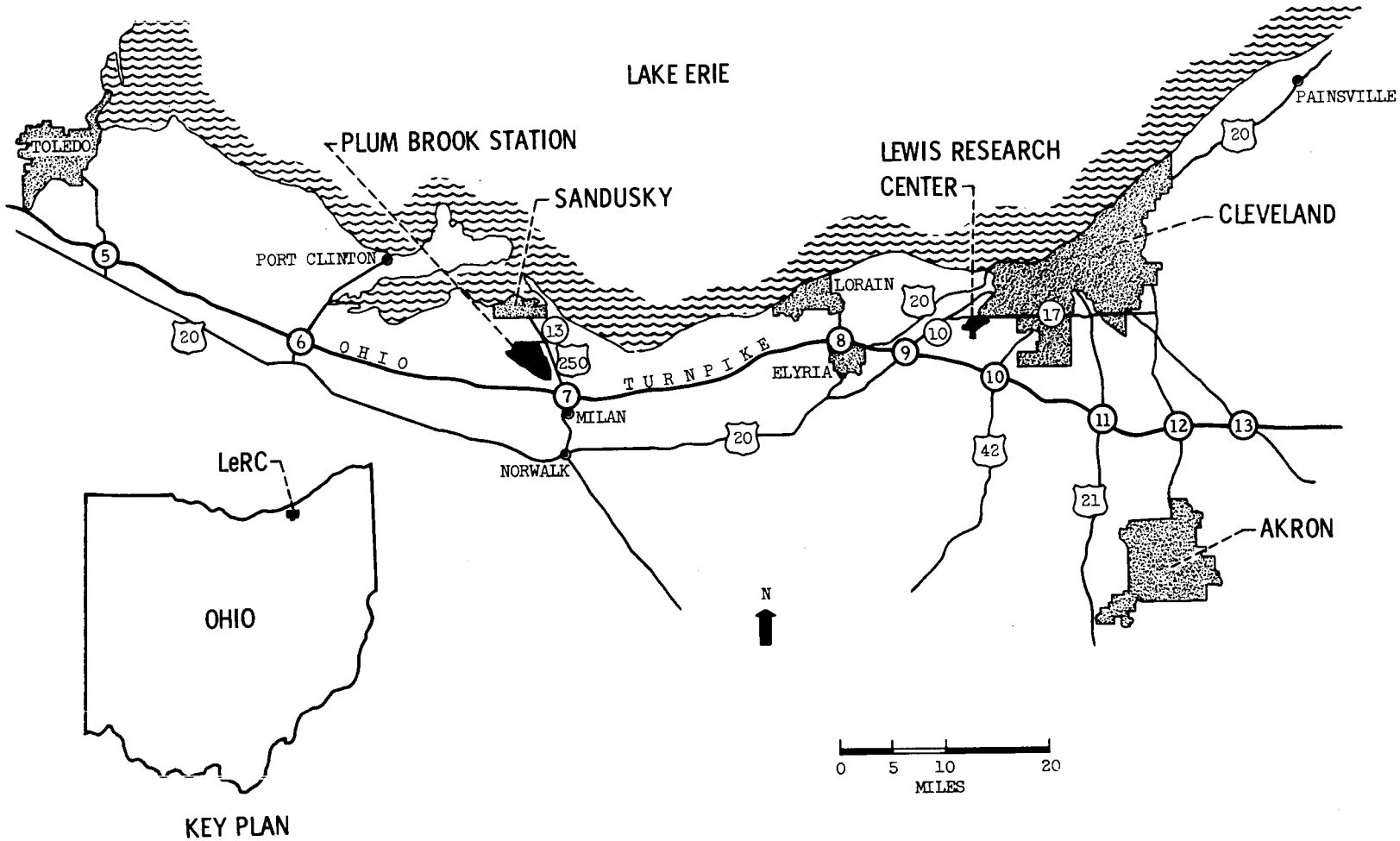
FISCAL YEAR 1973 ESTIMATES

LEWIS RESEARCH CENTER

	Page No.
Location plan	CF 6-1
Summary	CF 6-4
Office of Aeronautics and Space Technology Project:	
Modification of high temperature and high pressure turbine and combustor research facility	CF 6-5

LEWIS RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

AREA MAP



LEWIS RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

LOCATION PLAN

LEGEND-EXISTING BUILDINGS

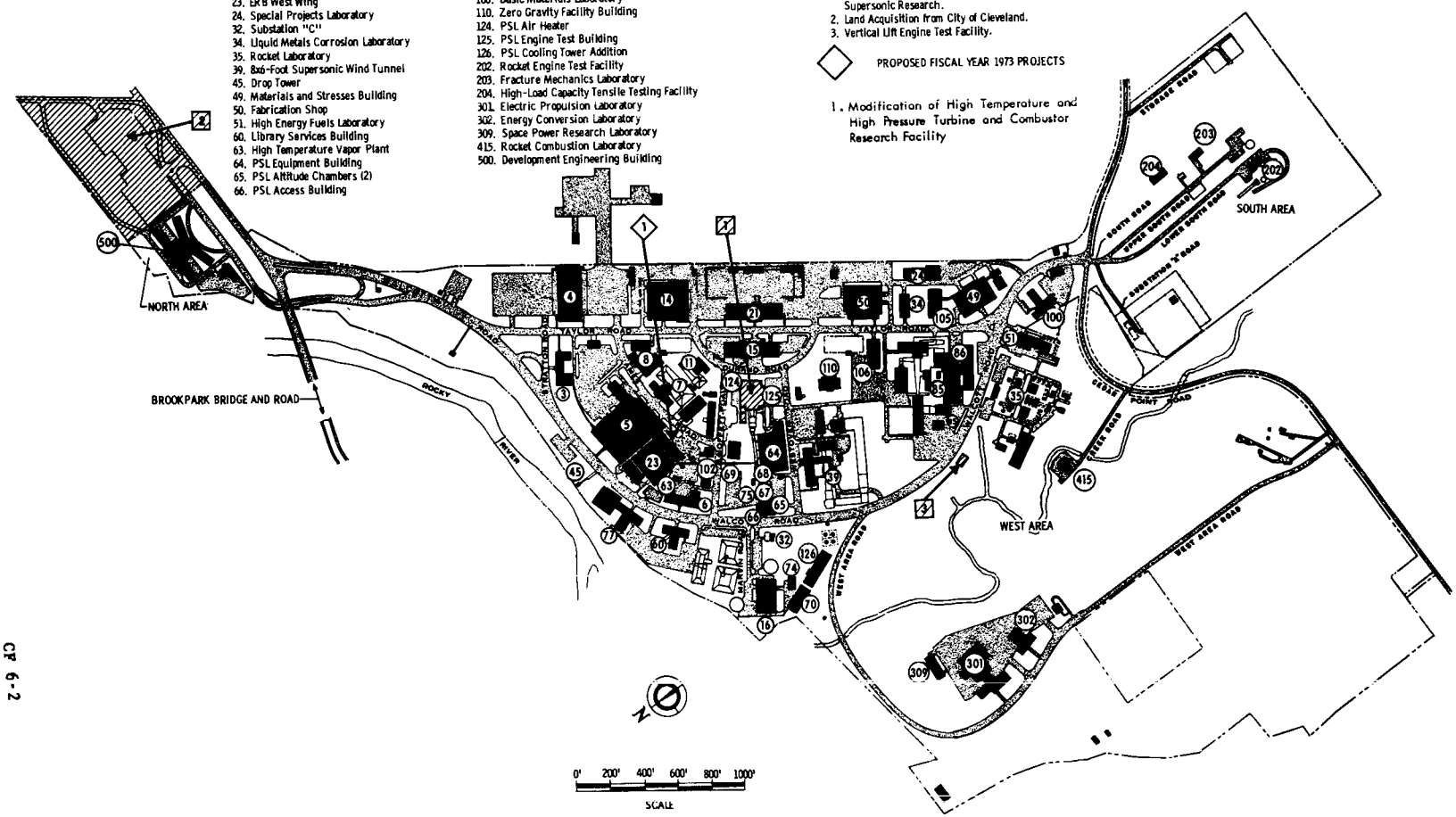
3. Administration Building
4. Flight Research Building
5. Engine Research Building
6. Chemistry Laboratory
7. Space Power Chambers
8. Aerospace Inform. & Display Building
11. Icing Research Tunnel
14. Technical Services Building
15. Utilities Building
16. Electric Propulsion Research Building
21. Engineering Services Building
23. ERB West Wing
24. Special Projects Laboratory
32. Substation "C"
34. Liquid Metals Corrosion Laboratory
35. Rocket Laboratory
39. 8x6-Foot Supersonic Wind Tunnel
45. Drop Tower
49. Materials and Stresses Building
50. Fabrication Shop
51. High Energy Fuels Laboratory
60. Library Services Building
63. High Temperature Vapor Plant
64. PSL Equipment Building
65. PSL Attitude Chambers (2)
66. PSL Access Building
67. PSL Primary Coolers (2)
68. PSL Secondary Cooler (1)
69. PSL Tie Lines
70. PSL Cooling Tower No. 3
74. PSL Cooling Tower Pump Bldg. Extension
75. PSL Substation "J"
77. Instrument Research Laboratory
85. 10x10-Foot Supersonic Wind Tunnel
86. 10x10-Foot Supersonic Wind Tunnel Office & Computer Center
100. Rocket Operations Building
102. Engine Components Research Laboratory
105. Materials Processing Laboratory
106. Basic Materials Laboratory
110. Zero Gravity Facility Building
124. PSL Air Heater
125. PSL Engine Test Building
126. PSL Cooling Tower Addition
202. Rocket Engine Test Facility
203. Fracture Mechanics Laboratory
204. High-Load Capacity Tensile Testing Facility
301. Electric Propulsion Laboratory
302. Energy Conversion Laboratory
309. Space Power Research Laboratory
415. Rocket Combustion Laboratory
500. Development Engineering Building

FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

1. Expansion of the Propulsion Systems Laboratory for Supersonic Research.
2. Land Acquisition from City of Cleveland.
3. Vertical Lift Engine Test Facility.

PROPOSED FISCAL YEAR 1973 PROJECTS

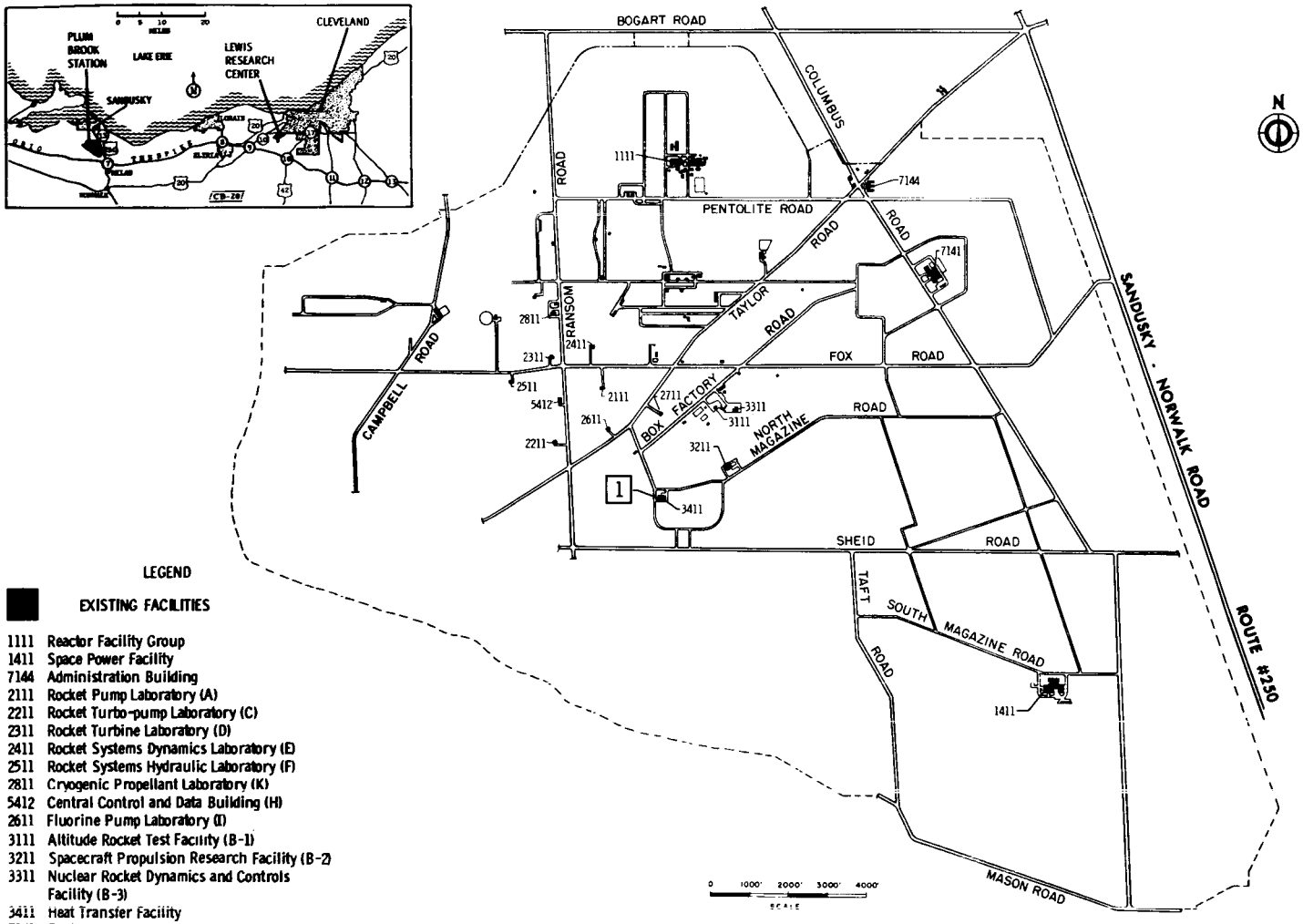
1. Modification of High Temperature and High Pressure Turbine and Combustor Research Facility



LEWIS RESEARCH CENTER
PLUM BROOK STATION

FISCAL YEAR 1973 ESTIMATES

LOCATION PLAN



LEGEND

EXISTING FACILITIES

1111 Reactor Facility Group
1411 Space Power Facility
7144 Administration Building
2111 Rocket Pump Laboratory (A)
2211 Rocket Turbo-pump Laboratory (C)
2311 Rocket Turbine Laboratory (D)
2411 Rocket Systems Dynamics Laboratory (E)
2511 Rocket Systems Hydraulic Laboratory (F)
2811 Cryogenic Propellant Laboratory (K)
5412 Central Control and Data Building (H)
2611 Fluorine Pump Laboratory (I)
3111 Altitude Rocket Test Facility (B-1)
3211 Spacecraft Propulsion Research Facility (B-2)
3311 Nuclear Rocket Dynamics and Controls Facility (B-3)
3411 Heat Transfer Facility
7141 Engineering Building

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 BUDGET ESTIMATES

(Dollars in thousands)

NASA INSTALLATION		COGNIZANT PROGRAM OFFICE FOR INSTALLATION
Lewis Research Center		Aeronautics and Space Technology
LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Cleveland, Ohio	Cuyahoga	Cleveland, Ohio

INSTALLATION MISSION

Research and development in the areas of advanced propulsion and space power generation. Basic and applied research is conducted in-house on materials and metallurgy; cryogenic and liquid-metal heat-transfer fluids; pumps and turbines; combustion processes, propellants, tankage, injectors, chambers, and nozzles; system control dynamics; plasmas and magnetohydrodynamics; space meteoroid damage and zero-gravity effects. The Center maintains technical management of NASA contracts on chemical and electric propulsion and on nuclear and solar space power systems, including the Centaur and Agena engine programs.

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 1973 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Modification of High Temperature and High Pressure Turbine and Combustor Research Facility	AST	145	9,710	-0-	9,855
TOTAL			9,710		

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NASA-HQ

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Modification of High Temperature and High Pressure Turbine and Combustor Research Facility
LOCATION	Lewis Research Center
	FY 1973 CoF ESTIMATE $9,710,000

COGNIZANT INSTALLATION: Lewis Research Center

LOCATION OF PROJECT: Cleveland, Cuyahoga County, Ohio

COGNIZANT PROGRAM OFFICE: Office of Aeronautics and Space Technology

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$145,000	
Construction	---	(No CoF investment subsequent to transfer of the facility to NASA.)
Total FY 1972 and Prior Years	$145,000	

SUMMARY PURPOSE AND SCOPE:

The effective continuation of advanced turbine and combustor research at Lewis Research Center will require a facility to supply approximately 240 pounds per second of air at a pressure of 660 pounds per square inch absolute to simulate compressor discharge pressure. The air must be heated to between 3,000 and 4,000°F for turbine testing. The existing air system is limited to 165 pounds per square inch absolute pressure, and the temperature for turbine testing is limited to 2,500°F. This proposed project will provide the necessary upgrading of research capability essential to maintain progress in air breathing propulsion.

PROJECT JUSTIFICATION:

Compressor pressure ratio and turbine inlet temperature of gas turbine engines have been steadily increasing since the introduction of the gas turbine engine during World War II. These changes have resulted in engine designs which are compact, lightweight and superior in specific fuel consumption. The trend in both military and commercial gas turbine engines is towards turbofan engines having a compact, high temperature gas generator. To illustrate, a typical 1957 engine has a compressor pressure ratio of 13 and turbine inlet temperature of 1,850°F. Advanced engines of today are designed for compressor

pressure ratio of 25 to 30 and turbine inlet temperatures up to 2,500°F. Cycle and mission analyses for future generation engines indicate that the compressor pressure ratio will increase to 30 to 40, and turbine inlet temperature will rise to 3,000 to 4,000°F, provided materials and cooling designs can be developed to operate satisfactorily at these high pressure and temperature conditions.

From a turbine cooling standpoint the vanes and blades will be difficult to cool due to the small size of the more compact high pressure gas generators. New technology is required to obtain adequate coolant flow within pressure loss limitations and suitable coolant passage heat transfer configurations in small blades and vanes.

From the combustor design standpoint, high inlet and exit temperatures will make combustor reliability and durability difficult to achieve in this new high pressure operation regime. In addition, combustor performance characteristics such as combustion efficiency, smoke, pollutant emission and exit radial profile must be determined and improved.

In 1966, equipment was installed in the Lewis Engine Component Research Laboratory to conduct turbine cooling research. This facility is limited to a compressor pressure ratio of 10 and turbine inlet temperatures up to 2,500°F. By 1975, Lewis will have completed most of the planned turbine cooling research that can be accomplished in this facility. Many of the cooled blade and vane configurations that perform well at 2,500°F will not be suitable for temperatures of 3,000 to 4,000°F. Current limitation of the air supply pressure to 165 pounds per square inch absolute precludes testing even current engines at the correct operating conditions. A list of pressures and flow rates for some modern engines are given below:

	Combustor Inlet Pressure at Takeoff, psia	Core Weight Air Flow Lbs./Sec.
JT-9D	330	240
TF-39 or CF-6	325	174
F-100	335	137
F-100 (Supersonic dash)	294	120
F-101	377	96
F-101 (Sea level dash)	473	121

It is essential that a high temperature, high pressure facility be provided so that research on turbine and combustors of advanced gas turbine engines may continue, and that Lewis may continue its mission as the nation's leading multidisciplinary center in propulsion and power generation research for space and aeronautics.

PROJECT DESCRIPTION:

The proposed facility will include two test stations and will be located in the existing Engine Research Building. Air at 165 pounds per square inch absolute and 100°F will be ducted from the existing Propulsion Systems Laboratory to the proposed facility where it will be further heated to 500°F and then compressed to 660 pounds per square inch absolute.

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The high pressure will be achieved by staging one multi-stage centrifugal compressor and one multi-stage axial compressor each driven by a free-turbine drive which is powered by a jet aircraft type gas turbine. The heat of compression will be utilized to increase the air temperature to 1,150°F. A facility combustor will further increase the temperature to between 3,000 and 4,000°F for turbine testing. The maximum flow rate will be approximately 240 pounds per second. The heated high pressure gas discharged from the test rigs will be ducted through acoustically treated discharge stacks to the atmosphere. Auxiliary systems are required for fuel, cooling water, lubrication, electrical control and instrumentation, safety and pollution abatement.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,342,800
Building modifications:				
Architectural/structural	LS	---	---	301,840
Mechanical	LS	---	---	2,800
Electrical	LS	---	---	3,360
Air, water, and fuel system	LS	---	---	978,800
Fire protection modifications	LS	---	---	56,000
Equipment				8,367,200
Free turbine drives	Each	2	$1,583,680	3,167,360
Compressor - first stage	Each	1	840,000	840,000
Compressor - second stage	Each	1	1,514,240	1,514,240
Gear boxes	Each	2	72,800	145,600
Hot turbine rig	Each	1	2,000,000	2,000,000
Controls and data acquisition systems	LS	---	---	700,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$9,710,000

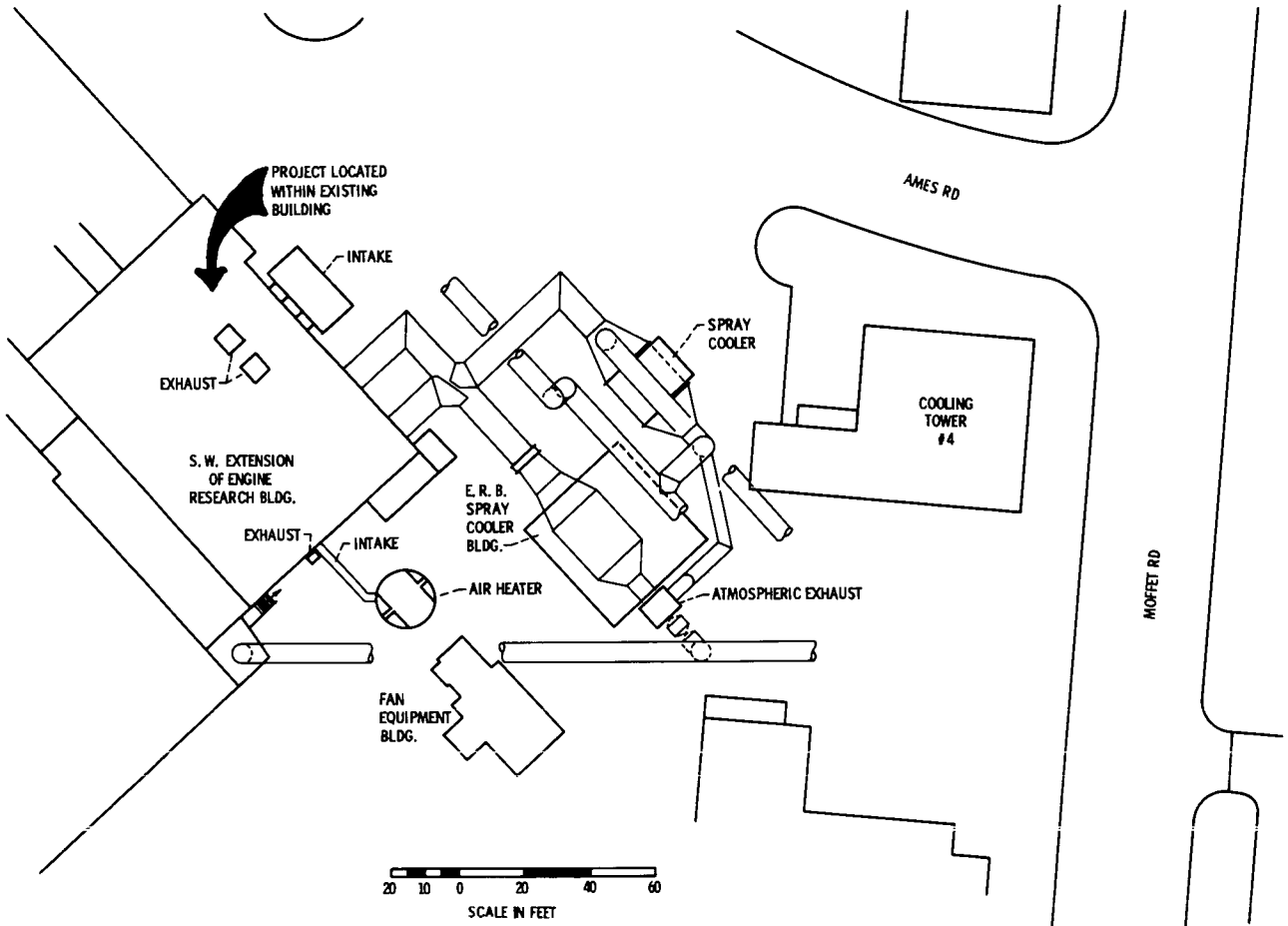
This project does not involve any additional equipment or property required for initial operational use other than that reflected in the above estimated cost data.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

For presently planned usage there are no currently foreseen future funding requirements necessary to complete this project.

LEWIS RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

MODIFICATION OF HIGH TEMPERATURE AND HIGH PRESSURE TURBINE AND COMBUSTOR RESEARCH FACILITY

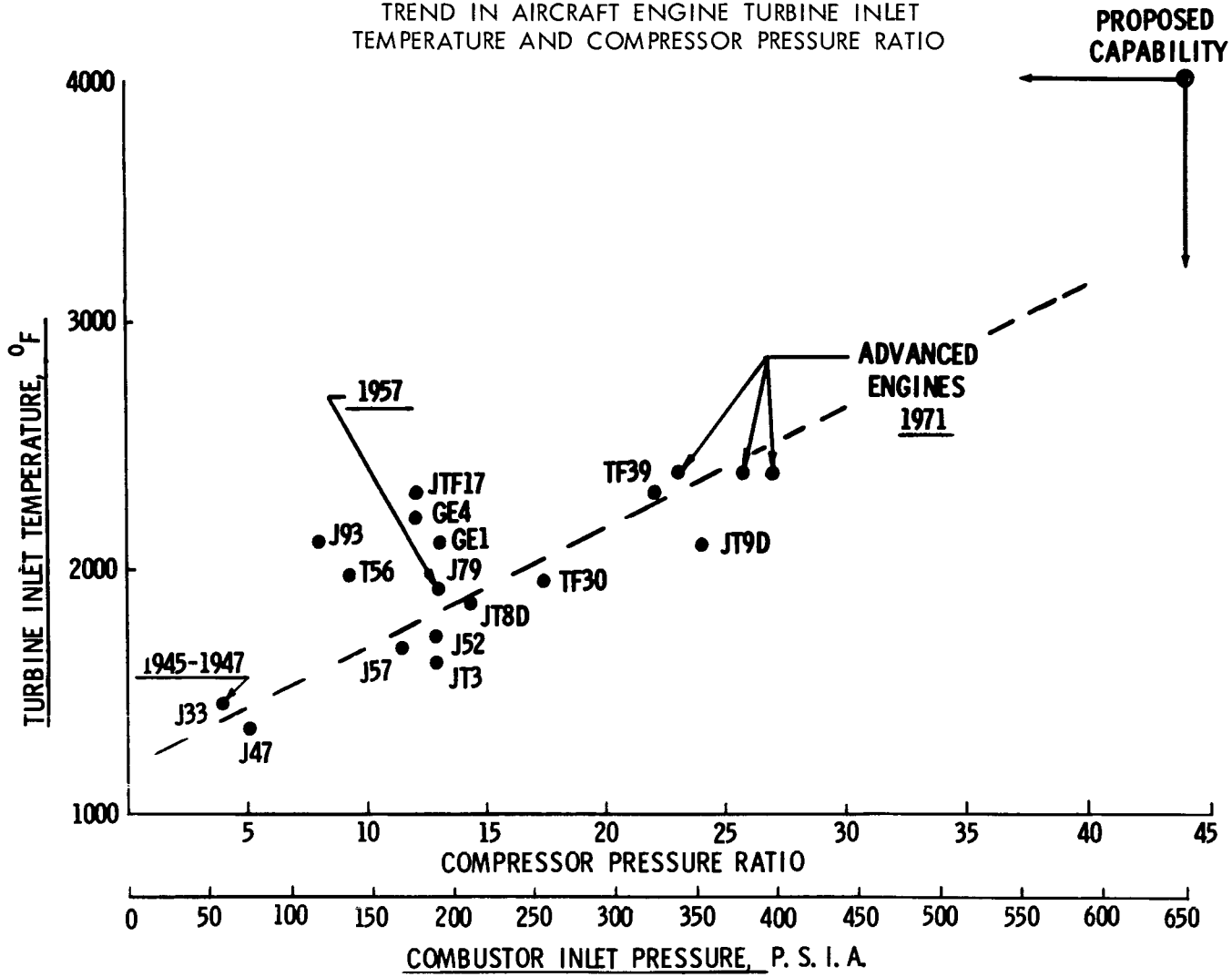


SITE PLAN

LEWIS RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

MODIFICATION OF HIGH TEMPERATURE AND HIGH PRESSURE TURBINE AND COMBUSTOR RESEARCH FACILITY

TREND IN AIRCRAFT ENGINE TURBINE INLET TEMPERATURE AND COMPRESSOR PRESSURE RATIO



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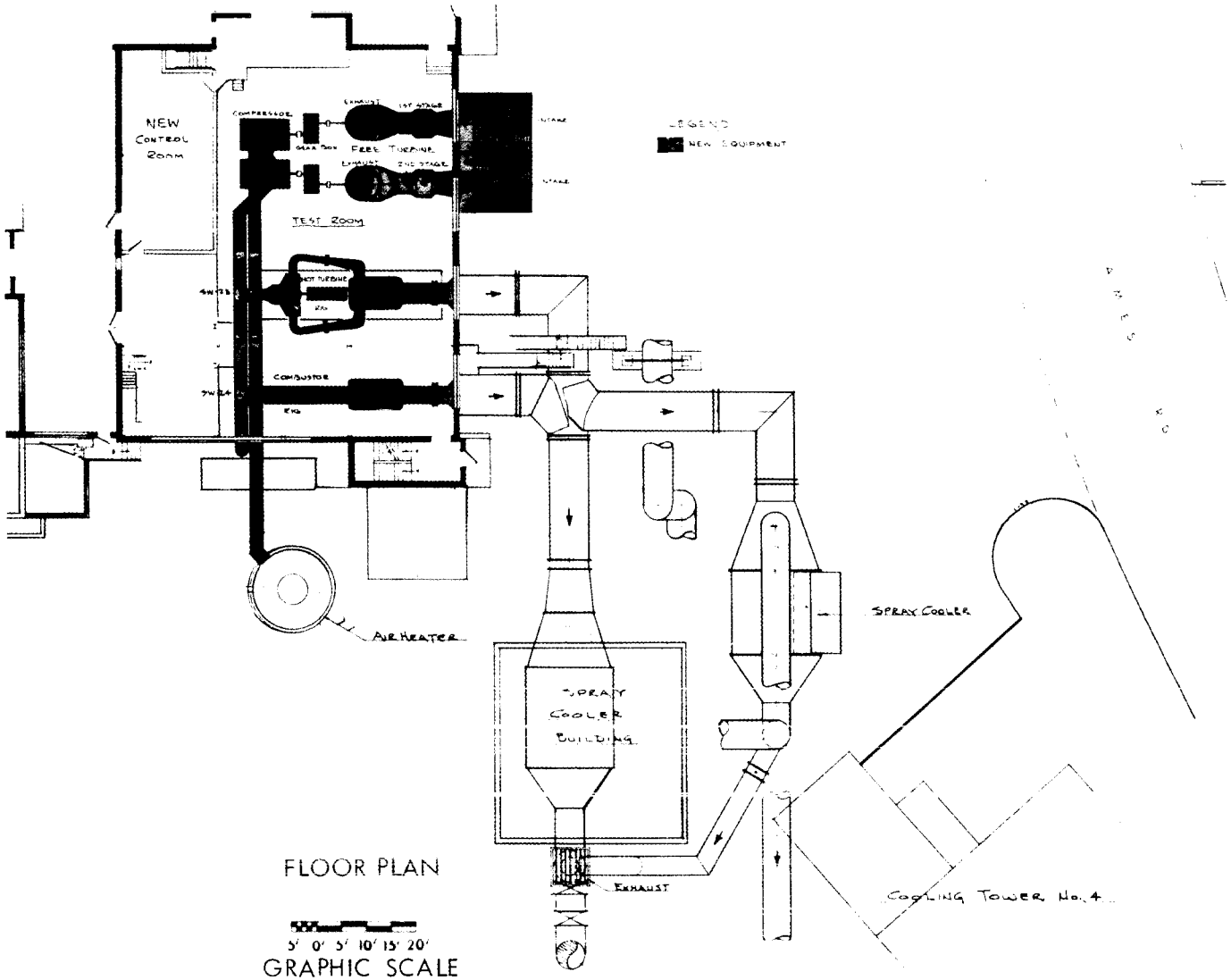
LEWIS RESEARCH CENTER
FISCAL YEAR 1973 ESTIMATES

MODIFICATION OF HIGH TEMPERATURE AND HIGH PRESSURE TURBINE AND COMBUSTOR RESEARCH FACILITY



FLOOR PLAN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

MANNED SPACECRAFT CENTER

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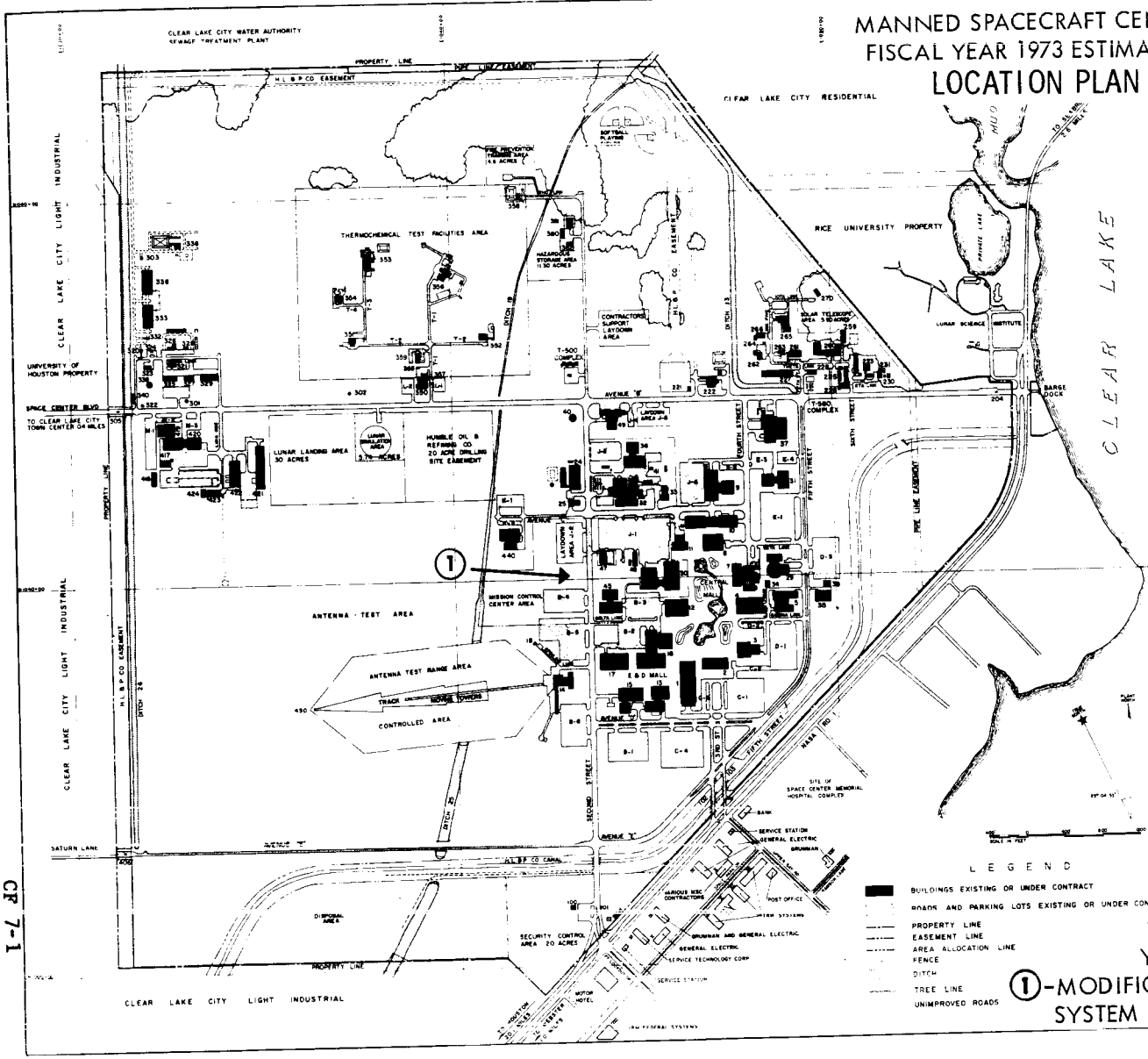
Modification of fire protection system	CF 7-3

MANNED SPACECRAFT CENTER
FISCAL YEAR 1973 ESTIMATES
LOCATION PLAN



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PROPOSED FISCAL YEAR 1973 PROJECT

(1)-MODIFICATION OF FIRE PROTECTION SYSTEM (VARIOUS FACILITIES)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 73 BUDGET ESTIMATES

(Dollars in thousands)

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

INSTALLATION MISSION

The Manned Spacecraft Center has as its primary mission the development of spacecraft for Manned Space Flight programs. The Center is also responsible for Manned Space Flight operations, conduct of astronaut training, and the earth resources aircraft project.

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 19 73 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Modification of Fire Protection System	MSF	43	585	-0-	628
TOTAL			585		

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NASA-HQ

CF 7-2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Modification of Fire Protection System	
LOCATION	Manned Spacecraft Center	
	FY 1973 CoF ESTIMATE	$585,000

COGNIZANT INSTALLATION: Manned Spacecraft Center

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$42,500
Construction	*
Total FY 1972 and Prior Years	*

*Existing fire detection systems were included in major construction activities and are not separately identifiable.

SUMMARY PURPOSE AND SCOPE:

This project will provide ionization detection and fire suppression systems for the high density electronic equipment areas within the various buildings at the Manned Spacecraft Center.

PROJECT JUSTIFICATION:

Currently, MSC does not have automatic extinguishing systems for use in case of a fire in the electronic equipment areas. However, automatic extinguishing systems are required in accordance with the Federal Fire Council RP-1 Manual. The systems must protect both the inside and outside of computers and other electronic complexes. Experience, and surveys conducted by the Federal Fire Council and Factory Mutual Associates, have shown that the cost of a fire in a protected lab is 10 to 50 percent less than for an unprotected lab. In addition, down-time is less and information loss is reduced.

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Many of the computer and other electronic areas are mission essential. The loss of one of these areas could delay launch operations until the equipment is repaired or replaced.

In addition to the mission control function, MSC maintains (1) extremely valuable scientific data for day-to-day use by the scientific world; (2) real time flight data, emergency plans, landing and recovery data, and other one-of-a-kind flight data; (3) earth resources data and computer banks for the detailed air, land, and water pollution control studies, and crop growth data; (4) engineering design and analyses, of the current and future spacecraft configuration studies; and (5) the medical research and analyses with regard to man's ability to perform in space and the effects of extended missions. All of these make this an urgent and extremely vital requirement at the earliest possible date.

An in-house survey was completed in June 1970 to determine the value of MSC's electronic equipment and which equipment requires protection. The results of this survey indicate that the replacement value of the equipment to be protected by this project is $258,752,000. This does not include the value of the data stored or used in these areas daily. The estimated cost of this project is $585,000. Accordingly, the cost of protection is comparatively small when related to the loss which could be sustained in case of a fire.

PROJECT DESCRIPTION:

This project will provide for an ionization detection and sprinkler system for the high density electronic equipment areas in the various facilities at the Manned Spacecraft Center. A total of approximately 250,000 square feet will be protected in 29 buildings.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$585,000
Building	SF	250,000	$2.34	585,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$585,000

This project does not involve any additional equipment or property required for initial operational use other than that reflected in the above estimated cost data.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

For presently planned usage there are no currently foreseen future funding requirements necessary to complete this project.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

WALLOPS STATION

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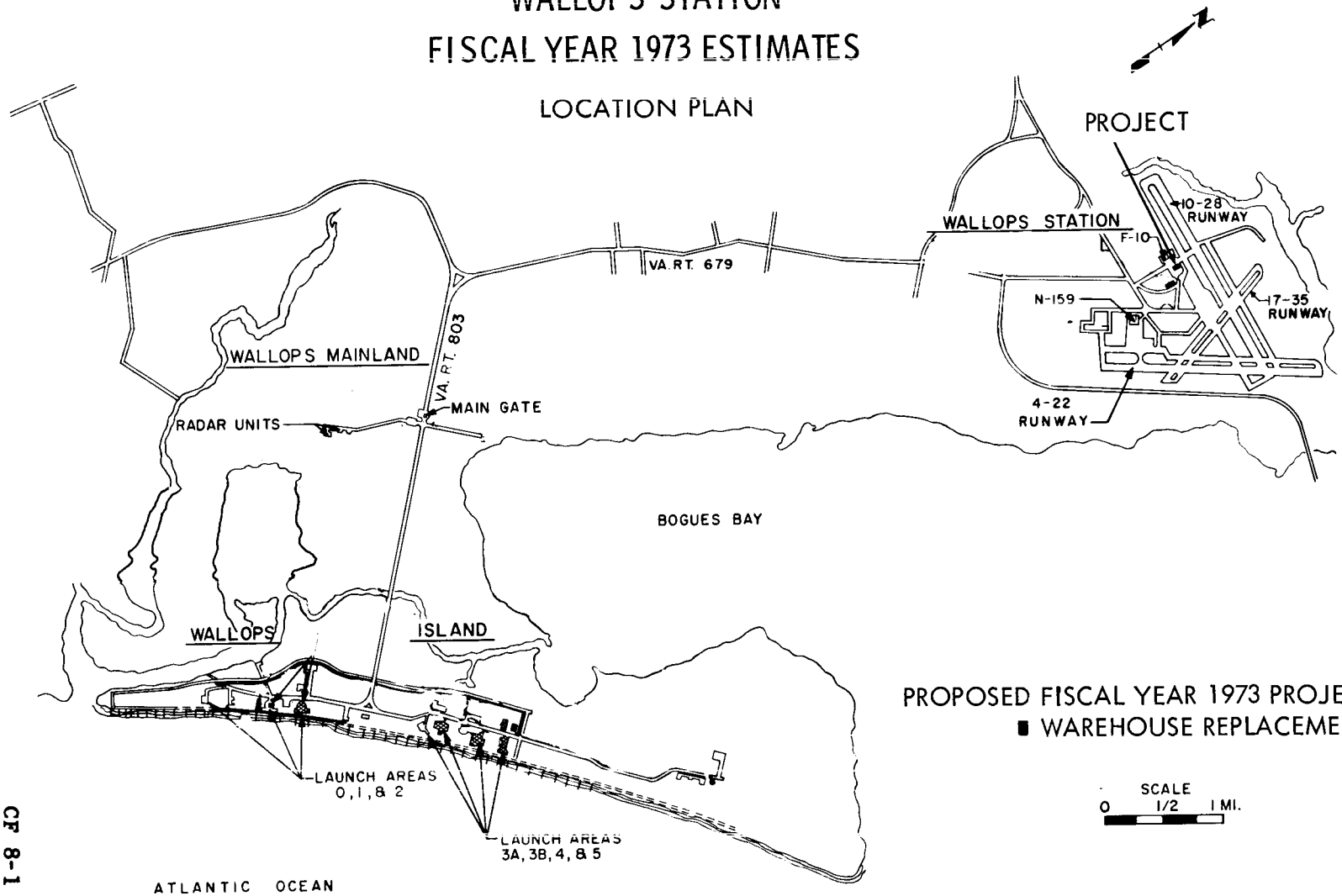
Office of Space Science Project:	
Warehouse replacement	CF 8-3

WALLOPS STATION
FISCAL YEAR 1973 ESTIMATES

LOCATION PLAN



PROPOSED FISCAL YEAR 1973 PROJECT
■ WAREHOUSE REPLACEMENT

SCALE
0 1/2 1 MI.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 BUDGET ESTIMATES

(Dollars in thousands)

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

INSTALLATION MISSION

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

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 1973 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Warehouse Replacement	OSS	20	350	-0-	370
TOTAL			350		

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NASA-HQ
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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Warehouse Replacement	
LOCATION	Wallops Station	
	FY 1973 CoF ESTIMATE	$350,000

COGNIZANT INSTALLATION: Wallops Station

LOCATION OF PROJECT: Wallops Station, Accomack County, Virginia

COGNIZANT PROGRAM OFFICE: Office of Space Science

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$19,800
Construction	---
Total FY 1972 and Prior Years	$19,800

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to replace the existing Wallops Station main warehouse which has deteriorated to the extent that it is beyond economical repair.

PROJECT JUSTIFICATION:

The present main warehouse is made up of two 25 year old Quonset huts which have been placed end-to-end to provide 20,000 square feet of space. They have long since exceeded the life expectancy of temporary structures of this type under normal conditions. The continuous long term exposure to the saline environment at Wallops Station has accelerated the deterioration to the point where the rusty metal structures are well beyond the point of economical repair.

There are no other existing facilities at Wallops Station to which the present integrated storage and supply function can be relocated.

While it is possible to break up and decentralize this warehousing function and place portions of this activity in several inadequately sized areas at various locations throughout the Station's existing buildings, this would be a very inefficient solution in terms of manpower utilization and resultant supply services.

The provision of a replacement building of masonry units and built-up roof is considered the best overall solution to this problem.

PROJECT DESCRIPTION:

This project will provide 20,000 square feet of storage space with 14-foot clearance. Construction will consist of clear span steel trusses, concrete masonry curtain walls, lighting, heating, and sprinkler system, with minimal plumbing for one small lavatory. The building will be sited in the vicinity of the existing building.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$350,000
Demolition of existing structure	LS	---	---	20,000
Warehouse building	SF	20,000	16.50	330,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$350,000

This project does not involve any additional equipment or property required for initial operational use other than that reflected in the above estimated cost data.

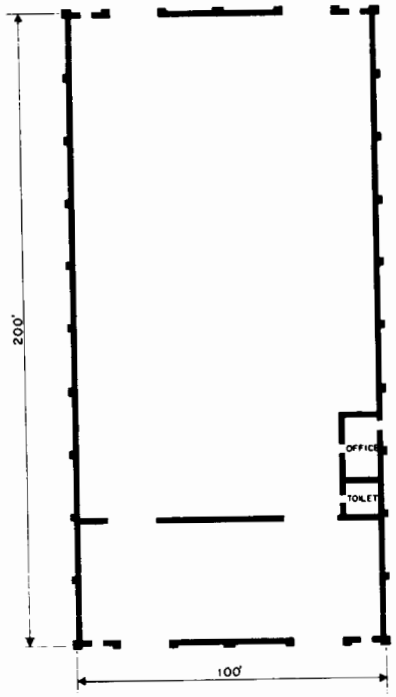
FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

For presently planned usage there are no currently foreseen future funding requirements necessary to complete this project.

WALLOPS STATION

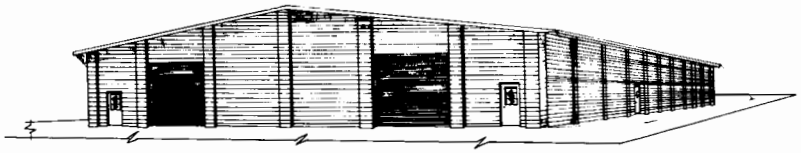
FISCAL YEAR 1973 ESTIMATES

WAREHOUSE REPLACEMENT

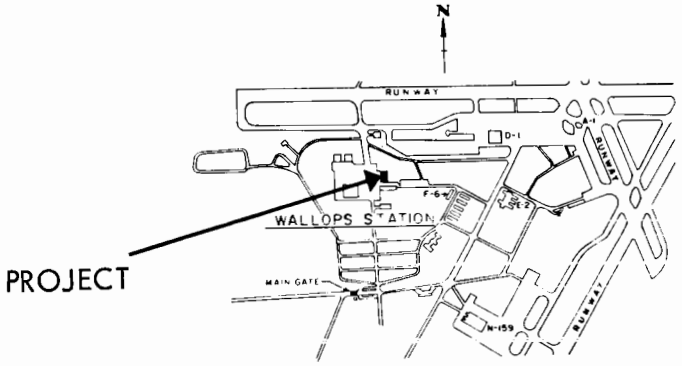


FLOOR PLAN

SCALE 10' 0' 10' 20' 30' 40'



PERSPECTIVE



LOCATION PLAN

SCALE 0' 500' 1000' 2000'

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

VARIOUS LOCATIONS

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 73 BUDGET ESTIMATES

(Dollars in thousands)

NASA INSTALLATION		COGNIZANT PROGRAM OFFICE FOR INSTALLATION
Various		Manned Space Flight/Aeronautics and Space Technology
LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
---	---	---

INSTALLATION MISSION

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 1973 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Space Shuttle Facilities at Various Locations	OMSF OAST	24,685	27,900	20,000 to 25,000	72,585 to 77,585
TOTAL			27,900		

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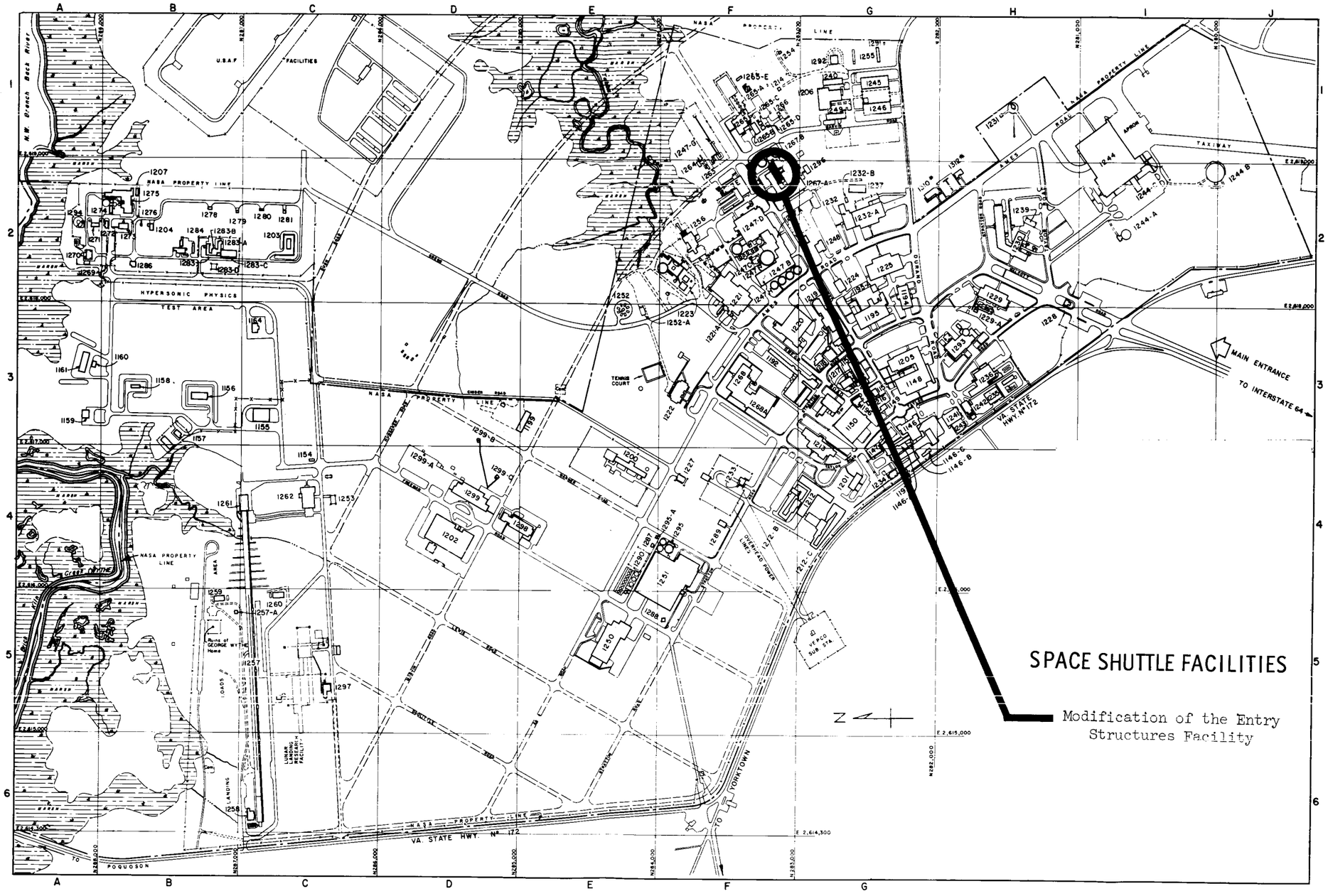
LANGLEY RESEARCH CENTER

FISCAL YEAR 1973 ESTIMATES

LOCATION PLAN



WEST AREA

FACILITY NO.	DESCRIPTION
1146	16-FOOT TRANSONIC TUNNEL
1147	TAYLOR ROAD SUBSTATION
1148	STRUCTURES RESEARCH LABORATORY
1149	DISPENSARY
1150	MODEL SHOP
1151	MANAGEMENT SUPPORT BUILDING
1152	PUBLICATIONS BUILDING
1153	METAL FINISHING SHOP
1154	GATE HOUSE CMTA
1155	CHEMICAL MAGAZINE, CMTA
1156	HYDRAZINE MAGAZINE, CMTA
1157	HYDROGEN PEROXIDE MAGAZINE, CMTA
1158	ROCKET MAGAZINE, CMTA
1159	ROCKET ASSEMBLY BUILDING, CMTA
1160	ROCKET TEST CONTROL BUILDING, CMTA
1161	ROCKET TEST CELLS, CMTA
1162	NITROGEN TETROXIDE MAGAZINE, CMTA
1191	1-FOOT HYPERSONIC ARC TUNNEL
1192	PHOTOGRAPHIC LABORATORY
1192-C	VIKING PROJECT OFFICE
1194	LIBRARY
1195	FISCAL AND PROCUREMENT BUILDING
1195-A	FISCAL AND PROCUREMENT BUILDING ANNEX
1196	FOUNDRY
1199	PLANT SUPPORT FACILITY
1201	MICROMETEOROID IMPACT SIMULATOR
1202	FLIGHT INSTRUMENTATION LABORATORY
1203	CHEMICAL STORAGE MPTA
1204	PYROTECHNIC RESEARCH LABORATORY
1205	FATIGUE RESEARCH LABORATORY
1206	SHIPPING AND RECEIVING BUILDING
1207	GENERAL STORAGE (PARTS) MPTA
1212	SUBSONIC TUNNELS LABORATORY
1212-B	HIGH-SPEED 7- BY 10-FOOT TUNNEL
1212-C	V/STOL TUNNEL
1213	WEST CAFETERIA
1214	TRANSPORTATION STORAGE
1215	WEST HEATING PLANT
1216	CHEMICAL MILLING
1217	PAPER SHREDDER
1218	HEADQUARTERS ANNEX
1218-A	ANECHOIC NOISE FACILITY
1219	LRC HEADQUARTERS
1220	SIMULATION RESEARCH LABORATORY
1221	HIGH INTENSITY NOISE FACILITY
1221-A	LOW-FREQUENCY NOISE FACILITY
1222	ACTIVITIES BUILDING
1223	SEWAGE DISPOSAL PLANT
1224	LUMBER STORAGE BUILDING
1225	EXPERIMENTAL MACHINE SHOP
1227	SUBSTATION - DL
1228	MAIL GATE HOUSE
1229	LOADS DIVISION
1229-A	BLOWDOWN TUNNEL (PILOT MODELS)
1230	INSTRUMENT RESEARCH LABORATORY
1231	ROTOR TEST TOWER
1232	SPACE TECHNOLOGY DIVISION
1232-A	FABRICATION SHOP
1233	STRATTON ROAD SUBSTATION
1234	JET EXIT TEST FACILITY
1235	FREQUENCY CONVERTER BUILDING
1236	4- BY 4-FOOT SUPERSONIC PRESSURE TUNNEL
1237	RESEARCH MODEL SUPPORT SHOP
1239	WARNER ROAD SUBSTATION
1240	READY ISSUE STORES BUILDING
1241	DRIVE CONTROL BUILDING
1242	PROPELLER STATIC TEST STAND
1243	YORKTOWN ROAD SUBSTATION
1244	HANGAR
1244-A	WATER TANK NO. 2
1244-B	VIKING LANDER IMPACT TEST FACILITY
1245	GENERAL STORAGE BUILDING
1246	GENERAL STORAGE BUILDING
1247-A	AERO-PHYSICS LABORATORY CENTER
1247-B	AERO-PHYSICS LABORATORY WEST WING
1247-C	AERO-PHYSICS LABORATORY COOLING TOWER
1247-D	AERO-PHYSICS LABORATORY EAST WING
1247-E	HIGH PRESSURE AIR FACILITY
1247-F	AMES ROAD SUBSTATION
1247-G	EXPANSION TUBE (PILOT MODEL)
1248	PLANT SAFETY BUILDING
1249	VEHICLE SERVICE BUILDING
1251	UNITARY PLAN WIND TUNNEL
1252	WATER TANK NO. 1
1252-A	TRANSPORTATION DISPATCHING OFFICE
1253	SUBSTATION - S2
1254	RADIATION WASTE STORAGE
1255	GENERAL STORAGE BUILDING
1256	9- BY 6-FOOT THERMAL STRUCTURES TUNNEL
1257	LANDING LOADS TRACK
1257-A	PAVED TEST STRIP
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
1265-A	OPERATIONS BUILDINGS
1265-B	OPERATIONS BUILDINGS
1265-C	OPERATIONS BUILDINGS
1265-D	OPERATIONS BUILDINGS
1265-E	OPERATIONS BUILDINGS
1266	MOFFETT ROAD SUBSTATION
1267	ENTRY STRUCTURES FACILITY
1267-A	ENTRY STRUCTURES SHOP
1267-B	CLOSED RAW WATER COOLING SYSTEM
1268	PLANT TEMPERATURE CONTROL
1269	GATE HOUSE (HYPERSONIC PHYSICS TEST AREA)
1270	ROCKET PROPULSION STATIC TEST FACILITY, HPTA
1271	DATA REDUCTION AND ACQUISITION FACILITY, HPTA
1272	HEATING PLANT, HPTA
1273	OPERATIONS CENTER, HPTA
1274	NINE EXPANSION ARC TUNNEL, HPTA
1275	IMPACT AND ARC TUNNELS FACILITY, HPTA
1276	IGNITER ASSEMBLY BUILDING, HPTA
1277	STORAGE A, HPTA
1278	EXPLOSIVE STORAGE, HPTA
1279	INERT ROCKET MATERIAL STORAGE NO. 1, HPTA
1280	HIGH EXPLOSIVE STORAGE, HPTA
1281	INERT ROCKET MATERIAL STORAGE NO. 2, HPTA
1282	STORAGE F, HPTA
1283	MATERIALS RADIATION LABORATORY
1284	PROPELLANT MIXING FACILITY, HPTA
1285	STORAGE H, HPTA
1286	ROCKET ASSEMBLY AND PROPELLANT ALTERATION BUILDING
1287	41-FOOT VACUUM SPHERE SHOP
1288	SOLAR-ENERGY COLLECTOR
1289	CUSTODIAL CONTRACTOR BUILDING
1290	SUBSTATION - UHWT
1291	PUMP STATION
1292	CONSTRUCTION AND REPAIR SHOP
1293-A	ATTITUDE CONTROL SIMULATOR FAC.
1293-B	DYNAMICS RESEARCH LABORATORY
1294	ROCKET MOTOR TEST FACILITY
1295	SHOP AND INSTRUMENTATION FOR 60-FOOT SPHERE
1295-A	PUMP HOUSE
1296	CERAMIC SPRAY SHOP
1297	LUNAR LANDING RESEARCH FACILITY
1298	STABILIZATION AND CONTROL LABORATORY
1299	VEHICLE ANTENNA TEST FACILITY
1299-A	OPERATIONS BUILDINGS
1299-B	OPERATIONS BUILDINGS
1299-C	OPERATIONS BUILDINGS

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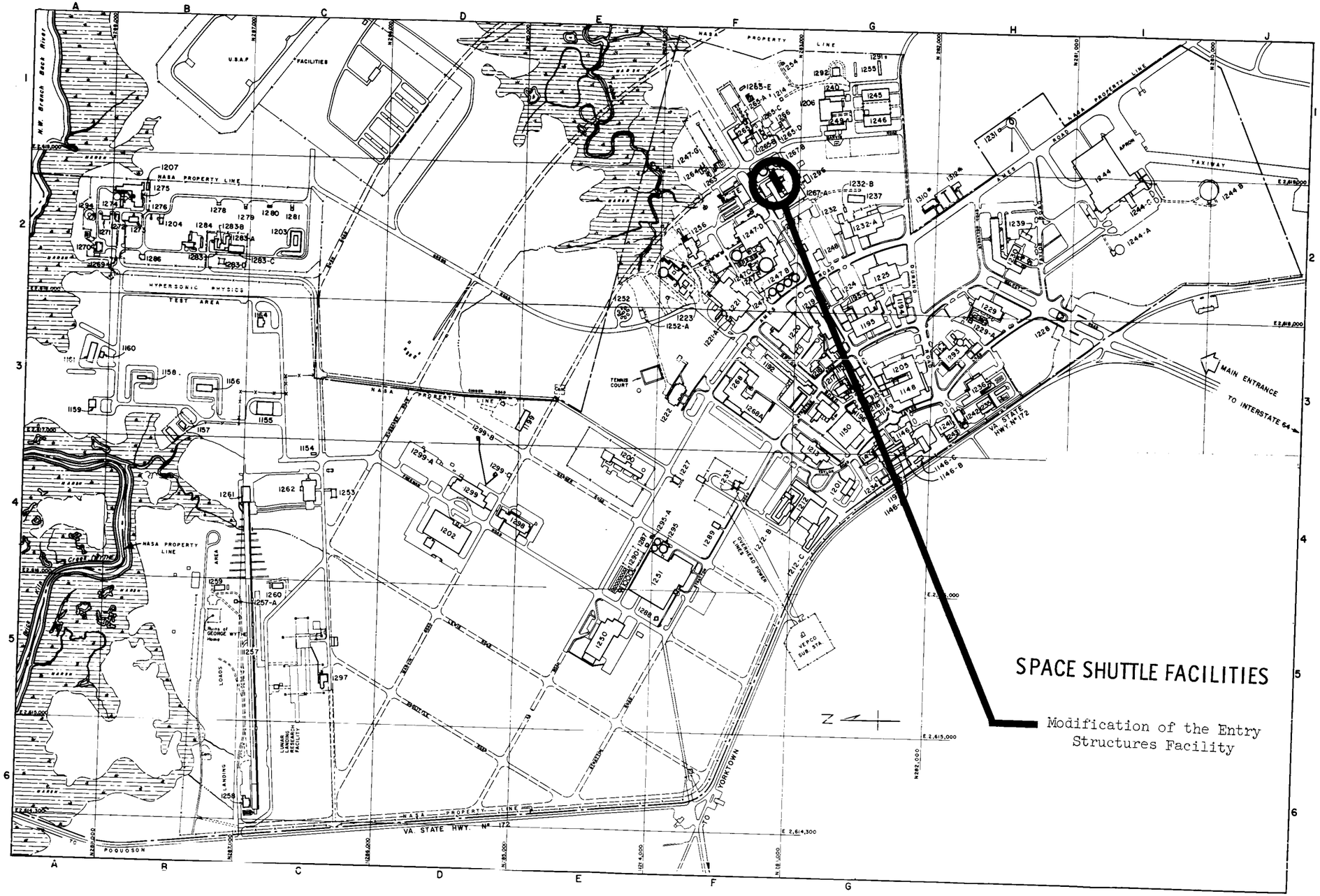

WEST AREA

1153	METAL FINISHING SHOP
1154	GATE HOUSE CMTA
1155	CHEMICAL MAGAZINE, CMTA
1156	HYDRAZENE MAGAZINE, CMTA
1157	HYDROGEN PEROXIDE MAGAZINE, CMTA
1158	ROCKET MAGAZINE, CMTA
1159	ROCKET ASSEMBLY BUILDING, CMTA
1160	ROCKET TEST CONTROL BUILDING, CMTA
1161	ROCKET TEST CELLS, CMTA
1164	NITROGEN TETROXIDE MAGAZINE, CMTA
1191	1-FOOT HYPERSONIC ARC TUNNEL
1192	PHOTOGRAPHIC LABORATORY
1192-C	VIKING PROJECT OFFICE
1194	LIBRARY
1195	FISCAL AND PROCUREMENT BUILDING
1195-A	FISCAL AND PROCUREMENT BUILDING ANNEX
1196	FOUNDRY
1199	PLANT SUPPORT FACILITY
1201	MICROMETEOROID IMPACT SIMULATOR
1202	FLIGHT INSTRUMENTATION LABORATORY
1203	CHEMICAL STORAGE HPTA
1204	PYROTECHNIC RESEARCH LABORATORY
1205	FATIGUE RESEARCH LABORATORY
1206	SHIPPING AND RECEIVING BUILDING
1207	GENERAL STORAGE (PARTS) HPTA
1212	SUBSONIC TUNNELS LABORATORY
1212-B	HIGH-SPEED 7- BY 10-FOOT TUNNEL
1212-C	V/STOL TUNNEL
1213	WEST CAFETERIA
1214	TRANSPORTATION GARAGE
1215	WEST HEATING PLANT
1216	CHEMICAL MILLING
1217	PAPER SHREDDER
1218	HEADQUARTERS ANNEX
1218-A	ANECHOIC NOISE FACILITY
1219	LRC HEADQUARTERS
1220	SIMULATION RESEARCH LABORATORY
1221	HIGH INTENSITY NOISE FACILITY
1221-A	LOW-FREQUENCY NOISE FACILITY
1222	ACTIVITIES BUILDING
1223	SEWAGE DISPOSAL PLANT
1224	LUMBER STORAGE BUILDING
1225	EXPERIMENTAL MACHINE SHOP
1227	SUBSTATION - DL
1228	MAIL GATE HOUSE
1229	LOADS DIVISION
1229-A	BLOWDOWN TUNNEL (PILOT MODELS)
1230	INSTRUMENT RESEARCH LABORATORY
1231	ROTOR TEST TOWER
1232	SPACE TECHNOLOGY DIVISION
1232-A	FABRICATION SHOP
1233	STRATTON ROAD SUBSTATION
1234	JET EXIT TEST FACILITY
1235	FREQUENCY CONVERTER BUILDING
1236	4- BY 4-FOOT SUPERSONIC PRESSURE TUNNEL
1237	RESEARCH MODEL SUPPORT SHOP
1239	WARNER ROAD SUBSTATION
1240	READY ISSUE STORES BUILDING
1241	DRIVE CONTROL BUILDING
1242	PROPELLER STATIC TEST STAND
1243	YORKTOWN ROAD SUBSTATION
1244	HANGAR
1244-A	WATER TANK NO. 2
1244-B	VIKING LANDER IMPACT TEST FACILITY
1245	GENERAL STORAGE BUILDING
1246	GENERAL STORAGE BUILDING
1247-A	AERO-PHYSICS LABORATORY CENTER
1247-B	AERO-PHYSICS LABORATORY WEST WING
1247-C	AERO-PHYSICS LABORATORY COOLING TOWER
1247-D	AERO-PHYSICS LABORATORY EAST WING
1247-E	HIGH PRESSURE AIR FACILITY
1247-F	AMES ROAD SUBSTATION
1247-G	EXPANSION TUBE (PILOT MODEL)
1248	PLANT SAFETY BUILDING
1249	VEHICLE SERVICE BUILDING
1251	UNITARY PLAN WIND TUNNEL
1252	WATER TANK NO. 1
1252-A	TRANSPORTATION DISPATCHING OFFICE
1253	SUBSTATION - S2
1254	RADIATION WASTE STORAGE
1255	GENERAL STORAGE BUILDING
1256	9- BY 6-FOOT THERMAL STRUCTURES TUNNEL
1257	LANDING LOADS TRACK
1257-A	PAVED TEST STRIP
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
1265-A	OPERATIONS BUILDINGS
1265-B	OPERATIONS BUILDINGS
1265-C	OPERATIONS BUILDINGS
1265-D	OPERATIONS BUILDINGS
1265-E	OPERATIONS BUILDINGS
1266	MOFFETT ROAD SUBSTATION
1267	ENTRY STRUCTURES FACILITY
1267-A	ENTRY STRUCTURES SHOP
1267-B	CLOSED RAW WATER COOLING SYSTEM
1268	DATA REDUCTION CENTER
1269	GATE HOUSE (SUPERSONIC THROUGH TEST AREA)
1270	ROCKET PROPULSION STATIC TEST FACILITY, HPTA
1271	DATA REDUCTION AND ACQUISITION FACILITY, HPTA
1272	HEATING PLANT, HPTA
1273	OPERATIONS CENTER, HPTA
1274	HIGH ENTHALPY ARC TUNNEL, HPTA
1275	IMPACT AND ARC TUNNELS FACILITY, HPTA
1276	IGNITER ASSEMBLY BUILDING, HPTA
1277	STORAGE A, HPTA
1278	EXPLOSIVE STORAGE, HPTA
1279	INERT ROCKET MATERIAL STORAGE NO. 1, HPTA
1280	HIGH EXPLOSIVE STORAGE, HPTA
1281	INERT ROCKET MATERIAL STORAGE NO. 2, HPTA
1282	STORAGE F, HPTA
1283	MATERIALS RADIATION LABORATORY
1284	PROPELLANT MIXING FACILITY, HPTA
1285	STORAGE H, HPTA
1286	ROCKET ASSEMBLY AND PROPELLANT ALTERATION BUILDING
1287	11-FOOT VACUUM SPHERE SHOP
1288	SOLAR-ENERGY COLLECTOR
1289	CUSTODIAL CONTRACTOR BUILDING
1290	SUBSTATION - UPWT
1291	PUMP STATION
1292	CONSTRUCTION AND REPAIR SHOP
1293-A	ATTITUDE CONTROL SIMULATOR FAC.
1293-B	DYNAMICS RESEARCH LABORATORY
1294	ROCKET MOTOR TEST FACILITY
1295	SHOP AND INSTRUMENTATION FOR 60-FOOT SPHERE
1295-A	PUMP HOUSE
1296	CERAMIC SPRAY SHOP
1297	LUNAR LANDING RESEARCH FACILITY
1298	STABILIZATION AND CONTROL LABORATORY
1299	VEHICLE ANTENNA TEST FACILITY
1299-A	OPERATIONS BUILDINGS
1299-B	OPERATIONS BUILDINGS
1299-C	OPERATIONS BUILDINGS

CF 9-2

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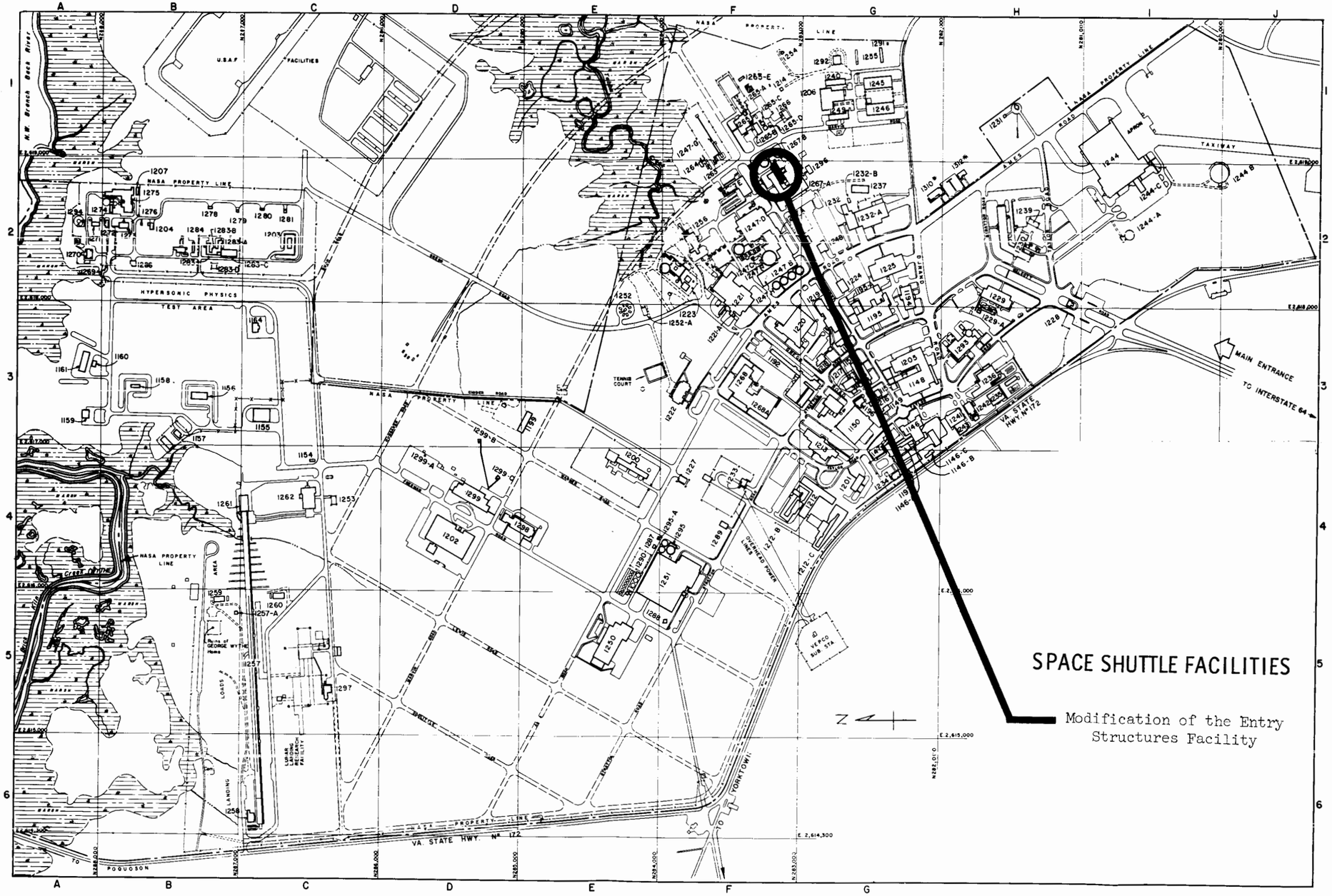
LOCATION PLAN



WEST AREA

1146 STRUCTURES RESEARCH LABORATORY
1149 DISPENSARY
1150 MODEL SHOP
1151 MANAGEMENT SUPPORT BUILDING
1152 PUBLICATIONS BUILDING
1153 METAL FINISHING SHOP
1154 GATE HOUSE CMTA
1155 CHEMICAL MAGAZINE, CMTA
1156 HYDRAZINE MAGAZINE, CMTA
1157 HYDROGEN PEROXIDE MAGAZINE, CMTA
1158 ROCKET MAGAZINE, CMTA
1159 ROCKET ASSEMBLY BUILDING, CMTA
1160 ROCKET TEST CONTROL BUILDING, CMTA
1161 ROCKET TEST CELLS, CMTA
1164 NITROGEN TETROXIDE MAGAZINE, CMTA
1191 1-FOOT HYPERSONIC ARC TUNNEL
1192 PHOTOGRAPHIC LABORATORY
1192-C VIKING PROJECT OFFICE
1194 LIBRARY
1195 FISCAL AND PROCUREMENT BUILDING
1195-A FISCAL AND PROCUREMENT BUILDING ANNEX
1196 FOUNDRY
1199 PLANT SUPPORT FACILITY
1201 MICROMETEOROID IMPACT SIMULATOR
1202 FLIGHT INSTRUMENTATION LABORATORY
1203 CHEMICAL STORAGE HPTA
1204 PYROTECHNIC RESEARCH LABORATORY
1205 FATIGUE RESEARCH LABORATORY
1206 SHIPPING AND RECEIVING BUILDING
1207 GENERAL STORAGE (PARTS) HPTA
1212 SUBSONIC TUNNELS LABORATORY
1212-B HIGH-SPEED 7- BY 10-FOOT TUNNEL
1212-C V/STOL TUNNEL
1213 WEST CAFETERIA
1214 TRANSPORTATION STORAGE
1215 WEST HEATING PLANT
1216 CHEMICAL MILLING
1217 PAPER SHREDDER
1218 HEADQUARTERS ANNEX
1218-A ANECHOIC NOISE FACILITY
1219 LRC HEADQUARTERS
1220 SIMULATION RESEARCH LABORATORY
1221 HIGH INTENSITY NOISE FACILITY
1221-A LOW-FREQUENCY NOISE FACILITY
1222 ACTIVITIES BUILDING
1223 SEWAGE DISPOSAL PLANT
1224 LUMBER STORAGE BUILDING
1225 EXPERIMENTAL MACHINE SHOP
1227 SUBSTATION - DL
1228 MAIL GATE HOUSE
1229 LOADS DIVISION
1229-A BLOWDOWN TUNNEL (PILOT MODELS)
1230 INSTRUMENT RESEARCH LABORATORY
1231 ROTOR TEST TOWER
1232 SPACE TECHNOLOGY DIVISION
1232-A FABRICATION SHOP
1233 STRATTON ROAD SUBSTATION
1234 JET EXIT TEST FACILITY
1235 FREQUENCY CONVERTER BUILDING
1236 4- BY 4-FOOT SUPERSONIC PRESSURE TUNNEL
1237 RESEARCH MODEL SUPPORT SHOP
1239 WARNER ROAD SUBSTATION
1240 READY ISSUE STORES BUILDING
1241 DRIVE CONTROL BUILDING
1242 PROPELLER STATIC TEST STAND
1243 YORKTOWN ROAD SUBSTATION
1244 HANGAR
1244-A WATER TANK NO. 2
1244-B VIKING LANDER IMPACT TEST FACILITY
1245 GENERAL STORAGE BUILDING
1246 GENERAL STORAGE BUILDING
1247-A AERO-PHYSICS LABORATORY CENTER
1247-B AERO-PHYSICS LABORATORY WEST WING
1247-C AERO-PHYSICS LABORATORY COOLING TOWER
1247-D AERO-PHYSICS LABORATORY EAST WING
1247-E HIGH PRESSURE AIR FACILITY
1247-F AMES ROAD SUBSTATION
1247-G EXPANSION TUBE (PILOT MODEL)
1248 PLANT SAFETY BUILDING
1249 VEHICLE SERVICE BUILDING
1251 UNITARY PLAN WIND TUNNEL
1252 WATER TANK NO. 1
1252-A TRANSPORTATION DISPATCHING OFFICE
1253 SUBSTATION - S2
1254 RADIATION WASTE STORAGE
1255 GENERAL STORAGE BUILDING
1256 9- BY 6-FOOT THERMAL STRUCTURES TUNNEL
1257 LANDING LOADS TRACK
1257-A PAVED TEST STRIP
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 6-FOOT HIGH-TEMPERATURE STRUCTURES TUNNEL
1265-A OPERATIONS BUILDINGS
1265-B OPERATIONS BUILDINGS
1265-C OPERATIONS BUILDINGS
1265-D OPERATIONS BUILDINGS
1265-E OPERATIONS BUILDINGS
1266 MOFFETT ROAD SUBSTATION
1267 ENTRY STRUCTURES FACILITY
1267-A ENTRY STRUCTURES SHOP
1267-B CLOSED RAW WATER COOLING SYSTEM
1268 DATA REDUCTION CENTER
1269 GATE HOUSE (HYPERSONIC PHYSICS TEST AREA)
1270 ROCKET PROPULSION STATIC TEST FACILITY, HPTA
1271 DATA REDUCTION AND ACQUISITION FACILITY, HPTA
1272 HEATING PLANT, HPTA
1273 OPERATIONS CENTER, HPTA
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1276 IGNITER ASSEMBLY BUILDING, HPTA
1277 STORAGE A, HPTA
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1284 PROPELLANT MIXING FACILITY, HPTA
1285 STORAGE H, HPTA
1286 ROCKET ASSEMBLY AND PROPELLANT ALTERATION BUILDING
1287 41-FOOT VACUUM SPHERE SHOP
1288 SOLAR-ENERGY COLLECTOR
1289 CUSTODIAL CONTRACTOR BUILDING
1290 SUBSTATION - UPWT
1291 PUMP STATION
1292 CONSTRUCTION AND REPAIR SHOP
1293-A ATTITUDE CONTROL SIMULATOR FAC.
1293-B DYNAMICS RESEARCH LABORATORY
1294 ROCKET MOTOR TEST FACILITY
1295 SHOP AND INSTRUMENTATION FOR 60-FOOT SPHERE
1295-A PUMP HOUSE
1296 CERAMIC SPRAY SHOP
1297 LUNAR LANDING RESEARCH FACILITY
1298 STABILIZATION AND CONTROL LABORATORY
1299 VEHICLE ANTENNA TEST FACILITY
1299-A OPERATIONS BUILDINGS
1299-B OPERATIONS BUILDINGS
1299-C OPERATIONS BUILDINGS

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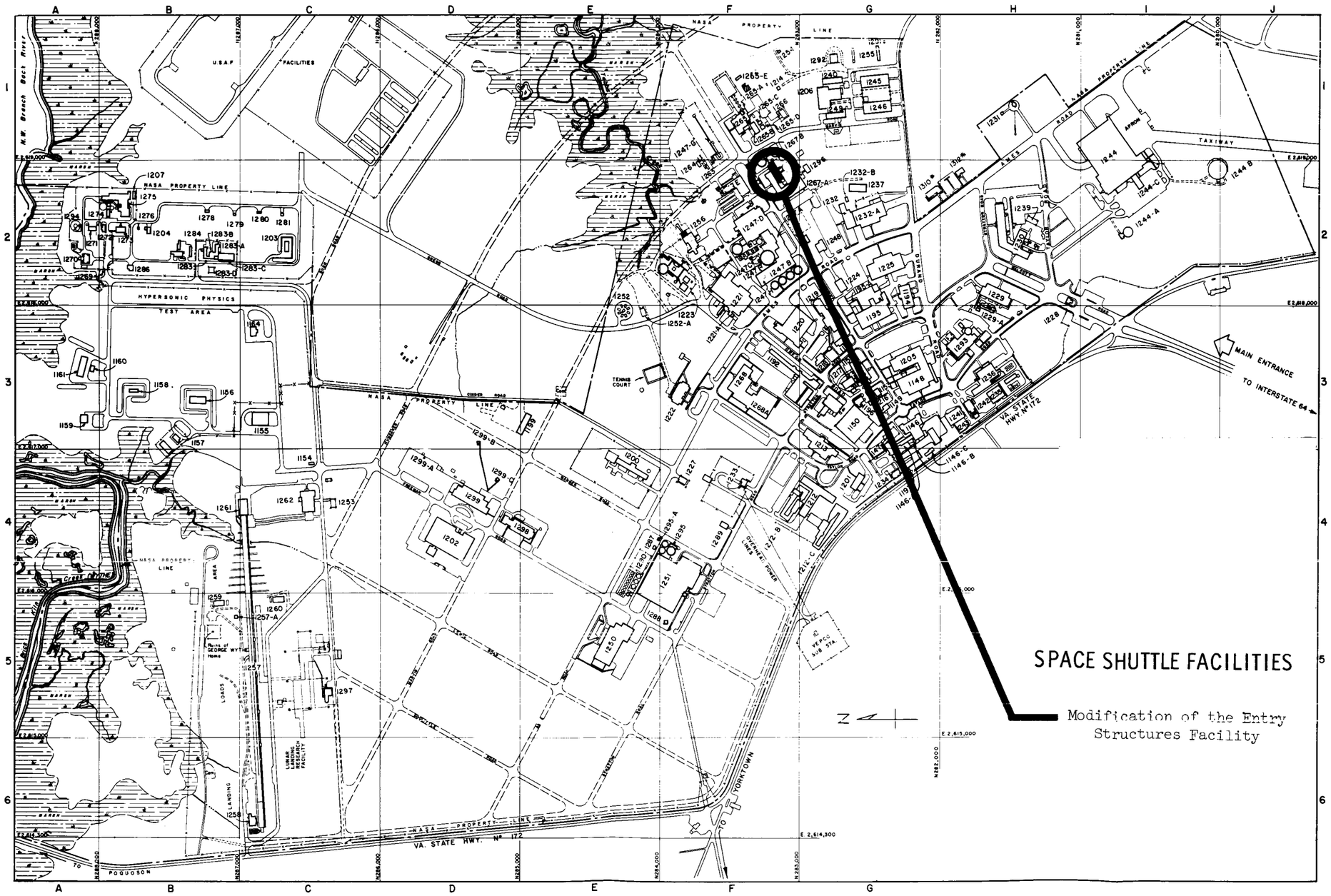
LANGLEY RESEARCH CENTER

FISCAL YEAR 1973 ESTIMATES

LOCATION PLAN



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FACILITY NO.	DESCRIPTION
1146	16-FOOT TRANSONIC TUNNEL
1147	TAYLOR ROAD SUBSTATION
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1151	MANAGEMENT SUPPORT BUILDING
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1214	TRANSPORTATION STORAGE
1215	WEST HEATING PLANT
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1218-A	ANECHOIC NOISE FACILITY
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1221	HIGH INTENSITY NOISE FACILITY
1221-A	LOW-FREQUENCY NOISE FACILITY
1222	ACTIVITIES BUILDING
1223	SEWAGE DISPOSAL PLANT
1224	LUMBER STORAGE BUILDING
1225	EXPERIMENTAL MACHINE SHOP
1227	SUBSTATION - DL
1228	MAIL GATE HOUSE
1229	LOADS DIVISION
1229-A	BLOWDOWN TUNNEL (PILOT MODELS)
1230	INSTRUMENT RESEARCH LABORATORY
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1232	SPACE TECHNOLOGY DIVISION
1232-A	FABRICATION SHOP
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1234	JET EXIT TEST FACILITY
1235	FREQUENCY CONVERTER BUILDING
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1237	RESEARCH MODEL SUPPORT SHOP
1239	WARNER ROAD SUBSTATION
1240	READY ISSUE STORES BUILDING
1241	DRIVE CONTROL BUILDING
1242	PROPELLER STATIC TEST STAND
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1249	VEHICLE SERVICE BUILDING
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1254	RADIATION WASTE STORAGE
1255	GENERAL STORAGE BUILDING
1256	9- BY 6-FOOT THERMAL STRUCTURES TUNNEL
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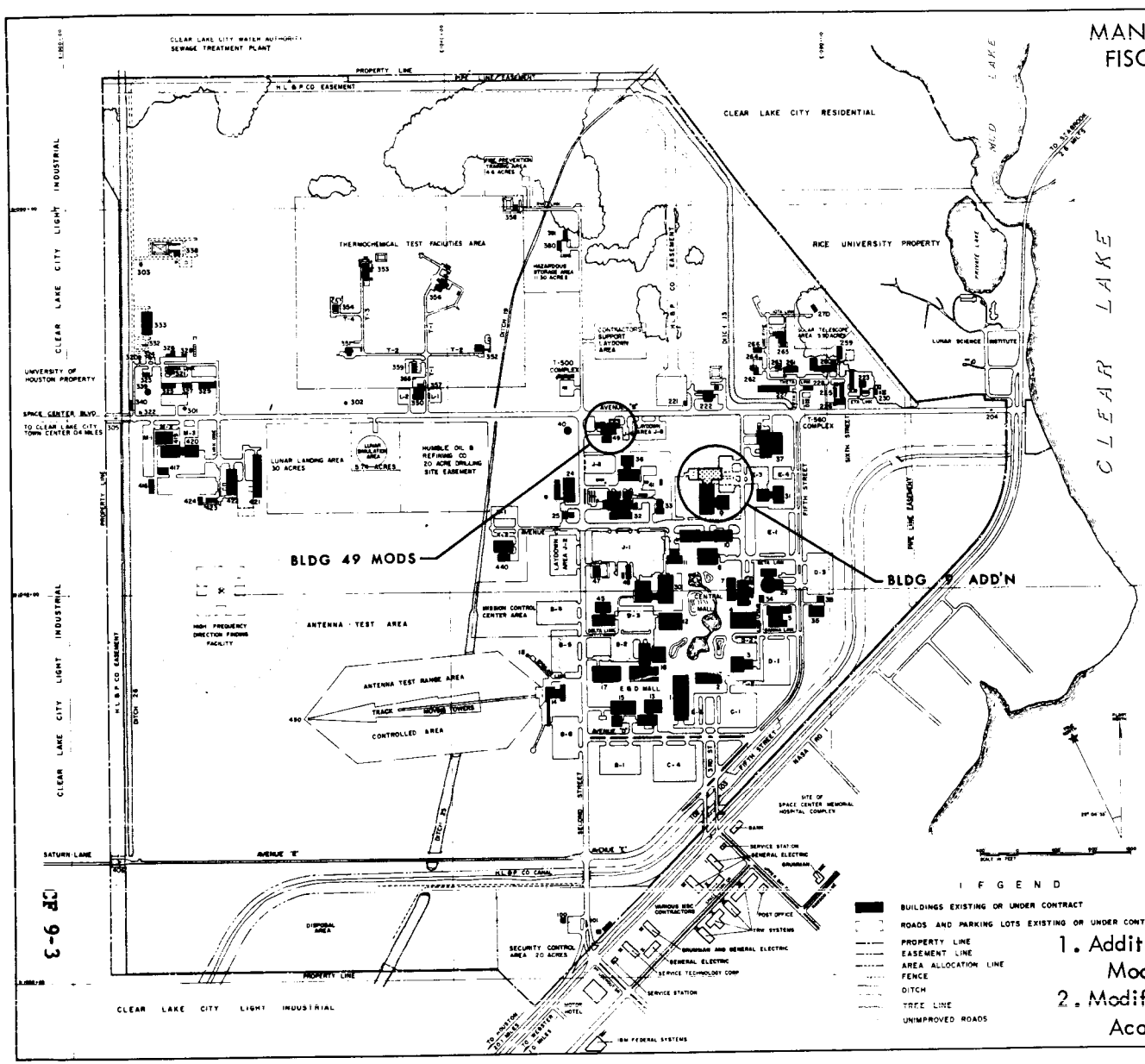
MANNED SPACECRAFT CENTER
FISCAL YEAR 1973 ESTIMATES
LOCATION PLAN



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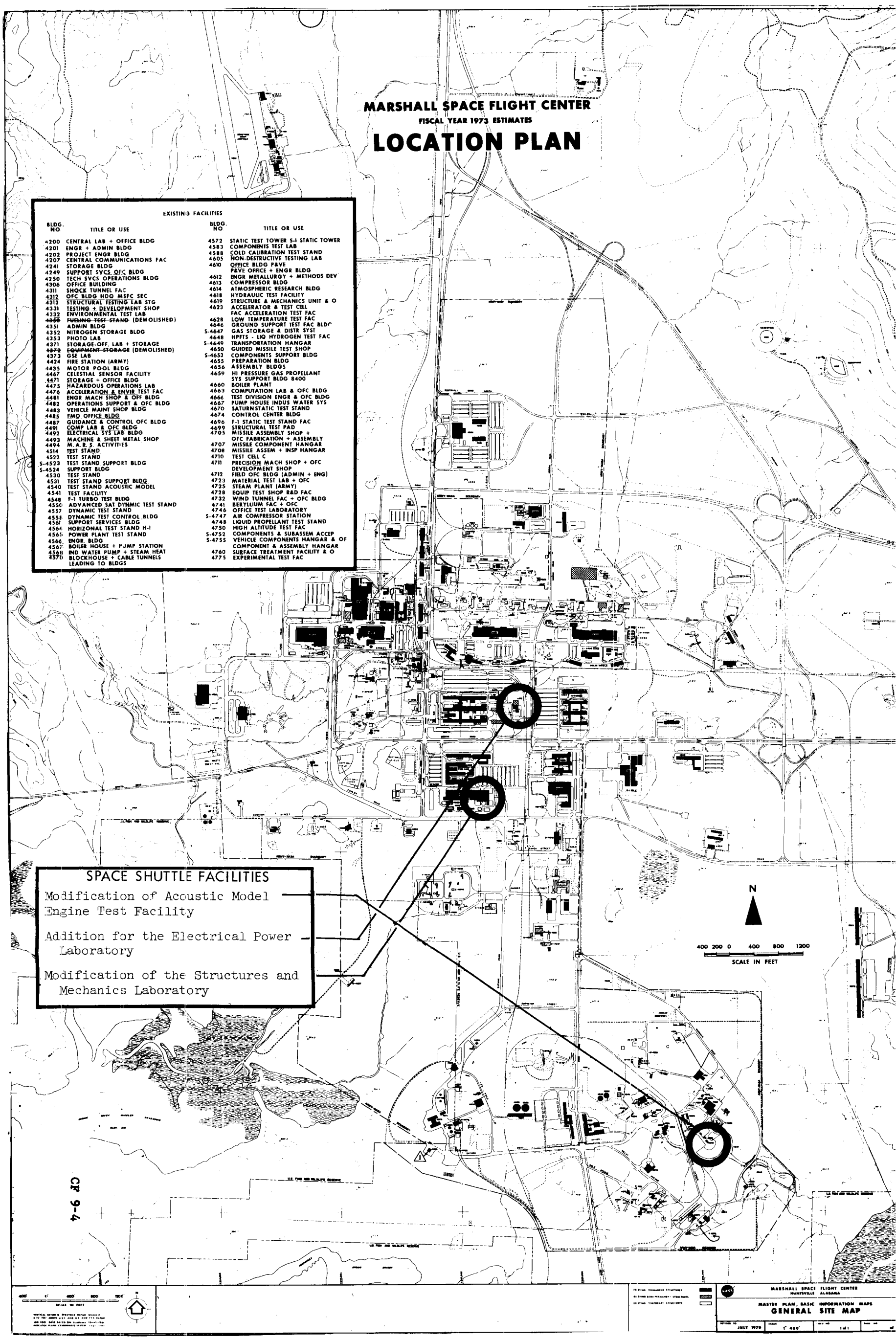
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4613 COMPRESSOR BLDG
4614 ATMOSPHERIC RESEARCH BLDG
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SCALE IN FEET
MARSHALL SPACE FLIGHT CENTER
HUNTSVILLE ALABAMA
MASTER PLAN, BASIC INFORMATION MAPS
GENERAL SITE MAP
JULY 1970
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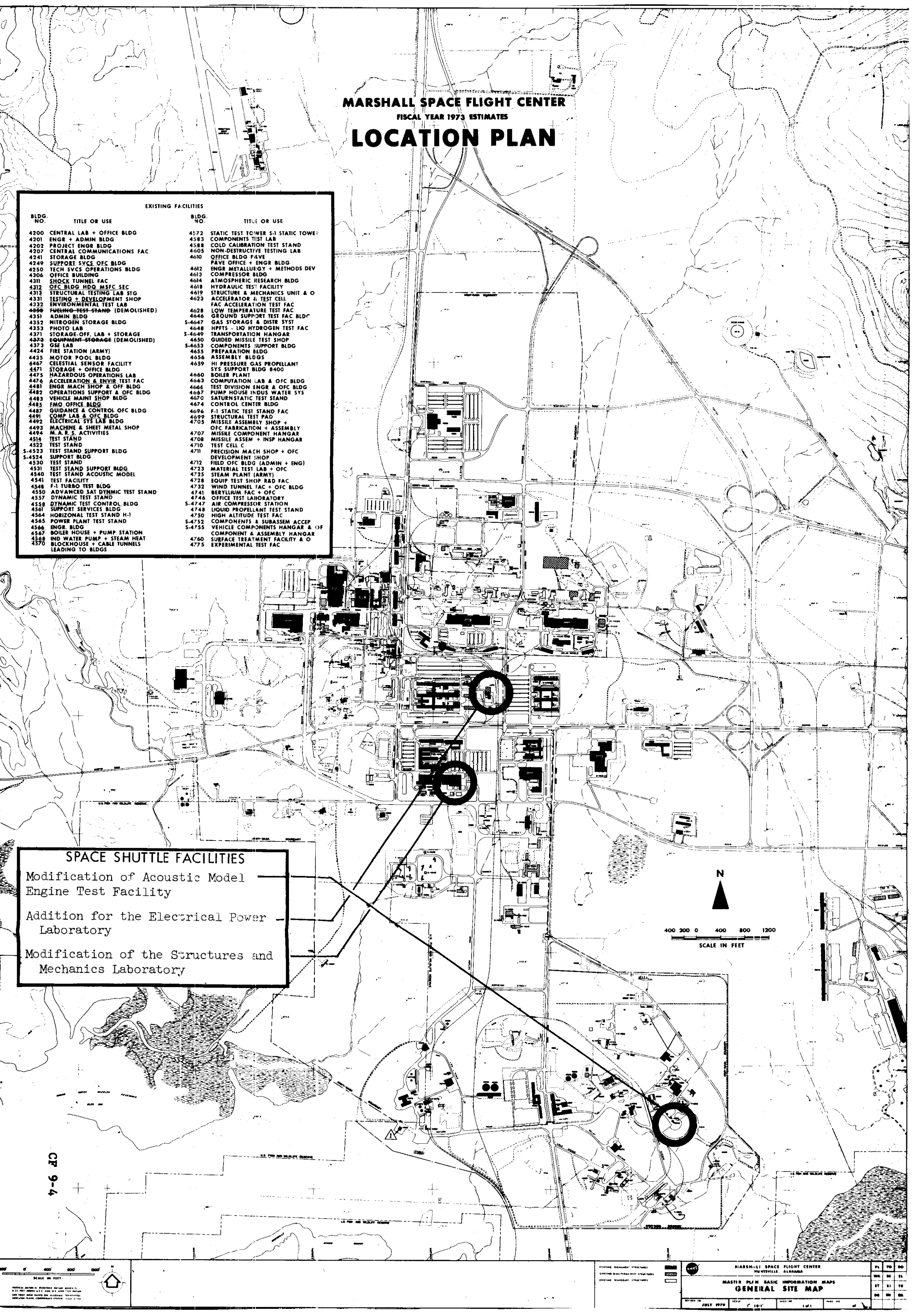
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GENERAL SITE MAP
JULY 1970

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE Space Shuttle Facilities at Various Locations

FY 1973 CoF ESTIMATE $27,900,000

COGNIZANT INSTALLATION: Various Locations

LOCATION OF PROJECT: Locations as identified or to be selected as indicated in the following documentation.

COGNIZANT PROGRAM OFFICES: Office of Manned Space Flight
Office of Aeronautics and Space Technology

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$4,685,000
Construction	20,000,000
Total FY 1972 and Prior Years	$24,685,000

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to rehabilitate, modify and add to existing Government-owned facilities so that they may be effectively used to meet requirements generated by and in support of the space shuttle program. In FY 1973 these requirements fall into three main areas: (1) Engine Test Facilities needed to support the development and acceptance of a reusable high pressure liquid oxygen/liquid hydrogen engine to be used in the orbiter vehicle, and a pressure fed liquid oxygen/RP-1 or propane type booster engine; (2) Research and Development Facilities required for research, development, testing, evaluation and qualification of each key element of the total system, such as acoustic model engine test for early solutions to problems associated with induced vibrations; acoustic and sonic fatigue tests of vehicle components, structures and mechanical systems; electrical systems development; vibration and structural testing of component and sub-systems; and systems integration; and (3) Manufacturing and Final Assembly Facilities required for the manufacture of test articles, certain components of the total system and the final assembly of flight booster and orbiter vehicles and associated external tanks.

BRIEF PROJECT JUSTIFICATION:

General - The FY 1972 CoF program provided for the modification of facilities for two sea level test positions at the Mississippi Test Facility (MTF), Bay St. Louis, Mississippi, for the testing of a new high pressure engine to be used in the orbiter. These two test positions are being provided by the modification of existing Government-owned facilities at MTF. The FY 1972 program also provided for the initial actions related to the modification of engine altitude test facilities at Arnold Engineering Development Center (AEDC), Tullahoma, Tennessee, and for facilities modifications required in support of the development of thermal protection systems associated with the flight vehicles of the space shuttle program.

This proposed FY 1973 program continues and extends the FY 1972 increment of the space shuttle facilities program. Included in this project are the requirements for: (1) Main Engine Test Facilities required for the continuation of the altitude test capability at AEDC, the rehabilitation of the cryogenic and gas systems at MTF, and the modification of two existing test stands for sea level testing of the pressure fed booster engine and its thrust chamber; (2) Modifications and additions to the research and development facilities at Marshall Space Flight Center, Huntsville, Alabama; Manned Spacecraft Center, Houston, Texas; and Langley Research Center, Hampton, Virginia; and (3) the initial phase of modifications to existing Government-owned facilities required to manufacture major subassemblies, such as the fuselage, wings, vertical stabilizers, to install thermal protection systems and the final assembly of the booster, orbiter, and the orbiter external propellant tanks.

This FY 1973 CoF request is submitted in such a manner as to permit later accommodation to a subsequent decision regarding the specific type of booster to be utilized. Studies are continuing on this matter and the two primary candidate types are: (1) a pressure fed liquid oxygen/RP-1 or propane fueled water recoverable type booster; and (2) a solid fueled expendable booster. The facilities requirements presented in this request are structured to initially support the pressure fed booster configuration and to permit ready adaption to the requirements of the solid fueled configuration.

To provide resources for the first phase of the pressure fed engine test facilities and to augment manufacturing facilities for the booster, it becomes necessary to defer one research and development project and curtail the scope of two other projects which would otherwise be provided from FY 1973 resources for the solid fueled booster configuration. Projects so affected are the Addition for Systems Integration and Mockup

Laboratory at MSC, the Modification to the Altitude Test Facilities at AEDC, and the Modification of the Structures and Mechanics Laboratory at MSFC. In the event a subsequent determination is made to select a solid fueled booster, the affected projects would be provided for at the levels shown under summary project cost estimates below.

This summary is a listing of projects included in the FY 1973 CoF request reflecting the associated estimated costs, and the adjustments for each booster configuration.

PROJECT DESCRIPTION:

This project provides for necessary modification, rehabilitation, and addition to existing engine test facilities, research and development facilities, and manufacturing and final assembly facilities in support of the space shuttle program. It is comprised of ten projects as shown under the Summary Project Cost Estimate. The detailed documentation for each project, including purpose, justification, description and cost estimate therefore is subsequently provided below.

SUMMARY PROJECT COST ESTIMATE:

	Booster Configuration	
	Pressure Fed	Solid Fueled
Main Engine Test Facilities.....	$11,435,000	$7,960,000
Modifications of pressure fed engine test facilities, Various.....	4,795,000	---
Modification of altitude test facilities, Arnold Engineering Development Center.....	5,480,000	6,800,000
Rehabilitation of propellant and high pressure gaseous systems, Mississippi Test Facility.....	1,160,000	1,160,000
Research and Development Facilities.....	9,575,000	14,400,000
Modification of the entry structures facility, Langley Research Center.....	1,635,000	1,635,000
Addition for systems integration and mockup laboratory, Manned Spacecraft Center.....	---	2,545,000
Modification of the vibration and acoustic test facility, Manned Spacecraft Center...	2,770,000	2,770,000
Modification of the structures and mechanics laboratory, Marshall Space Flight Center.....	2,420,000	4,700,000

	Booster Configuration	
	Pressure Fed	Solid Fueled
Addition for electrical power laboratory, Marshall Space Flight Center.....	$320,000	$320,000
Modification of acoustic model engine test facility, Marshall Space Flight Center.....	2,430,000	2,430,000
Manufacturing and Final Assembly Facilities...	6,890,000	5,540,000
Modification of manufacturing and final assembly facilities, Various.....	6,890,000	5,540,000
TOTAL.....	$27,900,000	$27,900,000

PROJECT DOCUMENTATION:

There follows, in the order of the above listing, a detailed justification, description and cost estimate for each project included in this space shuttle facilities project.

MODIFICATIONS FOR PRESSURE FED ENGINE TEST FACILITIES
Various Locations

SUMMARY PURPOSE AND SCOPE:

This project provides for the modification of two existing test stands at a Government-owned location to be determined for the sea level testing of the pressure fed booster engine and its thrust chamber. This testing is required for development and qualification of the pressure fed engine and its thrust chamber for space flight. Although a specific installation has not yet been selected, the facility modifications required have been determined on the basis of detailed engineering evaluation of test requirements and the existing facilities to achieve program goals. The estimated cost of facility modifications shown in this project have been developed using the Edwards Test Facility, Edwards Air Force Base, California as the basis for the work which would most probably be involved.

PROJECT JUSTIFICATION:

A key element in the development of a recoverable booster for the shuttle is a new liquid oxygen/RP-1 or liquid oxygen/propane engine, with a thrust level of approximately 1.2 million pounds. Seven such engines could then be clustered to make up a booster stage.

The evaluation of the developmental and acceptance test program for such an engine dictate that a minimum of two sea level engine test positions be provided to meet program requirements. To achieve the test objectives, modification of two existing engine test stands will be necessary. This fiscal year 1973 request provides for one operable engine test position. A second position will be accomplished with subsequent fiscal year resources.

A critical component of this engine which requires early development is the thrust chamber. Developmental testing and simulation essential to evaluate and resolve issues relating to the chamber's combustion dynamics and stability, heat transfer, material selection, propellant injection and ignition will be required. The primary objective of this work is to develop a chamber that is readily maintainable and reusable. To meet these needs, modifications of an existing test stand for this purpose will be necessary.

The current pressure fed engine development schedule provides for the start of component developmental testing in mid 1973, and for the first static engine firing in early 1974. To meet these goals, the modification of the facilities as proposed must be accomplished with FY 1973 resources.

PROJECT DESCRIPTION:

This project provides for modifications to two existing test stands at a Government-owned location for testing the pressure fed booster engine and thrust chamber. An engine stand, which was formerly used for engine testing, will be adapted to test the new engine; and an additional stand will be activated for the thrust chamber developmental effort.

The work will consist of procurement and installation of 80,000 gallon liquid oxygen and 40,000 gallon fuel run tanks at the engine stand. The stand's superstructures will be modified to support the new cylindrical run tanks. A new 1,250 cubic feet, 5,000 pounds per square inch gaseous nitrogen storage vessel will be added to provide the necessary pressurant and purging requirements. Associated modifications and additions to the on-stand gaseous and propellant piping to interface with the new engine will also be accomplished.

Other work will include structural modification to the existing thrust mount structure, changes to the electrical system, provision for new hole pattern in the stand deflector, and modifications and addition to the on-stand and the test control center's instrumentation and control systems.

Modification to a test stand for thrust chamber work will include those structural, mechanical and electrical changes required to adapt the stand for testing the new thrust chamber. A new thrust measuring system will be

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added; however, the existing run tanks, with certain modifications will be used. The instrumentation and control systems on the stand and in the test control center will be upgraded and adapted for this effort.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,910,000
Engine test stands modifications	LS	---	---	890,000
Structural modifications	LS	---	---	(265,000)
Mechanical modifications	LS	---	---	(385,000)
Electrical instrumentation system modification	LS	---	---	(240,000)
Thrust chamber stand modifications	LS	---	---	810,000
Test control centers modifications	LS	---	---	210,000
Equipment				2,885,000
Liquid oxygen tank	Each	1	---	1,300,000
Fuel tank	Each	1	---	780,000
High pressure gaseous vessel and valves	LS	---	---	695,000
Instrumentation and control	LS	---	---	110,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$4,795,000

BOOSTER SELECTION IMPACT STATEMENT:

If a solid fueled booster is selected this project will not be required, and the associated resources ($4,795,000) must then be applied to implement the Addition for Systems Integration and Mockup Laboratory and the second phase of the Structures and Mechanics Laboratory as elements of the FY 1973 program.

MODIFICATION OF ALTITUDE TEST FACILITIES

Arnold Engineering Development Center
Tullahoma, Tenn.

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to modify the existing J-4 Altitude Test Cell at Arnold Engineering Development Center, Tullahoma, Tenn., and adapt it for simulated altitude testing of the space shuttle's orbiter main engine. This testing is required for research, development and qualification of this engine for flight in outer space.

PROJECT JUSTIFICATION:

A key element in the development of the reusable shuttle's orbiter is a new high pressure, throttleable liquid oxygen/liquid hydrogen (LOX-LH_2) rocket engine. Developmental and acceptance testing of this engine under sea level conditions will be accomplished at the Mississippi Test Facility, Bay St. Louis, Mississippi. However, since the orbiter vehicle will operate at extreme altitudes, performance verification and reliability considerations dictate the need for testing of the engines at simulated altitude conditions.

The current development schedule for the orbiter main engine requires that the first altitude test firing be accomplished early in calendar year 1975. To meet this requirement, the procurement of long lead items, estimated to cost $2.0 million, will be initiated during mid calendar year 1972 using resources authorized and appropriated in the fiscal year 1972 Construction of Facilities Program. This fiscal year 1973 request is required to accomplish the structural, mechanical, and electrical modifications necessary to provide an operable facility for this altitude testing.

PROJECT DESCRIPTION:

This project provides for modification of the J-4 Test Cell at the Arnold Engineering Development Center, for the testing of the space shuttle orbiter main engine under simulated altitude conditions. The structural modifications of the J-4 Cell include modifications of the test capsule by the addition of a larger door, engine handling systems, and thrust measuring system. Mechanical modifications consist of providing additional spray cooling nozzles, increasing the steam and cooling water supplies as well as additions and modifications to the gas pressurant and purge system, the gimbal hydraulic supply system and the ejector/diffuser system. The instrumentation and controls will also be modified to meet the specific requirements of the new engine to be tested.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$5,480,000
Modification to structural and thrust measuring system	LS	---	---	690,000
Mechanical system modifications	LS	---	---	3,130,000
Electrical system modification	LS	---	---	1,510,000
Modification of instrumentation system	LS	---	---	150,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$5,480,000

BOOSTER SELECTION IMPACT STATEMENT:

It is now estimated that additional subsequent year resources in the amount of about $1,320,000 will be required to complete this facility as programmed for under the pressure fed booster concept. These additional resources are associated with the completion of the modifications of the instrumentation systems that normally are accomplished in the last phase of the construction and activation. As indicated in the program schedule, if a solid fueled booster is selected, the total requirements for this project in the amount of $6.8 million would be provided in fiscal year 1973.

REHABILITATION OF PROPELLANT AND HIGH PRESSURE GASEOUS SYSTEMS

Mississippi Test Facility
Bay St. Louis, Mississippi

SUMMARY PURPOSE AND SCOPE:

This project provides for the rehabilitation of the propellant and gaseous systems serving the shuttle's orbiter main engine test facilities at the Mississippi Test Facility, Bay St. Louis, Mississippi.

PROJECT JUSTIFICATION:

This project is required to provide for rehabilitation, repair, and replacement of deteriorated segments of the pressure reducing stations and the cryogenic propellant systems at the Mississippi Test Facility. The work is necessary to support the shuttle's orbiter main engine development program.

The gas reducing stations have the critical function of reducing the pressures of the incoming supply of nitrogen, hydrogen and helium gases from 6,000 pounds per square inch to approximately 3,000 pounds per square inch before delivery to the stands. These gases are then used to perform the vital tasks of purging and pressurizing the propellant run tanks and feed lines, and operating the control valves and instruments used in engine static firings. Because of the high pressures which were involved, the heavy duty which was encountered, and the subsequent inactive period, critical components of the pressure reducing stations including pressure reducing valves, shutoff valves, check and relief valves have deteriorated and will therefore require rehabilitation and replacement. Similarly, sections of the cryogenic piping which carried propellants at temperatures as low as -420°F, and associated expansion joints, seals and valves will also require replacement and repair.

The existing systems were built in 1965 and have been inactive for the past two years. During their service life, the systems were subjected to severe duty cycles resulting in component failures and the need for replacement. A recent detailed study indicates that a major rehabilitation and replacement effort is essential before the facilities are activated for the shuttle's orbiter main engine testing.

Current planning indicates that the workload for testing the main engine will be more frequent and demanding than that required to support the Saturn S-II stage development. To meet the engine developmental test program requirement, it is currently planned to conduct a total of approximately 1,000 test firings over the next five years. This will

require almost continuous availability of propellants and regulated gas supplies to the stands. Failure to accomplish this work now would degrade the reliability of the propellant and gaseous systems supporting the engine test program, and would correspondingly result in periodic stand shutdown, costly down modes for the idle facility and personnel, propellant wastage, and potential adverse impact on program schedules.

The work must be accomplished in the FY 1973 time frame in order to meet the start of engine test firings planned in first quarter of calendar year 1974.

PROJECT DESCRIPTION:

The project provides for rehabilitation, replacement, and upgrading of the gas pressure reducing stations serving test stands A-1 and A-2 as well as rehabilitation of the propellant transfer system at the stands and in the propellant storage area.

The rehabilitation work at the reducing stations will include: major overhaul of approximately 18 pressure reducing valves and 45 control valves, replacement of 30 valves and 14 regulators, installation of 7 new regulators and approximately 3,950 lineal feet of distribution lines.

For the propellant system, the rehabilitation effort will include realignment of 10,000 lineal feet of cryogenic piping support, replacement of 32 seals, overhaul of 14 LH_2 motor valves and replacement of approximately 21 check valves, 10 expansion joints, and 400 lineal feet of the cryogenic lines.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,160,000
Modification to gas pressure reducing stations	LS	---	---	548,000
Modification to cryogenic piping system	LS	---	---	612,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$1,160,000

MODIFICATION OF THE ENTRY STRUCTURES FACILITY

Langley Research Center
Hampton, Virginia

SUMMARY PURPOSE AND SCOPE:

This project is necessary to modify an existing facility at Langley Research Center to provide capability for research on the shuttle's heat shield materials and components under simulated reentry conditions.

PROJECT JUSTIFICATION:

The thermal protection systems for advanced aerospace vehicles, like the shuttle, present unique design and development problems. Previous manned space vehicles were designed for only one mission and a reentry duration period of 100 seconds. The shuttle's orbiter, on the other hand, will require that the heat shield be capable to withstand up to 100 entries, each of which would range in duration from 1,000 to 2,000 seconds. Material samples to be tested include non-metallic and metallic substances. To accomplish the required testing, modification of the existing facility is necessary.

The facility is required to investigate and evaluate the effects of cyclic heat fluxes on test specimens of various materials. Emphasis will be placed on simulating the aerodynamic and thermal effects in and around the joints as well as the impact and interface of cyclic heating on candidate thermal protection specimens. This will require subjecting the material samples to repeated tests, totalling as many as 100 to 120 tests per sample. Data on material strength, creep and other parameters will be collected and analyzed.

To meet the requirement for the great number of tests and for the long durations cited, it will be necessary in this time frame to install three multi-parameter simulators and a new arc heated aerothermal apparatus to simulate shuttle entry heating.

PROJECT DESCRIPTION:

The existing Entry Structures Facility, Building 1267 will be modified and upgraded in two principal areas: (1) the addition of three multi-parameter simulators; and (2) installation of an arc heated aerothermal apparatus and upgrading of supporting utilities.

The three multi-parameter simulators will consist of three identical assemblies arranged for independent operation. Each assembly will have a vacuum chamber arranged to contain six test specimens and capable of subjecting each specimen to a tensile load varying up to 1,000 pounds. The specimen will be mounted in a cylindrical cluster which will be enclosed by an electric heater and water cooling jacket.

The existing test facility will be upgraded to accommodate test specimens 25 cm long, 20 cm wide for higher mass flow rates and longer test durations than currently exist. This will be accomplished by installing a new arc heated aerothermal apparatus. The apparatus will consist of a new test section, nozzle and two arc heaters of different performance parameters. To support the operations of the new apparatus, additional power, cooling water and air supply will be supplied from nearby facilities. Electric transformers, switchgear and controls will be installed to provide the necessary power supply.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$585,000
Utilities (electrical, cooling water and gas)	LS	---	---	585,000
Equipment				1,050,000
Multi-parameter test simulators	LS	---	---	575,000
Arc heated aerothermal apparatus	LS	---	---	445,000
Transformers	LS	---	---	30,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$1,635,000

ADDITION FOR SYSTEMS INTEGRATION AND MOCKUP LABORATORY

Manned Spacecraft Center
Houston, Texas

SUMMARY PURPOSE AND SCOPE:

This project will provide a 35,900 square foot addition to the Technical Service Facility, Building 9, at the Manned Spacecraft Center. This capability is required in order to conduct engineering experiments with the use of mockups in support of the development and integration of the shuttle systems.

PROJECT JUSTIFICATION:

This facility is required to conduct broad experimental engineering programs ranging from simple full scale mockups for configuration definition to more sophisticated prototypes for the integration of the shuttle's subsystems.

Exploratory mockup development is utilized extensively by planners and designers of large vehicles such as ships, submarines and spacecrafts during the conceptual stages. At that time, many problems relating to form, fit, and functions can be identified and resolved through the use of inexpensive mockups. Such use will most probably minimize expensive changes during hardware fabrication and would therefore result in a more effective and economical development program.

In many cases, only full-scale functional mockups provide a means to achieve meaningful evaluation. As these spacecraft programs move from the design concept phase into early development, harder system and subsystem mockups will be required for the resolution of interfaces and solution of subsystem integration problems. These relatively high fidelity mockups will be integrated with sophisticated checkout and control electronics to evaluate control response, adequacy, and display. Because of the shuttle vehicle size and complexity, the number of personnel to be accommodated, and cargo transport and handling requirements, this systems integration facility is necessary.

The need for this specific capability is in the early phases of vehicle design and development; therefore, fiscal year 1973 funds are required. This facility will be used later to integrate the crew module with payload compartments and for the development of mission procedures. Mockups and experimental hardware are currently being designed and built in support of the shuttle program. The buildings at Manned Spacecraft Center were primarily designed and constructed to support the development of the Apollo Spacecraft. Consequently, there are no buildings of adequate size to accommodate the shuttle mockup and integration activities.

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PROJECT DESCRIPTION:

This project provides for an addition to the Technical Service Facility consisting of a 29,900 square foot high bay mockup area with a 6,000 square foot, two story connecting wing. The high bay addition will be a steel frame structure with insulated metal wall panels. Two large access doors to accommodate full size mockups will also be provided.

The 50 foot clear hook height high bay area provides space for assembly and evaluation of large mockups, an area for model checkout and test preparation, and a component test area for assembly and engineering development testing of large discrete spacecraft components. Two 15 ton capacity traveling cranes are provided to assist in the handling and manipulation of the spacecraft, cargo modules and multidisciplinary models.

The connecting wing will be a steel frame structure with precast exposed aggregate faced panels. The area will provide space for mechanical and electrical equipment, toilets and test article storage. Access drives and asphaltic laydown areas will be provided at both ends of the high bay addition.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$2,346,000
Building addition:				
High bay	SF	29,900	$66.55	1,990,000
Connecting wing	SF	6,000	38.00	228,000
Site preparation and utilities	LS	---	---	88,000
Drives and laydown area	SY	4,626	8.65	40,000
Equipment				199,000
15 ton bridge crane	Each	2	99,500	199,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$2,545,000

BOOSTER SELECTION IMPACT STATEMENT:

This project represents a definite requirement, and should be accomplished from FY 1973 Construction of Facilities resources. However, if the pressure fed booster is selected, it becomes most essential to provide for the pressure fed engine test facilities in this program. Consequently, within the total resources available, this Systems Integration and Mockup Laboratory project would be deferred to a subsequent program. Should the solid booster be selected, sufficient resources are then available for this project within the FY 1973 request in accordance with its valid requirements.

MODIFICATION OF THE VIBRATION AND ACOUSTIC TEST FACILITY

Manned Spacecraft Center
Houston, Texas

SUMMARY PURPOSE AND SCOPE:

This project is necessary to upgrade the existing Vibration and Acoustic Test Facility at the Manned Spacecraft Center by expanding the size of the acoustic chamber and constructing a sonic fatigue test cell. This will provide the capability for conducting acoustic fatigue tests on full-size segments and components of the shuttle vehicles.

PROJECT JUSTIFICATION:

This project is required to accommodate acoustic testing on full scale test modules of the space shuttle vehicle. The shuttle's orbiter will be subjected to several sources of severe noise impingement during launch, boost and reentry which will significantly influence the structural design of the overall vehicle. The astronauts' "shirt-sleeve" environment plus a multitude of delicate instruments make it imperative that the crew be shielded from excessive noise and that the sound level inside the compartment does not adversely affect crew operation, health or the integrity of the instruments and equipment. This facility will provide the capability to develop a crew compartment with adequate protection from the noise through simulation of the acoustic effects on a compartment module.

The cargo bay which will contain delicate equipment and experiment packages, and the tail section, which requires considerable thermal protection, will also be subjected to severe noise and vibration stresses during launch. These stresses will affect the structural adequacy of the fuselage, tail, wings, control flaps, as well as the thermal protection system. All of these orbiter components as well as critical booster segments must be evaluated experimentally. To accomplish the evaluation under the anticipated acoustic spectrum of the shuttle vehicle, the proposed expansion of the acoustic laboratory is necessary.

Sonic fatigue on a thermal protection system is a new aerospace challenge. Many of the types of thermal protection systems that are under consideration for the space shuttle have never been used on existing spacecraft. Because this is a new problem, a vigorous testing program is mandatory for the successful development of a reliable, low cost reusable thermal protection system. To accomplish this sonic testing on full scale orbiter segments with thermal protection system, the proposed sonic test cell is necessary.

The needed capability will be required early in the engineering development of the orbiter. This requires the facility to be operational by the end of calendar year 1973 to support program requirements. Currently, no facility exists which can be used to accomplish the necessary testing without the need for extensive modifications.

PROJECT DESCRIPTION:

The existing Vibration and Acoustic Test Facility, Building 49, will be modified in two major areas. First the Acoustic Laboratory will be modified to accommodate testing of full size segments of the shuttle vehicles in the launch, boost, and entry acoustic environments. These modifications include: increasing the size of the acoustic chamber by adding a 850 square foot bay at the full height of 104.5 feet; increasing the door opening to a height of 67 feet and a width of 46 feet; installing a 15 ton bridge crane; providing additional low energy absorption wall and ceiling panels; increasing the existing compressor room by approximately 880 square feet to house an additional air compressor, acoustic horns and noise generators.

The second major modification includes a 46 foot high bay extension to the east side of the existing facility covering an area of 2,816 square feet. This extension will house a specially constructed sonic test cell to provide a noise impingement and sonic fatigue testing capability for the shuttle hardware. A data control area of 1,760 square feet will be provided in the upper level of the test cell. Existing noise generation and control system equipment will be upgraded to provide the needed capacities for the sonic tests. A 15 ton bridge crane for equipment handling will also be provided.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,520,000

	Unit of Measure	Quantity	Unit Cost	Total Cost
Acoustic lab modification				
Extend acoustic chamber	CF	88,825	$2.31	$205,000
Extend compressor room	SF	880	35.23	31,000
Mechanical and electrical system	LS	---	---	363,000
Special construction features	LS	---	---	247,000
Sonic fatigue test lab				
Building addition	CF	129,500	2.33	302,000
Mechanical and electrical system	LS	---	---	241,000
Site work	LS	---	---	131,000
Equipment				1,250,000
Horns and noise generator	LS	---	---	230,000
Progressive wave fixture	LS	---	---	204,000
Signal conditioning equipment upgrading	LS	---	---	502,000
10,500 CFM compressor and ancillary equipment	LS	---	---	314,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$2,770,000

MODIFICATION OF THE STRUCTURES AND MECHANICS LABORATORY

Marshall Space Flight Center
Huntsville, Alabama

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to modify the data acquisition element of a complex of structures and mechanics laboratories at the Marshall Space Flight Center. These laboratories were originally built to support the Apollo Program and the proposed modifications are essential to the development of the space shuttle system.

PROJECT JUSTIFICATION:

The stringent performance requirements placed on the structural system of the shuttle's orbiter and booster will necessitate a thorough ground testing program to support and verify the design. The two main critical aspects of performance which make the design of the vehicle a difficult task are the requirements for minimum weight, and the necessity for the basic structure and the thermal protection system to meet the combined effects of aerodynamic loads and vibrations that are encountered in multiple reentries into the earth's atmosphere. To meet this development requirement, modules of the orbiter and booster must be subjected to similar forces in a complex ground based test program.

The vital need for this vibration-structural testing has been verified by the aerospace contractors who conducted definition studies of the shuttle concepts. Special test articles of the orbiter and booster assemblies will be produced and subjected to a rigorous test program. The existing facility as modified by this proposed work will be capable of accommodating these test requirements.

The most pressing need to initiate the structural program is to modify and update the existing instrumentation and data display capability in the Structures and Mechanics Laboratory, Building 4619. This existing system has gradually deteriorated over the past ten years, to the point where major modification, upgrading and replacement are necessary. The system now requires excessive maintenance effort. Replacement parts are, for the most part, no longer "off-the-shelf" items, and, for some items, the initial manufacturer is now no longer in business. As a result, replacement costs have increased considerably, and breakdowns produce unreasonably long delays in testing. The instrumentation system modification must be initiated at this time since some 24-28 months are required for the procurement, installation and checkout of the equipment involved. Current schedules indicate that this test program is planned to start in early 1975; therefore, fiscal year 1973 resources will be necessary for this work.

The existing facility, with the fiscal year 1973 instrumentation modifications, will be capable of accommodating the initial test requirements for shuttle subassemblies. Additional data channels and facility modifications, however, will be required to accommodate the fatigue testing of the shuttle's major assemblies to be tested later. These requirements are now estimated to cost about $2,300,000.

PROJECT DESCRIPTION:

This project provides for modification or major replacement of 2,400 channels of the existing digital data acquisition system, data control equipment and associated peripheral equipment. This peripheral equipment includes strip charts and X-Y recorders, oscillographs and data display equipment. Associated modification to the air conditioning system, rearrangement of space, and relocation of utilities are also included.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$125,000
Building modifications	SF	1,350	$18.52	25,000
Mechanical and electrical system	LS	---	---	100,000
Equipment				2,295,000
Data acquisition	LS	---	---	1,010,000
Controller/converter	LS	---	---	600,000
Peripheral equipment	LS	---	---	585,000
Equipment installation and checkout	LS	---	---	100,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$2,420,000

BOOSTER SELECTION IMPACT STATEMENT:

The total estimated requirement for the modification of the instrumentation system for this facility is estimated at $4.7 million. It is highly desirable to accomplish the total requirement with fiscal year 1973 resources. However, under the pressure fed booster option, it is most urgent to provide for the modification for the pressure fed engine test facilities, and to assist in meeting this resource need the FY 1973 request for the Structures and Mechanics Laboratory must be reduced to the total as indicated above. The balance, in the amount of approximately $2.3 million, would then be provided in a subsequent fiscal year. Should the solid fueled booster be selected, however, it would not be necessary to defer this increment of work and the total requirement would then be implemented from the fiscal year 1973 program at a total cost of $4,700,000.

ADDITION FOR THE ELECTRICAL POWER LABORATORY
Marshall Space Flight Center
Huntsville, Alabama

SUMMARY PURPOSE AND SCOPE:

This project provides for a 6,500 square foot addition to the Hazardous Operation Laboratory, Building 4475 at the Marshall Space Flight Center and is required to expand and augment the capability for research and development in new electrical power generation systems for the space shuttle.

PROJECT JUSTIFICATION:

This project is required for the research, development, and evaluation of advanced electrical power generation devices and integration of electrical systems in support of the space shuttle program. The long duration of the shuttle missions necessitates advancement in the electrical power field for such vehicles. The Marshall Space Flight Center has been conducting a limited research program in such areas as fuel cells, batteries and other liquid and solid power sources applicable to this problem. This effort, however, has necessarily been limited due to the lack of adequate facilities.

The potential advantages in reliability, higher performance and reduction in size, weight, and reusability of these power sources make further research in this field mandatory. Present facilities are considered inadequate for safe operation and testing of these shuttle electrical systems. To support the planned work and to provide the proper capability for integrating the optimum power devices in the shuttle overall electrical systems, the proposed addition to the existing laboratory is required.

PROJECT DESCRIPTION:

This project provides for the construction of a 6,500 square foot addition to the Hazardous Operation Laboratory, Building 4475. The exterior walls and interior partitions will consist of concrete masonry block. Six test cells, four preparation areas and a mechanical equipment room will be provided. The interior partition of one of the test cells will be constructed of reinforced concrete, one foot thick. The required utilities and compressed gaseous supplies will also be provided.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$284,000
Site work and utilities	LS	---	---	40,000
Building addition	SF	6,500	$37.54	244,000
Equipment	LS	---	---	36,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$320,000

MODIFICATION OF ACOUSTIC MODEL ENGINE TEST FACILITY
Marshall Space Flight Center
Huntsville, Alabama

SUMMARY PURPOSE AND SCOPE:

This project is required for the modification of the existing Acoustic Model Engine Test Facility at the Marshall Space Flight Center and is needed to accommodate the space shuttle model engine test requirements. The capability to conduct model engine testing is required for early solutions to many problems associated with induced vibrations, noise effects during lift-off and flight, and the design of launch facilities.

PROJECT JUSTIFICATION:

This project will provide an invaluable research tool for the solution of acoustic and propulsive system problems involved in the development and application of the propulsion system for the shuttle. The existing facility provided vital support in defining and coping with the acoustic field and the propulsive configurations of the Saturn boosters. The proposed modifications will enable this facility to provide the required comparable support for the greatly different and more exacting requirements of the planned shuttle propulsion system.

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The shuttle's booster and orbiter, as presently planned will use new propulsion systems for which there is little information relative to the resulting acoustic field. The orbiter will use liquid hydrogen/liquid oxygen engines with a thrust chamber pressure of approximately 3,000 pounds per square inch. The booster will use a cluster of up to seven pressure fed engines, generating a total thrust level of approximately 7-8 million pounds. A critical and urgent requirement exists to evaluate, study and definitize the acoustics generated by these new vehicles. The proposed facility, using scaled model engines of the basic propulsion concepts, will meet the program requirements in the most efficient way.

The specific contribution of this facility will include: (1) conducting scaled model engine tests to determine the effects of acoustically induced vibration and noise during lift-off and flight; (2) providing acoustic scaling information from single engine to cluster engines; (3) evaluating and verifying the design of the high pressure thrust chamber of shuttle's orbiter main engine in terms of combustion dynamics, heat transfer, chamber cooling and life cycle capability; (4) developing data on the influence of such parameters as nozzle contour and propellant mixture ratio on the specific impulse of the new engines; and (5) determining optimum launch pad configurations and deflector requirements.

The existing facility was configured to test model engines using RP-1 fuels. The proposed modification will provide the liquid hydrogen capability and upgrade the high pressure gaseous supply capability necessary to meet the model engine test requirements for the shuttle vehicles.

PROJECT DESCRIPTION:

This project provides for accomplishing modifications required at the existing Acoustic Model Engine Test Facility, Building 4540, and at the remotely located gaseous supply area to achieve the increased capability required to test scaled model rocket engines of the shuttle vehicles. Modifications to the acoustic facility include: (1) installation of existing liquid hydrogen run tanks, storage vessels and the associated transfer and distribution system. A new hydrogen fuel dump line and burn stack will also be provided; (2) procurement and installation of new high pressure gaseous hydrogen storage batteries and fuel distribution lines, and upgrading the instrumentation system for hydrogen detection; (3) increasing the liquid oxygen on-stand capability by installing an existing run tank, modifying the feed lines and upgrading the gaseous nitrogen pressurization system.

The work at the gaseous supply facilities includes an extension of 2,000 square feet to house existing nitrogen compressors; construction of a concrete pad of some 3,600 square feet to support the installation of an existing hydrogen storage tank, relocation and installation of hydrogen pumps and a vaporizer; and the installation of gaseous supply lines to the model engine test stand.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,921,000
Model engine stand modification:				
Modifications and additions to propellant and gaseous systems	LS	---	---	693,000
Modification of liquid oxygen propellant and gaseous systems	LS	---	---	242,000
Modification of instrumentation and control system	LS	---	---	161,000
High pressure gas supply area modification:				
Extension to nitrogen compressor facility	SF	2,000	$32.50	65,000
Modification to gaseous hydrogen vaporization facility	LS	---	---	225,000
High pressure gas distribution system	LS	---	---	535,000
Equipment				509,000
Gaseous hydrogen storage vessels	LS	---	---	509,000
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$2,430,000

MODIFICATIONS OF MANUFACTURING AND FINAL ASSEMBLY FACILITIES
Various Locations

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to modify and alter facilities so that they may be used for manufacturing and final assembly of major elements of the shuttle system. Although a specific plant has not yet been selected, the facility modifications required have been determined on the basis of detailed engineering analysis of the manufacturing requirements related to the space shuttle. The estimated costs of facility modification shown in this project has been developed using the Michoud Assembly Facility, New Orleans, La., as the basis for the work involved.

PROJECT JUSTIFICATION:

The space shuttle planning is currently based upon achieving a first manned orbital flight in calendar year 1978. The intervening period will require the development, manufacture, assembly and test of the shuttle orbiter and booster. To achieve these goals, the assembly of structural test articles of the booster and orbiter must be initiated late in the calendar year 1973, and the assembly of the first flight vehicles must be started by mid calendar year 1974. Correspondingly, the required assembly facilities must be operationally ready by these dates in order to support the program. To meet these milestones, fiscal year 1973 resources are necessary to initiate the facility modifications which will be required.

The proposed modifications are necessary to adapt the existing high bay areas for final assembly and checkout of the booster, orbiter and external propellant tanks of the orbiter. Modifications to structures and utilities as well as equipment rearrangement will be necessary to provide operable work stations especially tailored to the geometry, weight, and other characteristics of the vehicle assemblies.

These work stations are essential to produce and assemble the booster's tanks and thrust structure, accomplish final assembly for the orbiter, and provide a weld assembly area for the liquid hydrogen/liquid oxygen external tanks of the orbiter. The follow-on facility modification required for final assembly of the booster itself and the orbiter's external tanks are planned for accomplishment from subsequent year resources.

PROJECT DESCRIPTION:

This project provides modifications to existing manufacturing and assembly space required for the assembly of the shuttle's orbiter and subassembly of

the booster and external propellant tanks. The major work stations to be provided are:

Booster Facilities

1. Mockup fabrication area for producing wood and metal mockups of booster subassemblies.

2. Manufacturing and subassembly areas including a weld station for welding tank bulkhead skin into cylindrical sections, and a chemical cleaning area for the welded sections.

3. Heat treatment station for strengthening the metallic properties of the booster tanks.

Orbiter

1. Structural buildup and thermal protection stations for producing the major subassemblies, such as the fuselage, wings and vertical stabilizers, and then installing the thermal protection system.

2. Final assembly of the orbiter for joining together the major subassemblies.

Orbiter External Liquid Hydrogen/Liquid Oxygen Tanks

1. A welding subassembly area for producing the intertanks and interstage.

2. Structures subassembly areas to join the tank components.

The types of facility work required to provide the above stations include modifications to: concrete foundations, structural steel frames, platforms, large steel doors, relocation of utility lines and extension of structural members. Modification to the air conditioning and the overall lighting systems will also be required.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$6,890,000

	Unit of Measure	Quantity	Unit Cost	Total Cost
Booster assembly facilities	LS	---	---	$3,360,000
Orbiter assembly facilities	LS	---	---	1,220,000
External liquid hydrogen/ liquid oxygen tanks sub-assembly facilities	LS	---	---	2,310,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$6,890,000

BOOSTER SELECTION IMPACT STATEMENT:

If a solid fueled booster is selected, current planning indicates that its assembly would most probably be accomplished at a contractor-owned plant. In this case, the booster assembly facilities included in this project would be deleted, and additional work for the external tanks added to the project. The scope of this FY 1973 project would then be reduced to $5,540,000. This amount would be necessary to fund the modification for the orbiter assembly facilities ($1,220,000) and the orbiter external liquid hydrogen/liquid oxygen tanks welding and structures subassembly areas ($2,310,000), as indicated above, as well as the provision of pneumatic test facilities and major assembly facilities ($2,010,000) which are required to support the external tank assembly. In either case, additional resources will be required in subsequent years to complete this work.

SUMMARY PROJECT COST ESTIMATE:

	Booster Configuration	
	Pressure Fed	Solid Fueled
Main Engine Test Facilities	$11,435,000	$7,960,000
Research and Development Facilities	9,575,000	14,400,000
Manufacturing and Final Assembly Facilities	6,890,000	5,540,000
TOTAL	$27,900,000	$27,900,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

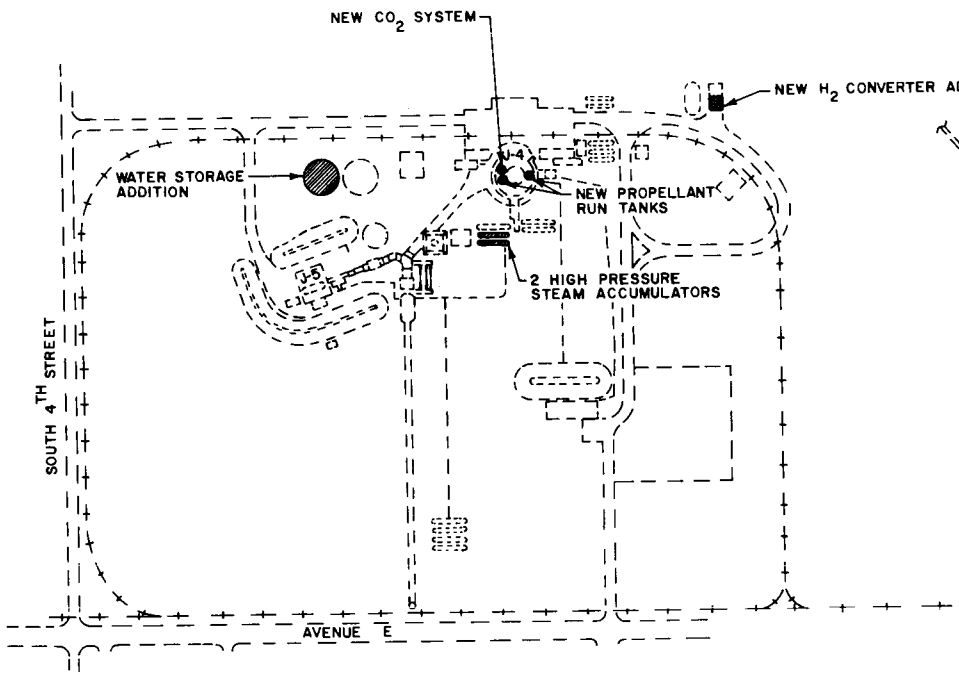
To support the pressure fed booster configuration it is estimated that between $20-25 million will be required for these projects in subsequent years. This includes approximately $3.7 million in modifications for a second pressure fed engine test stand, a minimum of $2.3 million for the second phase of the Modification to the Structures and Mechanics Laboratory at Marshall Space Flight Center, and $14-19 million for the manufacturing and final assembly facilities. If a solid booster is selected, then the future funding required is estimated to be $8-11 million. The reduction is the result of the deletion of requirements for pressure fed engine test facilities and manufacturing and final assembly facility needs associated with the pressure fed booster.

ARNOLD ENGINEERING DEVELOPMENT CENTER

FISCAL YEAR 1973 ESTIMATES

SPACE SHUTTLE FACILITIES

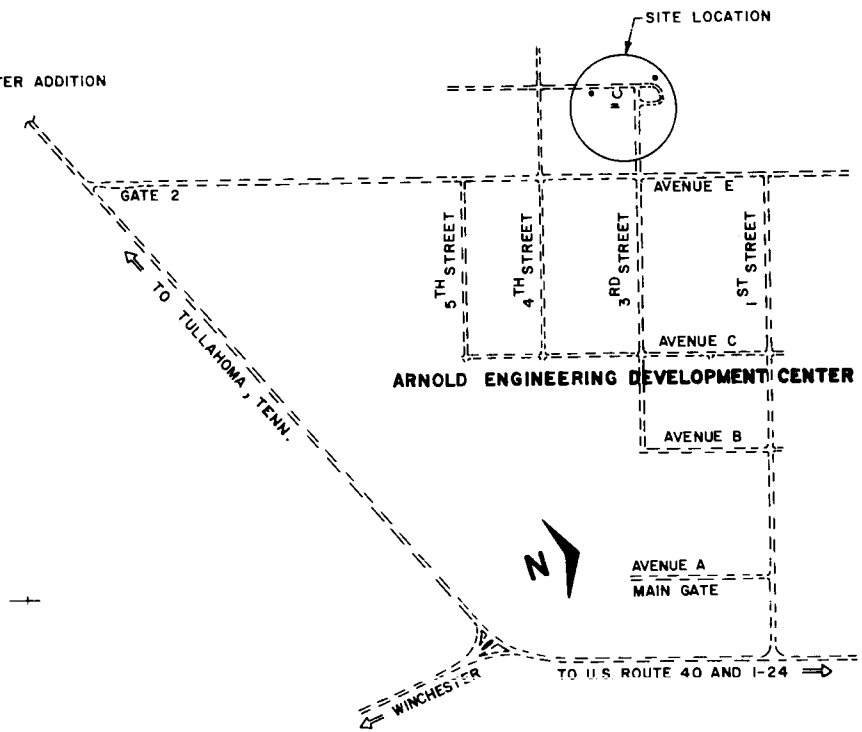
ALTITUDE TEST FACILITY



SITE PLAN

0 100 500 FT

N



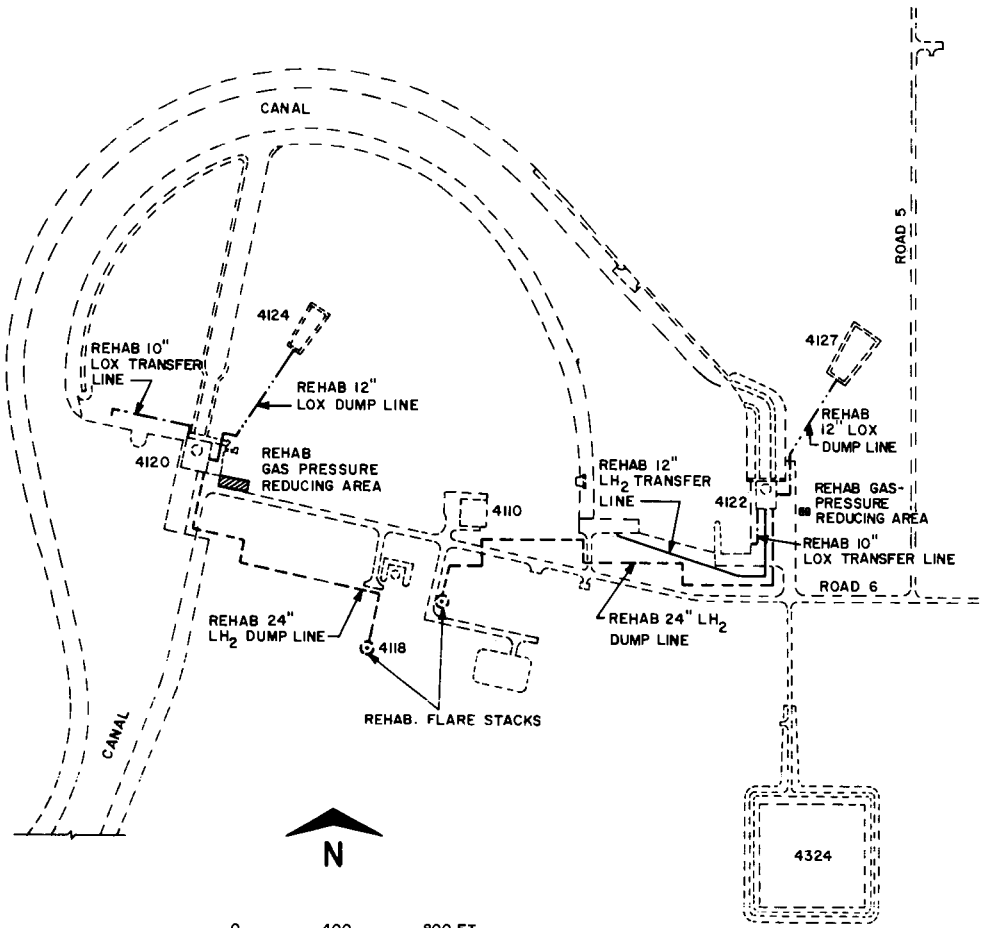
LOCATION PLAN

0 500 1000 1500 FT

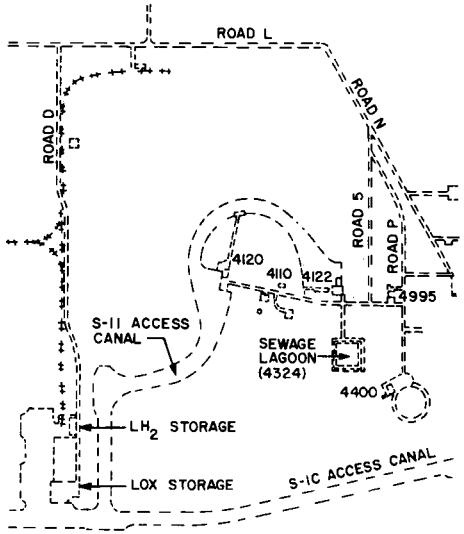
CP 9-32

MISSISSIPPI TEST FACILITY
FISCAL YEAR 1973 ESTIMATES
SPACE SHUTTLE FACILITIES

REHABILITATION OF PROPELLANT AND HIGH PRESSURE GASEOUS SYSTEMS



SITE PLAN



LOCATION PLAN

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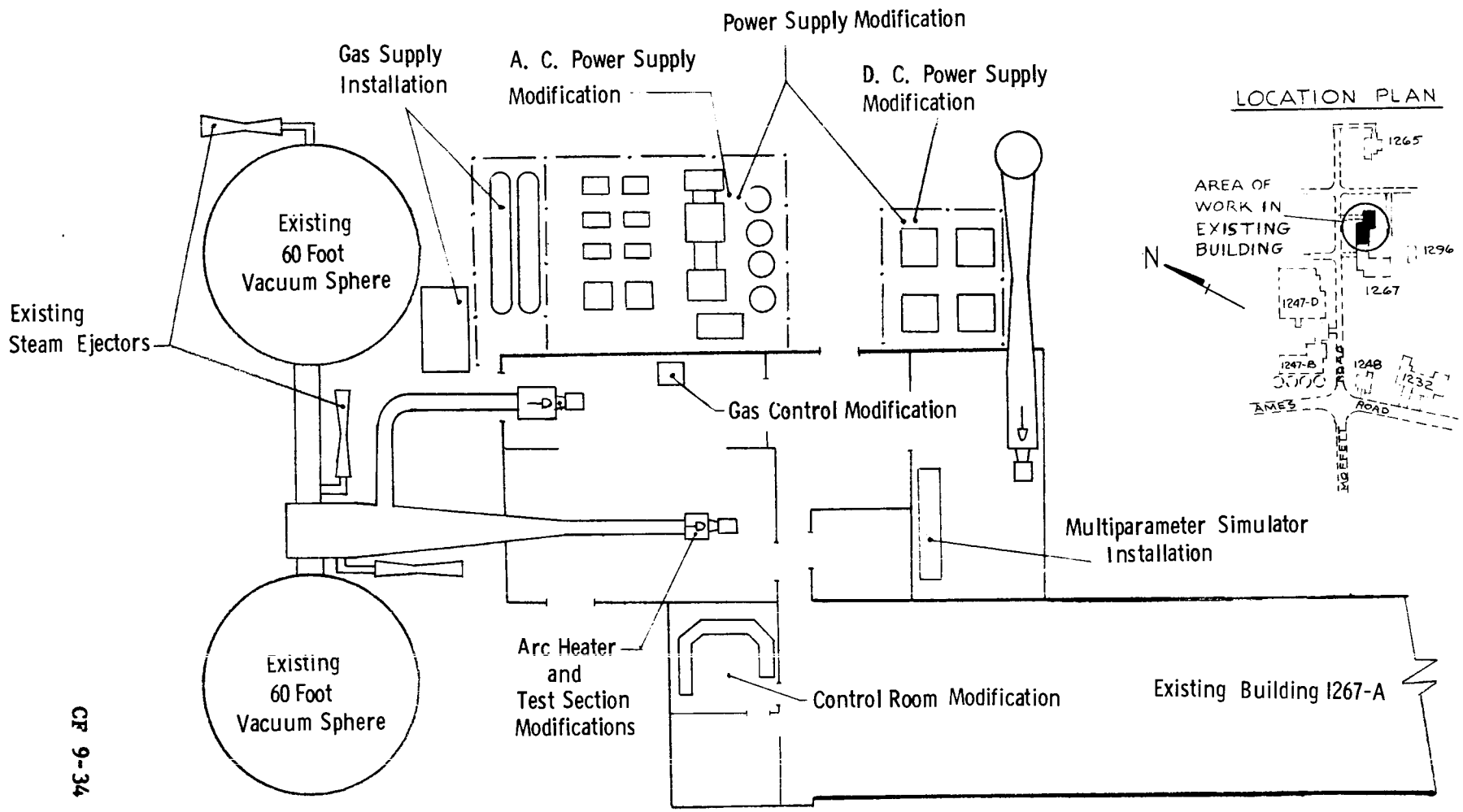
LANGLEY RESEARCH CENTER

FISCAL YEAR 1973 ESTIMATES

SPACE SHUTTLE FACILITIES

MODIFICATION OF THE ENTRY STRUCTURES FACILITY

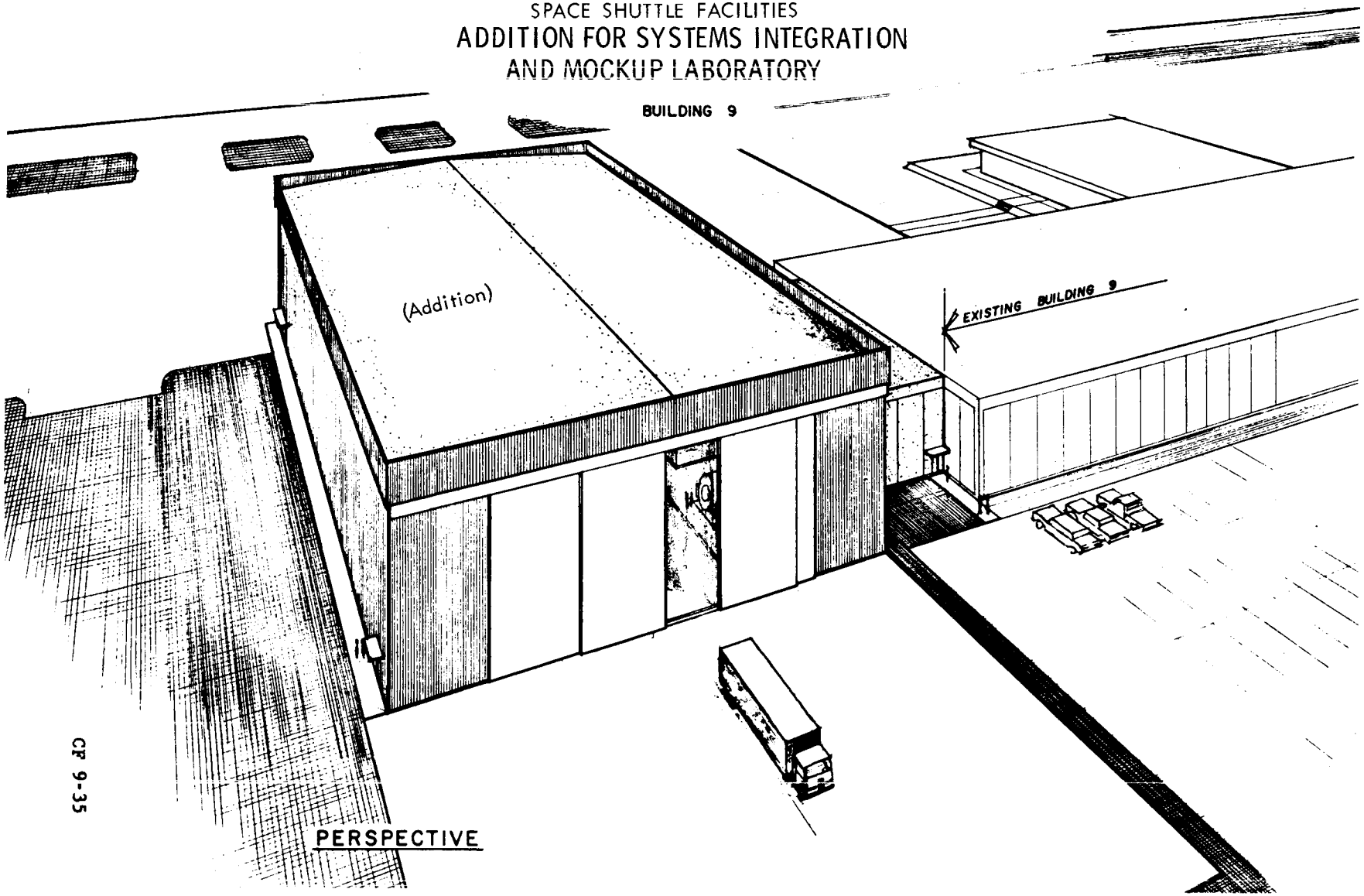


MANNED SPACECRAFT CENTER
FISCAL YEAR 1973 ESTIMATES

SPACE SHUTTLE FACILITIES

ADDITION FOR SYSTEMS INTEGRATION AND MOCKUP LABORATORY

BUILDING 9



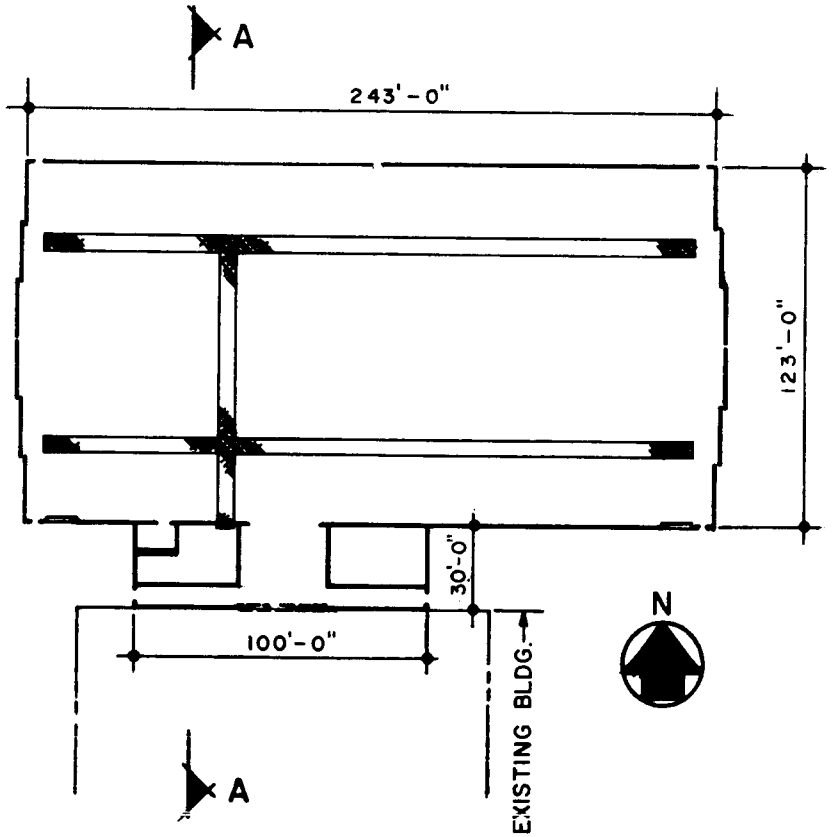
PERSPECTIVE

MANNED SPACECRAFT CENTER
FISCAL YEAR 1973 ESTIMATES

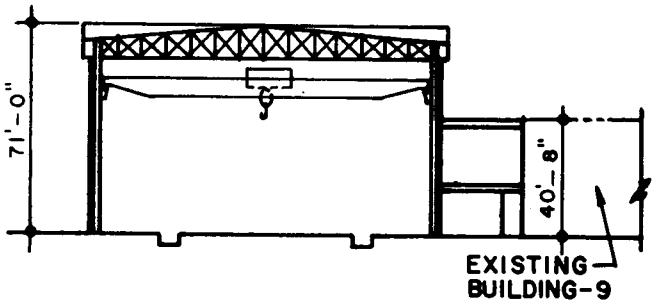
SPACE SHUTTLE FACILITIES

ADDITION FOR SYSTEMS INTEGRATION AND MOCKUP LABORATORY

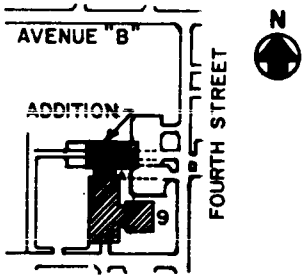
BUILDING 9



PLAN



SECTION A-A



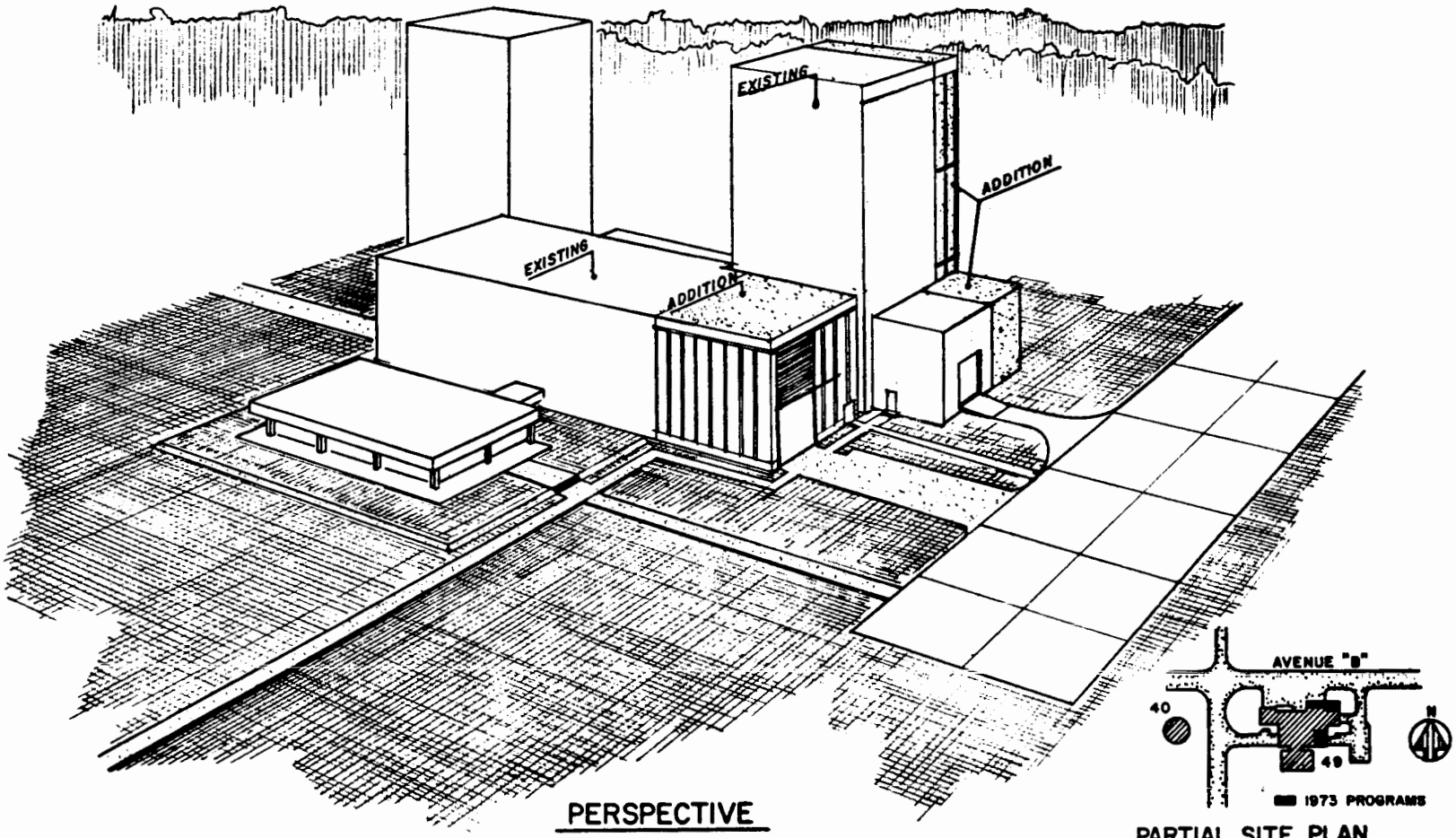
PARTIAL SITE PLAN

MANNED SPACECRAFT CENTER
FISCAL YEAR 1973 ESTIMATES

SPACE SHUTTLE FACILITIES

MODIFICATION OF THE VIBRATION AND ACOUSTIC TEST FACILITY

BUILDING 49



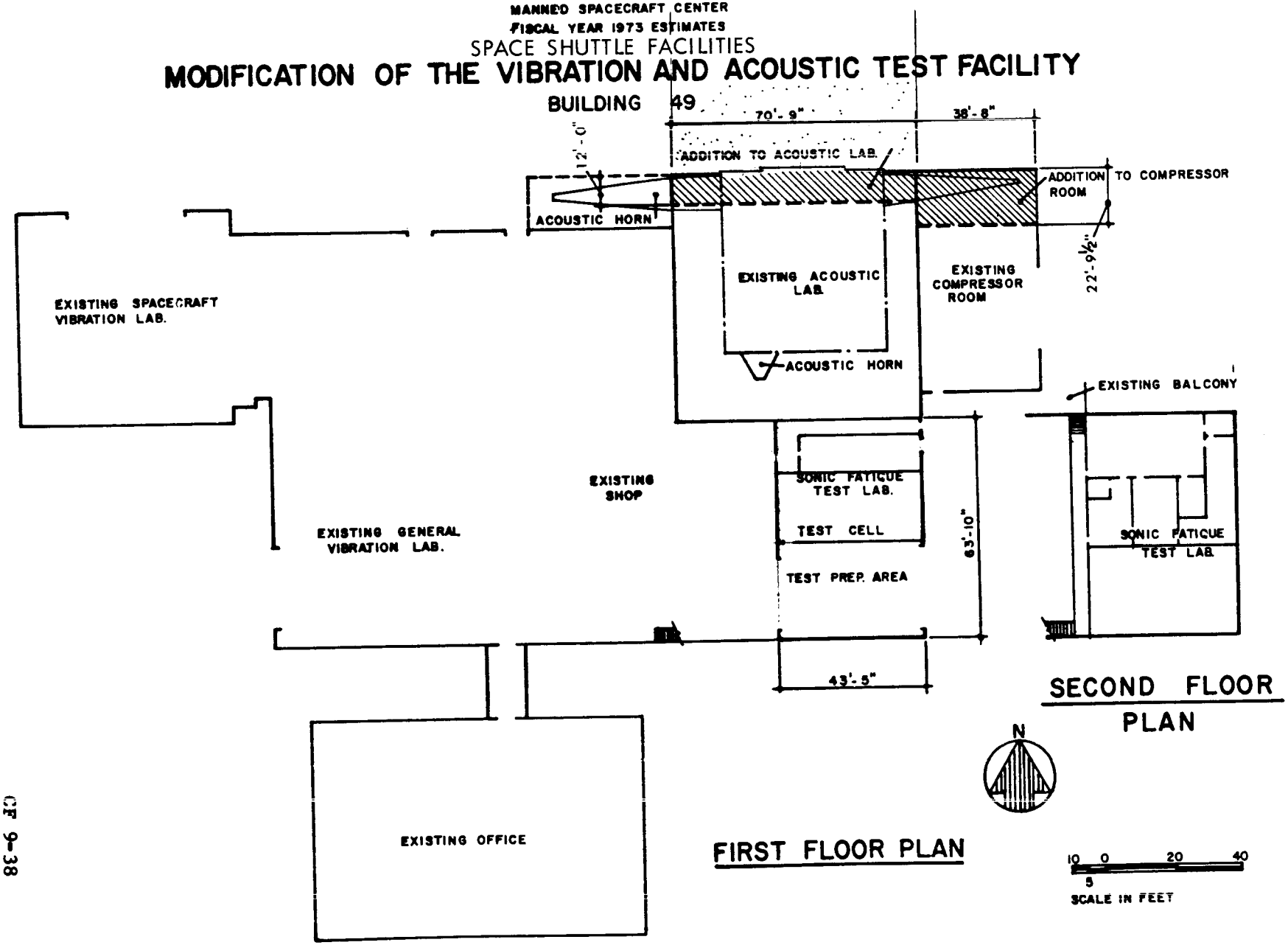
PERSPECTIVE

PARTIAL SITE PLAN

MANNED SPACECRAFT CENTER
FISCAL YEAR 1973 ESTIMATES
SPACE SHUTTLE FACILITIES

MODIFICATION OF THE VIBRATION AND ACOUSTIC TEST FACILITY

BUILDING 49

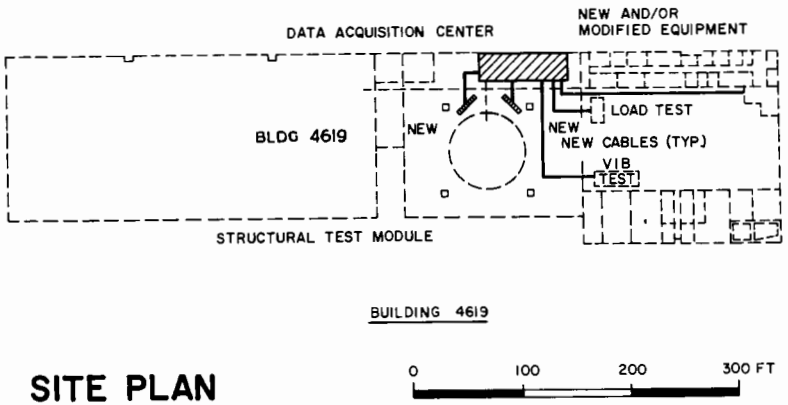


MARSHALL SPACE FLIGHT CENTER

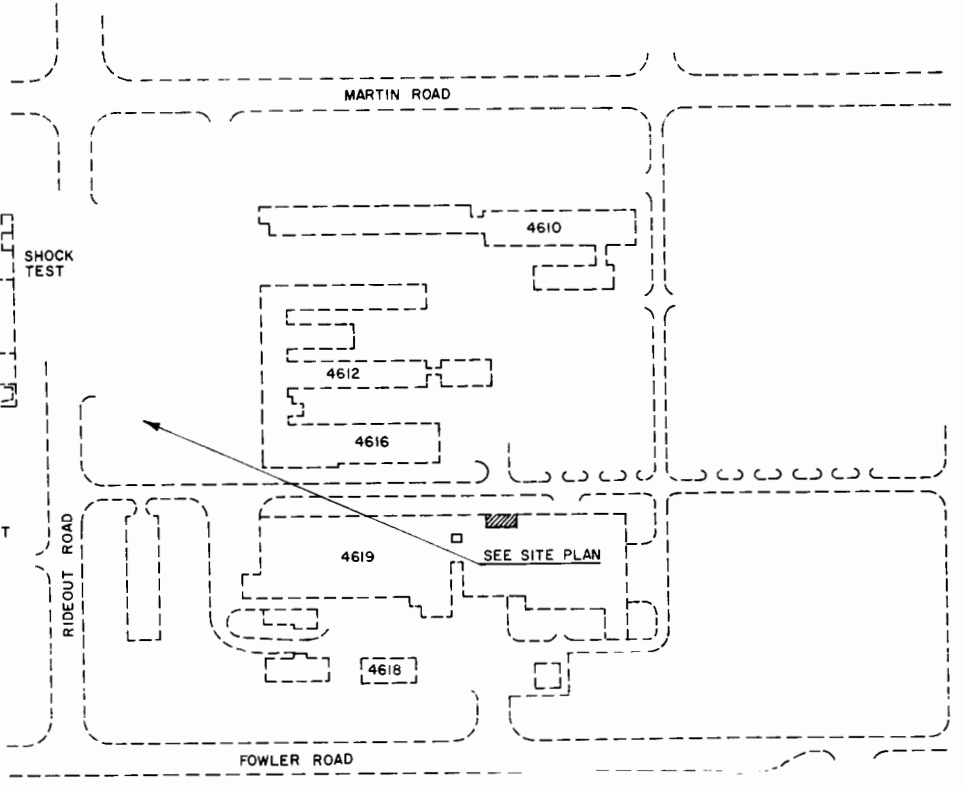
FISCAL YEAR 1973 ESTIMATES

SPACE SHUTTLE FACILITIES

MODIFICATION OF THE STRUCTURES AND MECHANICS LABORATORY



SITE PLAN



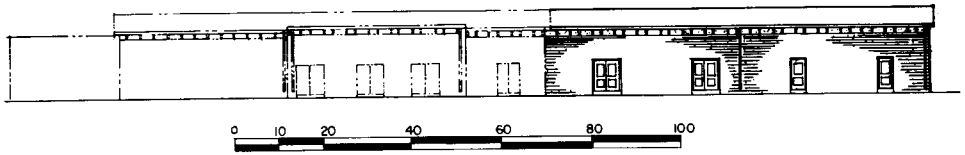
LOCATION PLAN

MARSHALL SPACE FLIGHT CENTER

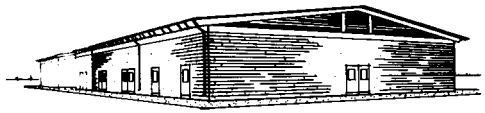
FISCAL YEAR 1973 ESTIMATES

SPACE SHUTTLE FACILITIES

ADDITION FOR THE ELECTRICAL POWER LABORATORY



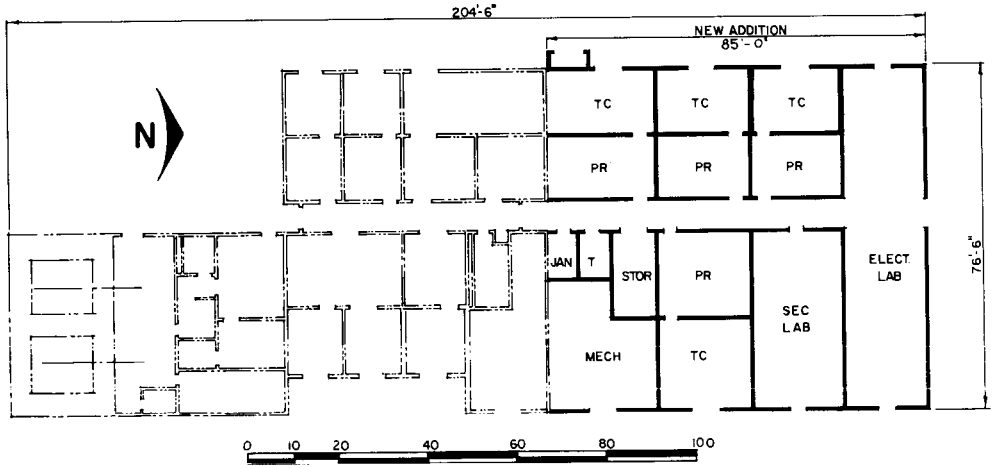
EAST ELEVATION



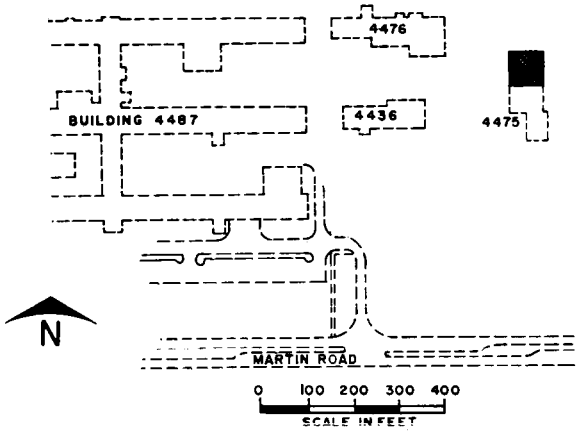
PERSPECTIVE

LEGEND

ELECT. - ELECTRONICS
JAN - JANITOR
MECH - MECHANICAL EQUIPMENT
PR - PREPARATION ROOM
SEC - SOLAR ENERGY CONV.
STOR - STORAGE
TC - TEST CELL
T - TOILET



FLOOR PLAN



SITE PLAN

CF 9-40

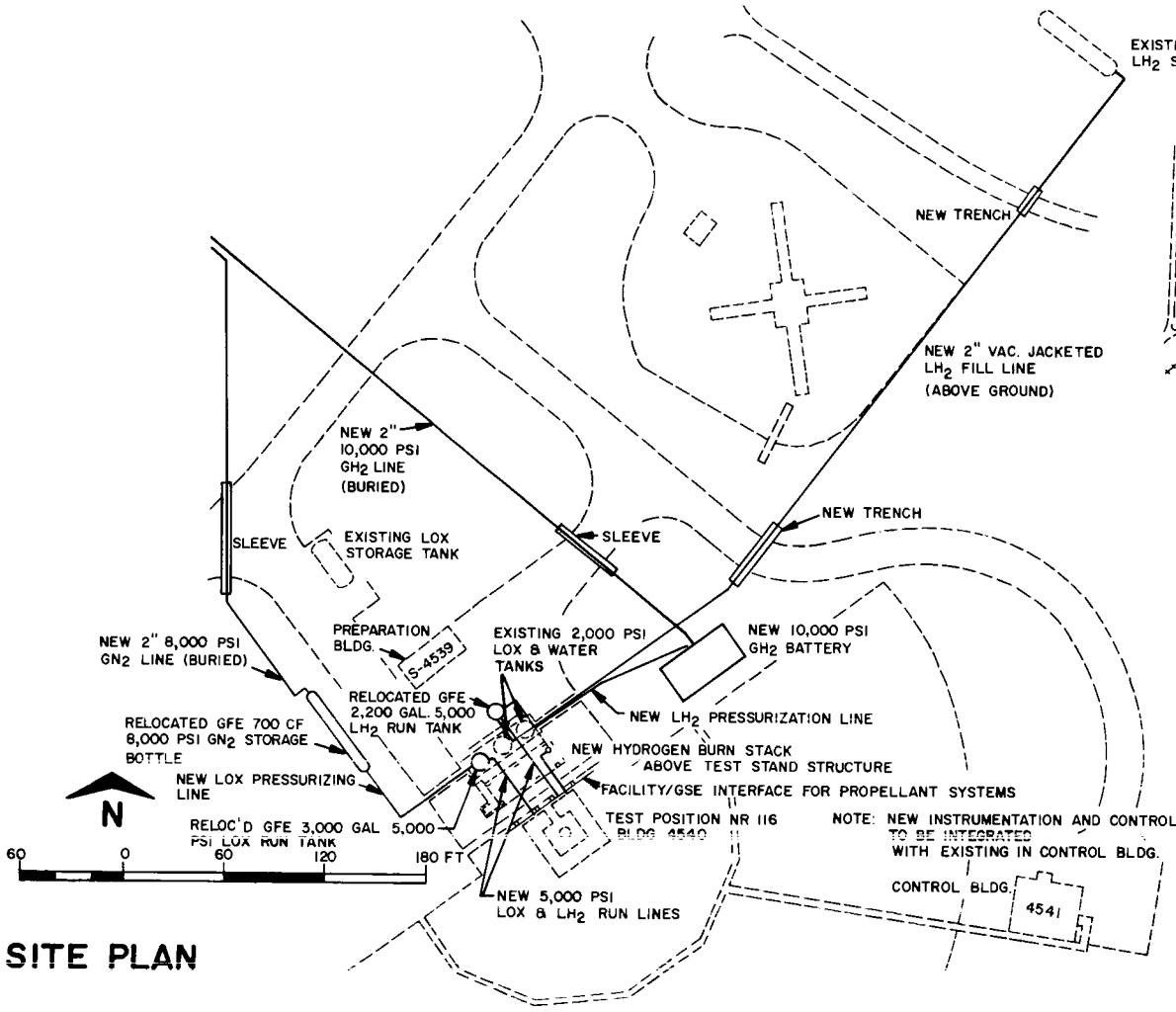
MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1973 ESTIMATES

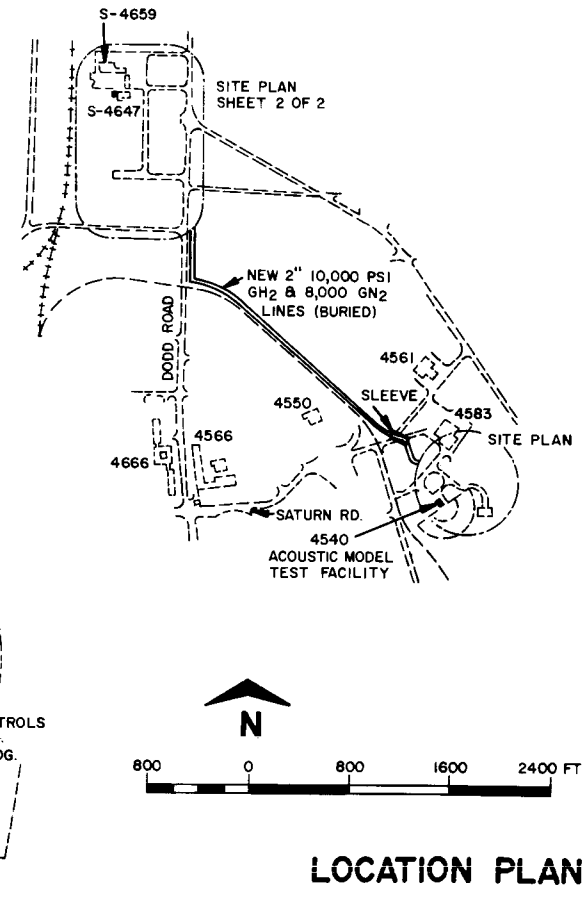
SPACE SHUTTLE FACILITIES

MODIFICATION OF ACOUSTIC MODEL ENGINE TEST FACILITY

SH 1 OF 2



CF 9-41 SITE PLAN

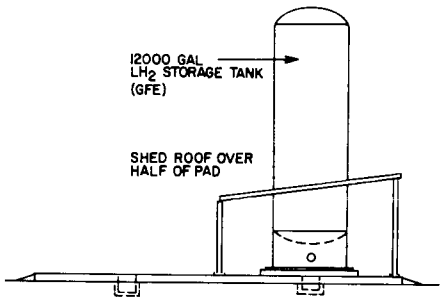


LOCATION PLAN

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1973 ESTIMATES
SPACE SHUTTLE FACILITIES

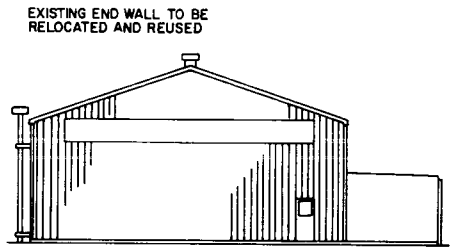
MODIFICATION OF ACOUSTIC MODEL ENGINE TEST FACILITY

SH 2 OF 2



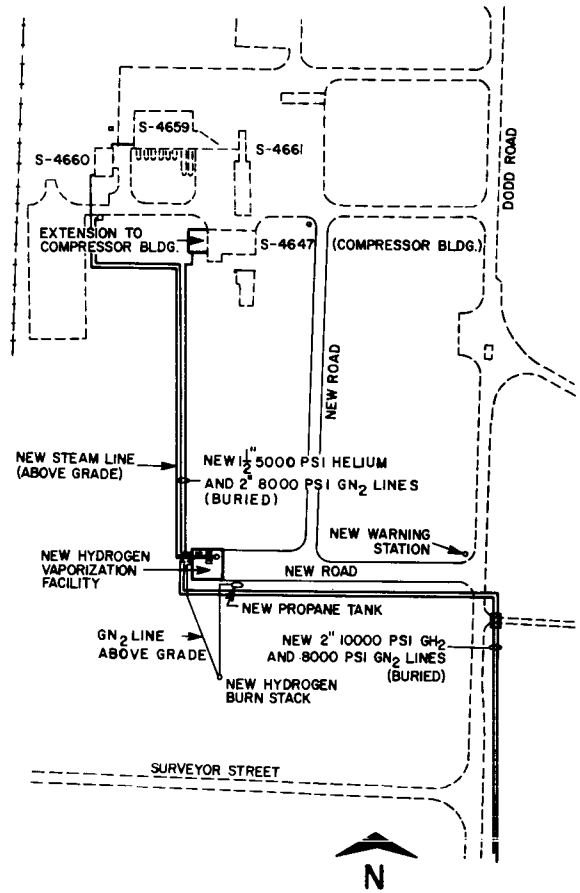
EAST ELEVATION

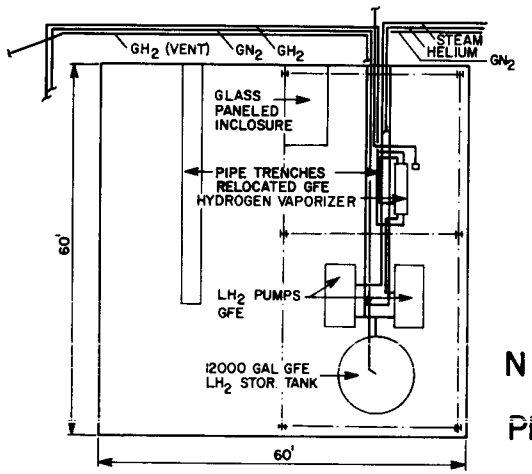
10 0 10 20 30 40 50 FT



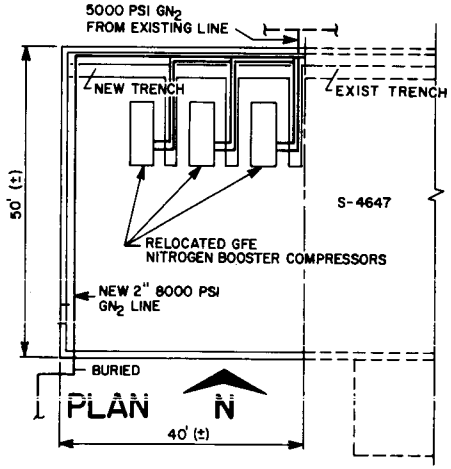
WEST ELEVATION

10 0 10 20 30 40 FT.





HYDROGEN VAPORIZATION FAC.



COMPRESSOR BLDG EXT.

SITE PLAN

200 0 200 400 FT.

CF 9-42

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

REHABILITATION AND MODIFICATION OF FACILITIES

	Page No.
Summary	CF 10-1
Office of Organization and Management Project:	
Rehabilitation and modification of facilities	CF 10-2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 73 BUDGET ESTIMATES

(Dollars in thousands)

NASA INSTALLATION		COGNIZANT PROGRAM OFFICE FOR INSTALLATION
Various Locations		Office of Organization and Management
LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Various Locations	Not Applicable	Not Applicable

INSTALLATION MISSION

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 19 73 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Rehabilitation and Modification of Facilities at Various Locations	O&M	34,328	11,580	-0-	Not Applicable
TOTAL			11,580		

NASA FORM 1029 . UN 69 PREVIOUS EDITIONS ARE OBSOLETE.

NASA-HQ
CF 10-1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Rehabilitation and Modification of Facilities at Various Locations
FY 1973 CoF ESTIMATE	$11,580,000

COGNIZANT INSTALLATION: Various Locations

LOCATION OF PROJECT: Various Locations

COGNIZANT PROGRAM OFFICE: Office of Organization and Management

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$3,003,350
Rehabilitation and Modification	31,325,000*
Total FY 1972 and Prior Years	$34,328,350

* NOTE: For this activity as previously structured and funded from CoF only; does not reflect facility projects estimated to cost less than $250,000 and previously funded in the R&PM and R&D appropriations.

SUMMARY PURPOSE AND SCOPE:

To provide for the rehabilitation and modification of facilities at NASA field installations and Government-owned industrial plants engaged in NASA activities. Included in this project are those rehabilitation and modification facility needs for FY 1973 which can be foreseen at the time of the submission of these estimates, and which are estimated to cost less than $500,000. The purpose of this program is to protect, preserve and enhance the capabilities and usefulness of existing NASA facilities, and to insure the continued safe, economical and efficient use of this physical plant.

PROJECT JUSTIFICATION:

At its initial cost, the existing NASA physical plant totals about $5.5 billion (June 30, 1971). This physical plant inventory is composed of two major segments. The first and oldest segment consists of the research centers and industrial plants which are now, in many cases, over 25 years old. For example, at Langley Research Center, Virginia, approximately 50% of the buildings are over 20 years old and 15% are over 30 years old. The second segment of this physical plant inventory is composed of facilities acquired more recently to support the Manned Space Flight program. However, even these facilities are rapidly approaching 10 years in age and are beginning to show the effects of exposure to hard and continued usage which has also had its effects to an even greater degree on the older segment of the plant. Both segments have, in addition to age and usage, experienced a history of changing utilization and adaptation.

A continuing program of rehabilitation and modification of these facilities is required to:

a. Protect the capital value represented by these facilities and to overcome the cumulative effects of wear and deterioration.

b. Insure the continued reliable availability of these facilities and their operational capabilities as applicable.

c. Improve the capabilities and usefulness of these facilities in terms of NASA mission accomplishment, and to overcome the cumulative effects of obsolescence.

d. Provide a better and safer environment for personnel.

This project includes only facility rehabilitation and modification type work having an estimated cost of less than $500,000. The work covered in this project is of such a nature and magnitude that it cannot be accomplished by routine day-to-day facility maintenance, or by related routine facility work efforts which are otherwise provided for in other than CoF estimates. Rehabilitation and modification work estimated to cost $500,000 or more is reflected as a major CoF project. Not included in this project are the minor construction of facilities (new and addition type projects) required in FY 1973. This latter requirement is provided for by a separate CoF project included in this submission.

PROJECT DESCRIPTION:

Items of rehabilitation and modification type work proposed to be accomplished within this program for FY 1973 are outlined under "Project Cost Estimate" and total $11,580,000. Of this total, $10,930,000 is related to specific and discrete work packages at designated NASA installations. The remaining $650,000 relates to that minor rehabilitation and modification type work estimated to cost less than $50,000, the nature and purpose of which is the same as for that work specifically delineated but which, because of their individual small size, are not listed by item.

At this time these items, as presented, are considered to be of the highest priority. They have been carefully selected from lists totalling over $40,000,000. The request for $11,580,000 represents a most modest increment in relation to the existing "backlog" of this type of work, which must be provided for over the next several years. For example, the FY 1973 estimate includes about $7,500,000 for the Aeronautics and Space Technology installations at Ames, Flight, Lewis and Langley Research Centers as well as Plum Brook Station. Of this amount $3,715,000 is included in this project and the balance is reflected as separate CoF line items. A recent survey conducted for NASA by an architect/engineer firm at these installations indicated about $90,000,000 of rehabilitation and modification type work should be undertaken as a phased program over the next several years to place these installations on a more economical and efficient operating basis. This survey is being refined and its concept expanded to other NASA installations in order to provide an improved NASA-wide base for this specific program. However, it is clear that Agency rehabilitation and modification of facilities needs are extensive. As indicated above, the projects in this request are considered to be of the highest priority on the basis of relative urgency and expected return on the investment involved. It is recognized, however, that during the course of the year some rearrangement of priorities may be necessary and it is realistic to assume that a change in some of the items to be accomplished within the allocated resources may be required.

The rehabilitation and modification items, as covered by this estimate, relate to the following broad categories of facilities:

a.	Utility Systems	$2,250,000
b.	Fire Detection/Protection Systems	$1,195,000
c.	General Purpose Buildings	$495,000
d.	Technical Buildings/Structures	$6,248,000
e.	Pavements and Drainage	$292,000
f.	Building Exteriors and Roofs	$440,000
g.	Other work	$660,000

The FY 1973 requests for facility rehabilitation and modification work is directed toward the most urgent current needs for work of this type in the continuation of this essential program at NASA installations.

PROJECT COST ESTIMATE:

REHABILITATION AND MODIFICATION	$11,580,000
1. OFFICE OF MANNED SPACE FLIGHT	(3,715,000)
A. Kennedy Space Center	70,000
(1) Rehabilitation of Road	70,000

Provides for the resurfacing of about three (3) miles of Beach Road westerly from the junction with Kennedy Parkway. The remainder of the road (3.1 miles) to the intersection with Titusville Road was resurfaced in 1964. Resurfacing of this second half of Beach Road with hot asphaltic concrete is now required to eliminate depressions, settlement, and pavement cracks which are rapidly becoming a hazard to safe driving.

B. Manned Spacecraft Center	1,500,000
(1) Rehabilitation of Utility Systems	140,000

Replaces 119 valves and 60 expansion joints in steam and chilled water distribution lines located in utility tunnel. In the chilled water and steam distribution systems, valves have become inoperative and expansion joints leak. Replacement is needed to prevent maintenance shutdowns, protect personnel and other systems and equipment, and prevent system failures.

(2) Rehabilitation of Utility Control System Computer Area, Building 24	117,000

Provides for the rehabilitation of the area needed to accommodate the replacement of the existing DDP-24 computer system with a new general purpose digital computer system in the central heating and cooling plant. The computer to be installed is excess to other needs and will interface with the existing data acquisition hardware, and will have the capability to satisfy all the requirements

of the real time utilities control system program and associated systems management functions. Upgrading of the existing system is not practical because of equipment obsolescence and excessive cost of repairs. Additionally, operational and maintenance history shows that the continued use of the present computer system is neither economical nor reliable.

(3) Rehabilitation of Building Air Conditioning and Heating Systems $200,000

This project provides for the replacement of the multiple direct expansion air conditioning systems in Thermal Chemical Test Facility, Building 350; Thermal Chemical Space Chamber Facility, Building 351 and Component Test Facility, Building 356. This will be done with a central condensing unit and chilled water system for each building. The work includes the removal of the existing units and the unusable components as well as the modifications to the duct work and the controls. Duplex compressors will be provided for each of the building central units to improve reliability. The air handlers, coils, boilers, and hot water systems will be modified to provide effective and reliable environmental control systems. The present arrangement of equipment is neither adequate nor reliable to support long duration tests (50-80 consecutive days) as required by Skylab and follow-on programs. Also, the maintenance costs and corresponding downtime have reached unacceptable levels. This is Phase 1 of a three-phase project totalling about $600,000.

(4) Rehabilitation of Roofs 100,000

This project provides for the rehabilitation of the roofs on several buildings including but not limited to Buildings 7, 13 High Bay, 14, 15, 16, 29, 30, 31, 36, 49, and 440. In general, the work involves the repair of copings, coping joints, flashings, parapets, and perimeter hard rubber joints. The work also provides for the cutting and repairing of blisters, the application of a resaturating agent to the old roofing felts, and the furnishing of new roofing materials where needed. This work is necessary to preclude damage not only to the buildings, but also to their contents. This is Phase 1 of a two-phase project totalling

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about $200,000. The deterioration in the above roofs caused by blisters, weathering, and sealant failures at the edges of the buildings has caused damage to interior equipment, ceiling panels, walks, floors, electrical panels, and structural members.

(5) Modifications and Rehabilitations of the Photographic Laboratory, Building 8 $250,000

This project provides for various modifications to rehabilitate deteriorated chemical piping and leaking valves, to install four underfloor drain lines, and to connect all chemical waste systems to these central drains. Installation is also included for a Government surplus film processor, relocation of a black and white Versamat processor, relocation of stainless steel sinks and associated plumbing in the film processing laboratories. In addition, the project includes installation of recycling systems to eliminate objectionable waste discharges.

(6) Rehabilitation and Modification of "Zero-G Facility" 130,000

This project provides for refurbishing this facility and surrounding area. The interior and exterior walls of the water immersion facility, floors, access stairways, and safety equipment will be cleaned and repainted. The preceding work is required to counteract corrosion in this crew training facility. It also provides for the modification of the computer and support equipment areas. These modifications consist of electrical work, changing visual drive cabling, relocating and adjusting the air conditioning ductwork, and rehabilitating the computer hardware areas. This work is required to reconfigure and upgrade the flight crew simulator areas for support of Skylab and follow-on manned space flight programs.

(7) Modification of Laboratory Area in Flight Operation Office, Building 4 80,000

This project provides for the modification of the laboratory areas in the central core of all three floors. These modifications consist of electrical work, reconfiguration of the area, and realigning and balancing

the air conditioning system. This work is required to reconfigure and upgrade the laboratory space in the central core of the building for support of Skylab and follow-on manned space flight programs.

(8) Modification of Systems and Work Areas, Space Environment Simulation Laboratory, Building 32 $293,000

This project provides for modification to the various systems and work areas required to service the environmental chambers. The work will include modification to the heating system to accommodate exhaust from the chambers, installing liquid nitrogen lines for Chamber B, modifying Chamber A to improve maintainability and control air pollution, and modifying an area to be used for the repair and adjustment of solar xenon lamps. The present system for heating the gaseous nitrogen is inadequate. The liquid nitrogen system for Chamber B will control the backstream contamination from the diffusion pumps to prevent contaminating sensitive experiments and other test articles. The air pollution control work will reduce the amount of solar lamp carbon dust being released to the atmosphere. The area for working on xenon lamps will provide for efficient servicing of solar lamp system modules near the chamber with adequate environmental control.

(9) Modifications of Air Conditioning and Electric Power Systems Mission Control Center, Building 30 130,000

This project provides for installation of additional feeders, breakers, ducts, panels, and transformers to increase the electric power service between the Emergency Power Building 48 and Building 30, and for the installation of additional air conditioning equipment to increase the cooling capacity for the second floor area of Building 30. This work is required to provide for the increased power requirements and the increased air conditioning load resulting from conversion to Skylab support. The Skylab program requires the installation of additional computers, consoles and auxiliary equipment which will place an additional load on the power and air conditioning systems. The existing air conditioning

system is marginal for the mission operations wing of the building. The Skylab program will require additional equipment and personnel which will overload the existing air conditioning system.

(10) Modification of the Computer Support Equipment Area Central Data Office, Building 12 $60,000

This project provides for the disconnection and removal of a substantial amount of non-computer data reduction equipment, two Univac 1107 computers, and two Univac 1106 computers, and for the installation of new non-computer data reduction equipment and one new Univac 1110 computer, replacement of the modified flooring in the equipment area, installation of new power and signal cables, and modifications to the air conditioning system to accommodate the new equipment. This project is required to meet the requirements imposed by the change over from the Apollo program to the Skylab program. Also, a cost reduction is realized by the exchange of the two Univac 1106 computers for one Univac 1110. This modification will provide the capability to support the Skylab mission.

C. Marshall Space Flight Center 1,555,000

(1) Modification of Structures and Mechanics Laboratory, Building 4619 200,000

Provides for modification of existing electrical power, heating, air conditioning, water and sewer systems, and office and laboratory space. This work is required to permit installation of special test equipment to be used in evaluation of various shuttle project concepts and to provide more effective management of payload development efforts.

(2) Modification of Acceleration and Test Facility, Building 4476 130,000

Provides for modification of the Optical Test Tower in Building 4476 and installation of a vertical vacuum test chamber. The test chamber will be approximately

9.5 feet by 55 feet and provide a vacuum of 10^{-2} torr. This increased test capability will be used to measure tolerances of mirrors and to test optical systems required in future flight programs.

(3) Rehabilitation of Missile Assembly Shop and Office Building 4705 $50,000

Provides for upgrading of lighting and air conditioning for approximately 9,000 square feet of office area and replacement of thirty defective insulated windows on the west side of this building. A central air conditioning system will be installed to replace existing window units which have insufficient cooling capacity, and are worn out and costly to maintain.

(4) Modification to High Pressure Gas Propellant System 100,000

Provides for replacement of six 14,000 gallon liquid nitrogen storage tanks with six 25,200 gallon tanks obtained from surplus. Included are removal of old foundations, installation of new foundations, new vacuum jacketed connecting piping and extension of roofs and catwalk for protection of operating personnel. The existing 14,000 gallon tanks are old and unreliable with at least one tank out of service at all times for repairs. The increased capacity provided by the 25,200 gallon tanks is required to meet future test program demands for liquid and gaseous nitrogen storage.

(5) Rehabilitation of Printed Circuit Board Facility, Building 4741 80,000

Provides for rehabilitation of the machine and plating shops and the development and etching rooms. Includes installing new doors, modifying and improving floor drainage, installing acid resistive floor tile in the plating shop, refurbishing of ceilings and upgrading of ventilation and lighting systems. Also, includes new or modified utility connections for forty pieces of existing equipment. This work is required to (1) expand capacity to manufacture new types of printed circuit boards,(2) incorporate new processes into current

capability, (3) upgrade substandard work areas, (4) eliminate potential environmental health and safety hazards, and (5) rearrange equipment for improved operating efficiency.

(6) Modification of Guidance and Control Building 4487 $75,000

Provides for modification of an area in this building for the monolithic and hybrid microcircuit mask making facility. The area will be rearranged into three rooms to house special equipment for making and inspecting precision high resolution glass masks, an air lock and a developing room. The equipment and developing rooms will be provided with clean room environment of Class 10,000 and Class 30,000 respectively. This facility provides floor area and equipment necessary to expose, develop, and inspect high resolution glass masks. High quality glass masks of one micron accuracy and highly specialized capabilities in making photographic master masks are essential to continuing improvement in production technology for microcircuit devices.

(7) Modifications of Guidance and Control Building 4487 100,000

Modify 2,600 square feet of laboratory space in Building 4487 to provide: (1) Class 1,000 clean benches for use as a photolithographic laboratory; (2) a Class 10,000 clean room for etching, diffusion, metalization and wafer probe; and (3) chemicals and equipment storage. Improved capability is needed to assist in solving existing problems encountered in applications of integrated circuits to space systems. The proposed clean rooms will provide proper environment for tightly controlled experiments to help solve current applications problems and for fabrication of microscopic and high purity material required in monolithic microelectronics.

(8) Rehabilitation of Environmental Controls in Missile Assembly Shop Building 4705 50,000

Provides for replacing existing environmental control equipment in two former engine cell rooms, totalling

3,400 square feet. The new units will have necessary capacity to control humidity to 50% under all operating conditions and to filter particulate matter to a Class 10,000 clean room standard. This upgrading is required to conform to process specifications for tube brazing and insulating of flight hardware items.

(9) Modification of Assembly Building 4656 $90,000

Provides for relocation of hydraulic facilities from the Guidance and Control Building 4487 to Building 4656. Includes construction of: (1) a pit to install an existing engine - vehicle dynamic load simulator; and (2) an actuator test fixture for variable actuator test configurations. This work is required in the development and testing of actuators for space vehicle guidance and control systems.

(10) Modification of Equipment Test Shop Building 4728 70,000

Modify 1,800 square feet of shop space to provide an Electrical Circuit Layout Processing Laboratory for processing electric circuit layouts into master pattern films, negatives and other art work necessary to manufacture printed circuit boards and microcircuit devices. Includes partitions to provide six laboratory rooms, new lighting, floor tile, humidity controlled air conditioning, and plumbing and electrical outlets for installation of existing equipment. Existing facilities are inadequate in size, arrangement and ability to be kept sufficiently clean to produce acceptable products for use in manufacturing printed circuit boards. An upgraded capability is urgently needed for this important work.

(11) Rehabilitation of Guidance and Control Building 4487 50,000

Provides for rehabilitation of environmental control system and fire protection on the first and second floors of Wing A. Includes reworking of temperature and humidity control equipment, and installation of fire walls, fire detection and prevention equipment. Environmental control equipment was installed on an improvised basis as assignment and use of Wing A changed over the years and

requires upgrading to reduce maintenance costs and provide a satisfactory operating environment. Because of space realignments and changed occupancies, additional fire safety measures are required to meet standards.

(12) Rehabilitation of Power Distribution System in Storage and Office Building 4471 $212,000

Rewire electrical distribution to and within this building; consolidate six transformer banks into one; eliminate fifty panel boards; rearrange feeder and load circuits. The existing electrical distribution system has been modified and expanded for the past 15 years to conform to changes in utilization of Building 4471. As the need arose, a new substation was installed and power distributed internally for the particular function involved. This action led to a conglomeration of transformers, panels, feeders and long runs to various loads. At the present time, certain systems are overloaded and other systems contain hardly any load. Low voltage conditions are produced, as systems become overloaded and new distribution transformers are required, thus adding to the conglomeration. This condition will continue to pyramid as functional changes occur. The present system has become costly to maintain, extend and operate, and should be modernized and updated to meet current and future occupancy needs. This provides for Phase 1 of this work.

(13) Modification of Space Science Laboratory, Building 4481 140,000

Modify 14,000 square feet to include air conditioning and heating, partitions, ceilings, lighting, utilities, exhaust fans and hoods. The modified space will be used to consolidate space physics research required to support development of launch vehicles and spacecraft. Present Space Sciences Laboratory activities are located in Building 4481 and 4331. The latter building is a converted W.W. II manufacturing building constructed of steel frame and cement asbestos siding. It is in very poor condition, not economical to repair, and is scheduled for demolition when the required modification is completed and space research activities are consolidated in Building 4481.

(14) Modification of Surface Treatment Facility Building 4760 $208,000

Provides for modifications of existing space and construction of two additions, totalling 2,300 square feet to the existing surface coating facility in Building 4760. A 27 by 33 foot section of the existing large spray booth will be modified to permit installation of two bench type spray booths, each 10 x 10 x 8 foot high, equipped to flow conditioned and filtered air over objects being surface coated. A new 26 x 28 x 28 foot high spray booth will be provided to surface coat objects in similar fashion up to 22 feet diameter and 24 feet high. Necessary modifications will be made in the refrigeration and air handling system to provide the conditioned and filtered air flows to Class 100,000 clean room standards. This work is needed to provide increased capability to properly apply thermal control (low solar absorptance to infrared emittance ratio) coatings to large size experimental, developmental and aerospace flight hardware objects. This will complete the work initiated in FY 1971.

D. Michoud Assembly Facility 245,000

(1) Rehabilitation of Drainage System 105,000

Replace pipe and catch basins north and south of Saturn Boulevard and west of Venus Drive. Original system was installed in 1943. Pipes and basins have deteriorated to the point where they must be replaced to provide adequate drainage.

(2) Fire Protection System in Computers and Office Building 901 (Slidell) 140,000

Provides for installation of a fire protection system in Building 901 at Slidell (110,500 SF). At the present time, this building has a fire detection system, but is not protected by a sprinkler system. This facility provides computer services for Michoud Assembly Facility and Mississippi Test Facility. The computer equipment contained in this building is valued at $20,000,000 and the facility structure is valued at $4,500,000. Project is required to provide protection of high value equipment and facility. This provides for the high priority features of a total project estimated to cost $265,000.

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E. Mississippi Test Facility $100,000

(1) Modification to Air Conditioning System in Component Test Facility Building 8100 100,000

Provides additional air conditioning and humidity control for the instrumentation and standards laboratories relocated from Building 1105. Present system has insufficient capacity to provide proper environmental control for the computer equipment and instrumentation associated with these relocated laboratories and must be updated to meet required tolerances.

F. Various Locations 245,000

(1) Rehabilitation and Modification of Industrial Plants 245,000

This project provides for rehabilitation of the facilities, utilities and support systems as required at NASA industrial plants in order to maintain the facilities in a serviceable condition to meet basic functional needs. This work involves necessary repair of water, sewage, heating and power lines, storm drains, parking lots, air conditioning and building equipment associated with the industrial plants at locations such as Canoga Park, Downey, and Santa Susana, California. There is significant investment in the facilities at the industrial plants which must be protected by a comprehensive program of repairs and replacement. The majority of these facilities were constructed 20 to 30 years ago and many are now in need of rehabilitation. This project will include the type of work required to protect the Government investment, prevent deterioration and maintain the facilities in a serviceable condition.

2. OFFICE OF SPACE SCIENCE (2,450,000)

A. Goddard Space Flight Center 1,005,000

(1) Modification of Fire Protection Systems in Buildings 1, 4 and 12

(a) Space Projects Building 1 (25,000 square feet): Sprinkler protection was provided in the computer

and telephone equipment areas of this building in FY 1970. This proposed project will provide like sprinkler protection for the first and second floors which contain the highly combustible magnetic tape and punch card libraries, key punch equipment, programming activities and scientific and administrative office areas. This is a continuation of the phased program of fire protection and completes the work presently required in this building.

(b) Laboratory Building 4 (35,000 square feet): This building houses thermal design, optical measurements, coatings and radio telemetry activities. Components and spacecraft for future flights are housed and tested in this building. A significant fire could result in major delay in flight schedules as well as high dollar property loss. This proposed work will complete the fire protection program for this building.

(c) Tracking and Telemetry Laboratory Building 12 (90,000 square feet): This building houses the Time Standard Facility in addition to the Manned Mission Support and Laser Development Laboratories. The provision of adequate fire protection is essential to avoid high value loss and program mission delay. The Time Standard Facility coordinates signals between spacecraft and critical network command and control computers in Building 14. The work proposed here will complete all presently envisioned work.

(2) Modification of ERTS Data Handling Area Building 23 $100,000

Provides for modification of 5,000 square feet of data handling and support areas on the third floor of Building 23 and includes: The Image Generating Facility; electronic maintenance and support areas; improvement of air conditioning and humidity controls for equipment areas and provision of a materials handling device for film and finished product handling. Modifications to Earth Resources Technology Satellite Data Handling Area on the third floor are necessary to meet changing and increasing program requirements.

(3) Replacement of Cooling Towers, Buildings 1 and 3 $75,000

Replaces five existing cooling towers including three on Building 3 with a total of 500 ton capacity and two on Building 1 with a total capacity of 625 tons. These 10-year old towers have deteriorated badly and require replacement to avoid high recurring maintenance cost and frequent outages.

(4) Modification to 40-foot Coil Building at Magnetic Test Facility 245,000

This project provides (1) temperature and dew point control to maintain temperature below 50°F at all times, and (2) filtration and air wash equipment for contamination removal. Included are an air plenum chamber, mechanical equipment room addition, and modifications to ductwork and refrigeration system. These modifications are required to provide improved environmental test conditions and avoid the many delays and abbreviated tests and experiments which have occurred in the past due to poor test environment.

(5) Rehabilitation of Road System 100,000

Provides for resurfacing of 9,000 square yards of existing asphalt surface roads, replacing approximately 1,000 square yards of badly cracked asphalt paving adjacent to buildings, regrading and relining ditches and modifying roads to improve traffic flow. Original road design provided for light duty traffic; however, traffic with heavy wheel loads have, of necessity, been required to use certain of the roads in the shop area. Consequently, road surfaces and their bases are now showing the effect of this hard use and must be repaired to prevent further deterioration. In some low areas ground water conditions have affected the supporting capacity of the subgrade requiring resurfacing. This is the initial phase of a comprehensive program to improve roads and drainage systems at GSFC.

(6) Modifications to Computer Facilities 255,000

Provides for modifications to data processing areas in eight buildings, including electrical, mechanical systems and partition and floor changes to suit equipment changes and replacements. Equipment changes are required

to meet changing technical requirements of various R&D programs. Buildings involved in this project are Nos. 1, 3/14, 7, 18, 22, 25 and 26. The associated data processing system equipment modifications and its installation will be funded under the R&D program. This is an initial phase of a longer range program to meet these needs at GSFC.

B. Jet Propulsion Laboratory $550,000

(1) Modification to Sewage Lift Stations 100,000

This project provides for modifications necessary to provide for automated control of the existing gravity system and three lift stations. The City of Pasadena has limited the discharge rate of sewage effluent through the meter from JPL's four independent systems to a total of 500 gpm to avoid flooding of its pump station. The modifications proposed are required to meet this limitation on the effluent discharge rates.

(2) Modification to Systems Development Laboratory Utility Systems 205,000

This project provides for (1) backup electrical power for the Systems Development Laboratory (SDL) by utilizing power from the existing emergency generators in the Space Flight Operations Facility (SFOF). This will require additional switchgear in the SFOF and the SDL and a transmission line between the two buildings; and (2) backup air conditioning in the SDL by using chilled water from the air conditioning systems in SFOF. This will require chilled water piping through the connecting instrumentation tunnel and new air handling coil units on each floor of the SDL. Viking Mission Support areas to be located in the SDL are essential to full mission support of the Viking missions. Potential power or lengthy air conditioning outages due to equipment failures could seriously jeopardize the mission during critical phases of the flight. For these reasons full redundancy is essential.

(3) Rehabilitation of Air Conditioning System in Laboratory and Office Building 125 145,000

Refurbish and upgrade air conditioning systems by the replacement of the obsolete two-pipe, hot/chilled

water and air conditioning system. The air conditioning system in this building is antiquated and provides unsatisfactory service. It has been the source of continuous maintenance and must be rehabilitated.

(4) Modification of Fire Protection System $100,000

Install sprinklers in two buildings, smoke detectors in four buildings and automatic signal systems in twenty-two buildings. This work is required to protect high dollar value equipment, such as computers, assembly and testing activities which are critical to spacecraft project and research and development activities. This is a continuing investment in a phased plan for this work at JPL. This project represents the most urgent work of that remaining to be done.

C. Wallops Station 895,000

(1) Rehabilitation of Seawall and Groin System 360,000

Replace sand and soil along protective sand dune line and repair damaged groins extending seaward from the seawall. Erosion of the dune line has exposed the bulkhead and is weakening the entire protective system along 11,200 linear feet of ocean front. In addition, ten of the groins have lost timber sheeting on their outboard areas and are no longer effective in trapping the moving sand caused by littoral drift. Repairs are required in order to continue to provide protection to the launch facilities from severe storm wave action within this area.

(2) Rehabilitation of Sounding Rocket Facility Building Z-55 195,000

Replace transite roof and sidewall panels and upgrade pressure relief capability. Rehabilitate heating system and electrical system. Since construction of the launch tower, more powerful first stage booster motors have been used to increase vehicle performance, resulting in increased internal pressure in the enclosed launch tower at the moment of vehicle firing. This increased pressure has resulted in loosening, splitting and actual blowout of the sidewall and roof panels and has created a hazard

from falling panels, as well as opening the structure to inclement weather. The expansion of needed capability has resulted from more sophisticated payloads which require better control of temperature during the launch preparation stage. Installation of payload checkout equipment and a clean room in the vehicle ready room has severely overloaded existing electrical feeder service and secondary circuits which will be expanded as a part of this project.

(3) Rehabilitation of Water Distribution System $340,000

Increase supply and improve reliability of Wallops Island water storage and distribution system by installing a 50,000 gallon elevated storage tank to replace an existing deteriorated tank and by providing a water main loop of 13,000 lineal feet to connect the northern and southernmost distribution systems. Existing separate systems require separate water treatment effort and fail to provide sufficient flow and pressure for fire protection purposes. The new tank, loop, and cross-connectors will unify existing systems, reduce treatment costs and provide alternate sources of water supply at launch areas for possible emergencies.

3. OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY (3,815,000)

A. Ames Research Center 265,000

(1) Modification to Flight and Guidance Simulation Laboratory Building N-243 50,000

Provides for isolation of the equipment of the visual flight simulator from the associated control, operations and maintenance area located in Flight and Guidance Simulation Laboratory Building N-243. A partition will be installed which will reduce dust and maintenance requirements of the simulator and associated visual display equipment. In addition, the operational personnel will be provided a work area free from intense light and radiant heat produced by the simulator equipment. Increased use of this facility makes this refinement a current need.

(2) Modification of Flight Simulator Laboratory Building N-210 $95,000

Provides for the modification of 4,100 square feet to meet expanded digital-hybrid computer requirements. Included is installation of raised computer floor, ceiling, improved lighting and increased air conditioning. Also includes conversion of Room 138 from shop to supporting laboratories, requiring additional lighting and air conditioning, and an asphalt tile floor. New flight projects require that hardware be brought into computer areas for more effective simulation. Because of these new requirements additional area is needed to avoid congestion and improve efficiency of operations.

(3) Modifications of 2' x 2' Transonic Wind Tunnel 120,000

Provides for the replacement of various materials in the 2' x 2' wind tunnel sections to permit the use of a heavy gas such as freon. The suitability of a heavy gas to conduct wind tunnel investigations at increased Reynolds Numbers will be tested in the 2' x 2' wind tunnel on a pilot basis. Increase in Reynolds Numbers capability is required to avoid present disparities between wind tunnel tests and flight test results. Use of a heavy gas such as freon may result in a threefold increase in test Reynolds Numbers in existing pressurized wind tunnels. This project will permit verification of the heavy gas approach by modification to the small 2' x 2' wind tunnel prior to application of this approach to the large pressurized wind tunnels.

B. Flight Research Center 420,000

(1) Rehabilitation of Lighting Systems 100,000

Rehabilitation is required to raise lighting levels to minimum standards for work performed. Portable lighting stands are currently used to supplement and increase the existing lighting levels.

(2) Rehabilitation of Mechanical Systems and Equipment 200,000

Rehabilitate air conditioning system, ductwork and cooling towers, boiler plant controls, elevators and bridge cranes. Rehabilitation, refurbishment or

replacement is required due to natural deterioration, aging, obsolescence and normal wear and tear. Boiler controls, elevator, air conditioning equipment, cooling towers, and ductwork have deteriorated to a point where replacement and rehabilitation are necessary to avoid excessive maintenance or breakdown.

(3) Rehabilitation of Roads and Paving $120,000

Rehabilitate taxiways, run-up pads and roadways which are spalling and breaking up from wear and tear and exposure to the elements. These pavements require timely repair to arrest further deterioration and to avoid complete replacement.

C. Jet Propulsion Laboratory 100,000

(1) Modification of Engineering Facilities Building 188 100,000

Provides for modification of Building 188, including electric-driven shock tubes, capacitor bank, charging apparatus and associated equipment. Modifications will increase velocity of shock tubes from 45 kilometers per second to approximately 60 kilometers per second and provide sufficient test time at high enough pressure to insure equilibrium conditions in test slugs. Increase in performance capability of shock tubes is necessary to cover complete range of variables expected for entry of probes into atmosphere of Jupiter and other major planets.

D. Langley Research Center 1,230,000

(1) Rehabilitation of Generator Plant Building 1152 206,000

Upgrade interior areas, walls, ceilings, floors, lighting and rest rooms. Replace wood windows and doors. Repair masonry. This building was built in the 1945-46 period when proper materials were difficult to secure. Quality levels were then kept to an absolute minimum. Normal wear and tear over the intervening 25 years now requires that a general refurbishment of interior office and work areas be undertaken in this building as part of a continuing building

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improvement program. Replacement of rotting wooden windows and doors, and rusting steel sash and repair of masonry is required to prevent entry of moisture and to arrest accelerated deterioration.

(2) Rehabilitation of Laboratory Building 1229 $315,000

Upgrade interior areas, walls, ceilings, floors, lighting, and rest rooms. Replace wood windows and doors. Repair masonry. This building was also built in the 1945-46 period when proper materials were scarce. Quality levels were kept to an absolute minimum. Normal wear and tear over the past 25 years now requires that a general refurbishment of interior office and work areas be undertaken in this building as part of a continuing building improvement program. Replacement of rotting wooden windows and doors, and rusting steel sash and repair of masonry is required to prevent entry of moisture and to arrest accelerated deterioration.

(3) Rehabilitation of Air Conditioning in Laboratory Buildings 1230 and 1219 236,000

Consolidate and upgrade air conditioning systems - chillers, ductwork, controls as well as necessary electrical items. These buildings were constructed in the 1945-46 period and air conditioning has been added on an improvised basis over the past years. Each building now has several systems of almost every type and kind available. The systems are generally short lived and submarginal in their availability to obtain operational diversity. They require many different spare parts and are frequently in a breakdown/shutdown mode. The result is poor performance at high cost. This project will replace these existing inadequate subsystems with modern systems or consolidate them into at most two systems in each building.

(4) Rehabilitation of Laboratory Building 1232 473,000

Upgrade interior area walls, ceilings, floors, lighting, rest rooms, and air conditioning systems. This building was built in the 1945-46 period when proper materials were difficult to secure. Normal wear and tear over the intervening 25 years now requires that a general

refurbishment of interior office and work areas be undertaken as part of continuing building improvement program. Replacement of rotting wooden windows and doors and rusting steel sash and repair of masonry is required to prevent entry of moisture and arrest accelerated deterioration. Air conditioning was added to this building on an improvised basis over the years. These systems represent several types, are generally short lived, marginal in performance and expensive to operate and maintain. This project will replace these inadequate systems with a single modern system or consolidate them into at most two systems within the building.

E. Lewis Research Center (Cleveland) $1,280,000

(1) Rehabilitation of Central Area Water Distribution System 220,000

Increase supply and improve reliability of water system by extending and looping of the 24" and 12" mains in the central area. The basic water supply and distribution system was installed in 1946 and has never been expanded to meet the increased demands which has doubled since that time. The result is inadequate pressure at time of higher consumption. Extending and looping the larger size mains will reduce this problem considerably and improve the fire protection capabilities at the Center.

(2) Rehabilitation of Aerospace Information Display Building 8 295,000

Upgrade interior areas to include refurbishing walls, ceilings, floors, lighting, heating, air conditioning, and rest rooms. Replace windows and doors. Repair masonry. This building was constructed in 1943-44 when proper materials were difficult to secure. Quality levels were kept to an absolute minimum. Normal use over the past 28 years now requires that refurbishment of interior office and work areas be undertaken. The initial phase of this work in Building 8 was included in the Fiscal Year 1972 program. The requested amount will complete all interior renovation in this building and also provide for replacement of deteriorated windows and doors and repair of masonry to prevent entry of moisture and arrest accelerated deterioration.

(3) Rehabilitation of Engine Research Building 23 $300,000

Upgrade interior areas to include refurbishing of walls, ceilings, floors, lighting, heating, air conditioning and rest rooms. Replace windows and doors. Repair masonry and roof. This building was constructed in 1943-44 when proper materials were difficult to secure. Quality levels were kept to a minimum. Normal use over the past 28 years requires that refurbishment of the interior areas be undertaken. Part of this building was refurbished in 1966. The requested amount will complete all interior renovation and also provide for replacement of deteriorated windows and doors and repair of masonry and roof to prevent entry of moisture and arrest accelerated deterioration.

(4) Rehabilitate Exhaust Intercoolers in Propulsion System Laboratory 150,000

Inspect, and replace as necessary, out-of-service tubes in each of 13 compressor and exhauster intercoolers. At the PSL Equipment Building, some of the 72 tube nests in the 13 intercoolers have a considerable percentage of out-of-service tubes due to plugging or sealing by maintenance personnel to prevent leakage. This significantly reduces the heat transfer capability of the coolers. Because of this reduced efficiency, a chilled water system is used to augment the coolers in order to cool the air to the desired temperatures. This increases power requirements and operating costs.

(5) Replacement of Expansion Engines, Helium Liquefaction Plant 60,000

Replace two existing helium expansion engines at the Helium Liquefaction Plant with two expansion turbines. The existing expansion engines are unreliable and costly to maintain. Many special parts are involved and frequent out-of-service periods are required for overhaul and repair. Highly efficient and reliable cryogenic expansion turbines have recently been developed and are proposed as a replacement. This work will permit the Helium Liquefaction Plant to provide the required level of support to research programs.

(6) Rehabilitation of Protection Signaling System $55,000

This project provides for the repair of Central Station protective signal system. One cable loop in the system is in need of replacement due to deterioration of insulation and shorts in the line. Two cable loops will be extended to buildings not now serviced by this system. Transmission facilities will be installed in these buildings and new readout equipment procured and installed at the monitoring station. This system must be rehabilitated to provide Lewis Research Center with adequate building protection and will complete this requirement based on current needs and standards.

(7) Modifications to Air Supply System 50,000

Provides for the upgrading of the 450 pounds per square inch air supply system available at the 9' x 15' low speed wind tunnel. This will be done by replacing the present 4" diameter supply pipe with 8" piping and extending the 30" diameter exhaust from the 8' x 6' tunnel heater to the 9' x 15' tunnel. This increased air supply capability is necessary under V/STOL test projects to permit testing of a group of 20" diameter fans at the required increased pressure rates. The extension of the 30" diameter exhaust duct is necessary to permit simulated engine tests for study of shock inlet design, including the effect of various designs on noise suppression and sensitivity of designs to inlet distortion at various angles of attack and forward speeds.

(8) Rehabilitation and Modifications of Cooling Tower Systems 150,000

Provides for the rehabilitation of cooling towers 1, 3 and 4 and consists of replacing wooden components such as fan tops, decking, fill and structural support, and the replacement of the deteriorated tower basin concrete. These repairs are necessary to maintain full operational capacity and to increase efficiency of the cooling systems.

Cooling Towers 1 and 4 utilize a common water piping system. Modifications will be made to this system so that one cooling tower will handle exhaust spray coolers with the second tower handling other requirements. At the present time combustion products accumulating in the single system as result of spray cooling of hot exhaust gases from the engine research test cells are plugging heat exchangers and filters throughout the combined system. Separation of the spray coolers from the general cooling system is necessary to reduce maintenance costs and improve the operational reliability of equipment utilizing cooling water.

F. Lewis Research Center (Plum Brook) $520,000

(1) Rehabilitation of Roofs 310,000

Replace roofs on Buildings 1411, 1441, 1491, 5411 and 8531. Correction of roof slope on the first three buildings is required to prevent ponding and entry of moisture during heavy storms. The roofs on the latter two buildings have served their normal design life and require replacement to prevent high continuing repair costs and damage to building structure and contents.

(2) Replacement of Heating Plants 110,000

Replace heating plants in five buildings. Boilers in two of the buildings were installed during W.W. II. One large heating plant was obtained from surplus and installed as a temporary measure. The boilers and heating plants have deteriorated beyond safe operation and economical maintenance and require replacement.

(3) Rehabilitation of Roads and Drainage Systems 100,000

Level, widen, and repave roads serving major research facilities. Restore portions of the storm drainage systems including repair of culverts. Roads are narrow and irregular, with dips and unsafe crossings. Sections of the storm drainage system and culverts have been damaged by past storms and require restoration to prevent future flooding and the ponding of water on roads and outside storage and work areas.

4. OFFICE OF TRACKING AND DATA ACQUISITION ($950,000)

A. Various Locations 950,000

(1) Fire Protection and Safety Modifications, Deep Space Network (DSN) Stations. 140,000

Increase the water supply, storage and distribution to support the automatic sprinkler systems, provide properly designed deadend mains in lieu of looping distribution mains, provide pressure tanks supply at remote buildings where it is not economically feasible to provide adequate water mains, improve protection to power plants with automatic sprinkling of engine generator room and switch gear room, improve fire walls between engine generator room, switch gear room and maintenance shop, relocate day tanks external to building, and install remote shutdown switches for utility systems and electronic systems at selected Deep Space Stations.

(2) Fire Protection and Safety Modifications, Spaceflight Tracking and Data Network (STDN) Stations. 480,000

Increase the water supply, storage and distribution to support the automatic sprinkler systems, provide properly designed deadend mains in lieu of looping distribution mains, provide pressure tanks supply at remote buildings where it is not economically feasible to provide adequate water mains, improve protection to power plants with automatic sprinkling of engine generator room and switch gear room, improve fire walls between engine generator room, switch gear room, and maintenance shop, relocate day tanks external to building, and install remote shutdown switches for utility systems and electronic systems at selected STDN Stations. .

(3) Modification to Heating, Ventilating and Air Conditioning Systems at Deep Space Network (DSN) Stations. $180,000

Rehabilitation of the air conditioning rotary equipment, some of which has been in continuous use for 10 years, is necessary at this time to dissipate the increased heat loads from the existing equipment and to increase the capacity of these systems to provide adequate redundant capacity and eliminate potential single point failures during mission support modes. All modifications will be made within existing structures. These modifications will be made at Goldstone and Madrid.

(4) Modifications to Air Conditioning System, STDN Stations, Mila. 150,000

Rehabilitation of the air conditioning plant in the Operations Building at the Merritt Island STDN Station, Merritt Island, Florida. Since this building was constructed, several major additions have been made to the building, and the electronics equipment has been extensively reconfigured and extensive amounts of equipment have been added. The existing plant is not adequate for the existing building. A complete redesign of the system will be made to improve controls and increase capacity. New ducting will be provided as necessary.

5. MISCELLANEOUS PROJECTS LESS THAN $50,000 EACH ($650,000)

TOTAL $11,580,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

It is estimated that an average of some $15,000,000 per year will be required for the continuation of this facility rehabilitation and modification program.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

MINOR CONSTRUCTION OF FACILITIES

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Office of Organization and Management Project:	
Minor construction of facilities	CF 11-2

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 73 BUDGET ESTIMATES

(Dollars in thousands)

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

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 19 73 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Minor Construction of New Facilities and Additions to Existing Facilities at Various Locations	O&M	103	1,720	-0-	Not Applicable
TOTAL			1,720		

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NASA-HQ
CF 11-1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE	Minor Construction of New Facilities and Additions to Existing Facilities at Various Locations
	FY 1973 CoF ESTIMATE $1,720,000

COGNIZANT INSTALLATION: Various Locations

LOCATION OF PROJECT: Various Locations

COGNIZANT PROGRAM OFFICE: Office of Organization and Management

FY 1972 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$103,000
Minor Construction	---*
Total FY 1972 and Prior Years	$103,000

*NOTE: This activity was previously included in the R&PM and R&D appropriation.

SUMMARY PURPOSE AND SCOPE:

To provide for minor facility construction at NASA field installations and at Government-owned industrial plants engaged in NASA activities. The purpose of this program is to provide for the continuation of this minor facility project work previously accomplished under the R&PM and R&D appropriations. This provides for minor facility projects involving the construction of minor new facilities or additions to existing facilities each project of which is estimated to cost less than $250,000. Such minor construction is necessary to improve the usefulness of NASA's physical plant by making it possible to accomplish needed adjustments in the utilization and augmentation of its capabilities.

PROJECT JUSTIFICATION:

The existing NASA physical plant is necessarily impacted by changing utilization and adaptations made necessary by changing technology and mission needs, as well as by new facility requirements generated by research, development, test and like activities. Items included in this project reflect those projects which must be accomplished in FY 1973 to meet general NASA installation requirements or general technical facility needs which are not solely or primarily required to support specific

research or development programs or projects. Also included are those items which are required in FY 1973 to meet the peculiar needs of one or more specific research or development programs or projects, and which could be adequately identified at the time of submission of this budget estimate.

Items of work proposed to be accomplished within this program for FY 1973 have been carefully selected from a list totalling about $5 million. This selection has been made on the basis of the relative urgency of each item and the expected return for its accomplishment in relation to the investment involved. It is recognized, however, that during the course of the year some rearrangement of priorities may be necessary and that changes may be required in some of the items to be accomplished within the resources allocated.

PROJECT DESCRIPTION:

Items of work included in this estimate are outlined under "Project Cost Estimate" and total $1,720,000. Of this amount, about $1,495,000 represented by specific, discrete items of work, and about $225,000 is indicated as a "lump sum" amount to provide for facilities work of these types (new construction and additions) estimated to cost less than $25,000.

PROJECT COST ESTIMATE:	$1,720,000
1. OFFICE OF MANNED SPACE FLIGHT	355,000
A. Kennedy Space Center	65,000
(1) Addition to Facilities for Proto-type Shop	35,000
Provides for relocating Building 25300AE (4,080 square feet) from LC 34, Cape Kennedy Air Force Station to the Fluid Test Area at Kennedy Space Center. The existing facilities at the Proto-type Shop are insufficient, and trailers are being used to supplement space. The relocation of this surplus building will eliminate approximately five (5) trailers, and will provide needed space.	
(2) Addition to Facilities for GSA Motor Pool Service Area	30,000
Provides for relocating Building 1705 (7,147 square feet) from Cape Kennedy Air Force Station to the GSA Motor Pool Area at Kennedy Space Center. It is no longer economical to continue vehicle body work, paint and storage activities at CKAFS. This building will provide improved work space and eliminate the present use of trailers.	

B. Manned Spacecraft Center 240,000

(1) Installation of an Industrial Water Treatment System 200,000

This project provides for the installation of an Industrial Water Treatment System to serve the Thermochemical Test Area Building 222, and small cooling towers at various locations.

Increased water usage has caused an increase in total dissolved solids with an attendant increase in scale deposits in cooling towers, water pipes, etc. Scale removal on an intermittent basis has become too costly.

(2) Addition to Laboratory Space, High Bay, Building 15 40,000

This project consists of constructing a second floor under the balcony in the high bay of Building 15. The floor will have the same load bearing strength as the existing balcony. Both 110 volt single phase and 28 volt direct current are available. Shop air, hot and cold water, and drain facilities are available in the area. This added capability will accommodate requirements for modifications, bench tests, checkouts, and configuration changes to infrared sensors, associated electronics, and ground support equipment due in part to the expanded Earth Observations Aircraft program. The present utilization of the Physical Optics Laboratory for this infrared work has created a congested and hazardous arrangement that severely curtails the functions of that laboratory for support of Skylab and other Center programs.

C. Mississippi Test Facility 50,000

(1) Construction of Remote Sensing Support Facility 50,000

Provides for construction of a 3,000 square foot metal frame building. This facility is required to provide necessary space for the conduct of studies related to remote ground sensing research and application. There is also included a 1,000 square foot cinder block structure to be used for associated analytical analysis and the evaluation of experimental samples. These experimental samples will be exposed to controlled amounts of pollutants and the changes in the detection characteristics on their surfaces will be measured and studied.

2. OFFICE OF SPACE SCIENCE $380,000

A. Goddard Space Flight Center 200,000

(1) Addition to Maintenance Shop Building 5 200,000

Construct a 10,000 square foot addition to Building 5. This maintenance shop requires an all-weather enclosed area for materials and in-process work staging. Current operational needs cannot be reasonably accommodated within the existing areas and improvised use of outside, uncovered space must be made.

B. Jet Propulsion Laboratory 180,000

(1) Addition to Spacecraft Storage Building 243 60,000

Provides for construction of a 500 square foot addition to Building No. 243 for handling and storage of complex and costly spacecraft antennas and associated hardware. This addition will be air conditioned and provided with special filters for dust control to minimize contamination of extremely sensitive flight control hardware associated with antennas. The addition is required to solve increasing complex storage and handling and should be located contiguous to the existing Range Testing Facility for maximum operational effectiveness.

(2) Addition of Radio Frequency Screen Room to Building 161 30,000

Provides for construction of a Radio Frequency (RF) screen room addition of about 300 square feet to Building 161. This screen room is required for simultaneous testing of high power transmitters and measuring of transmitters in a low RF noise environment. This increased capability is required for experimental and development work in direct support of development of advanced S/X band spacecraft radio equipment.

(3) Construction of a Pulsed Xenon Solar Simulator Test Facility 90,000

This provides for the construction of a facility approximately 800 square feet to accommodate a solar array 16' square which must be tested with a pulsed xenon light source at a distance of 30'. Testing requires close temperature controls. Present tests are conducted at Table Mountain, California

(a JPL remote site) with resulting hazards to solar panels while in transit to and from Pasadena. Adverse weather conditions at Table Mountain often affect test schedules. This project will reduce costs considerably over present procedures.

3. OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY — 160,000

A. Ames Research Center — 160,000

(1) Relocation of Rotor Test Stand

Provides for the removal of the rotor test stand from the aircraft ramp area and its relocation in the remote area reserved for such a facility in the Ames Research Center master plan. The project includes filling of the vacated fuel pit and restoration of the ground area for aircraft modification and maintenance activities. The present location of the test stand was initially selected prior to the expanded aircraft programs at the Center. It now presents a serious hazard, to added high value aircraft, which could result from flying debris from rotor failure under test conditions.

4. OFFICE OF TRACKING AND DATA ACQUISITION — $600,000

A. Various Locations — 600,000

(1) Addition to Telemetry Building Spaceflight Tracking and Data Network (STDN) Station, Canberra, Australia — $175,000

Provides for the expansion of the operations building at the STDN Station, Canberra, Australia. The central portion of the existing building will be cleared to permit reconfiguration of the electronics equipment. The new addition of approximately 2,400 square feet will provide space for the functions to be relocated from the central area. These functions include office areas and communications. The new addition will be temperature and humidity controlled and will include space for the necessary mechanical and electrical areas. The electronics equipment involved is not a part of this project.

(2) Addition to Telemetry Building STDN Station Quito, Equador — 125,000

Provides for the expansion of the telemetry building at STDN Station, Quito, Equador. Existing office

and support areas within the building will be removed to permit reconfiguration of the electronic equipment. A new addition of approximately 3,200 square feet will be added for office areas, toilet facilities, mechanical areas, tape storage areas and logistics and test equipment areas. The new addition will be provided with temperature and humidity control and a limited amount of raised floor for future expansion. The electronics equipment involved is not a part of this project.

(3) Addition to Operations Building and Antenna Pad - STDN Station - Guam $150,000

Augments the Guam STDN Station by the installation of a 136MC telemetry and command system consisting of two antenna foundations, a boresight tower and foundation, transmitter building, power and signal cables trenches and necessary roads and parking. Also a 2,000 square foot addition to the operations building is required to house and support additional electronic equipment. The building addition will match the existing construction and will be complete with suspended ceiling, raised floor, and air conditioning. The station's grounding, fire detection/protection and electrical systems will be extended as necessary. The electronics equipment involved is not a part of this project.

(4) Addition to Operations Building and Antenna Pad - STDN Station - Ascension 150,000

Augments the Ascension STDN Station by the installation of a 136 MC telemetry and command system consisting of two antenna foundations, a boresight tower and foundation, transmitter building, power and signal cables trenches and necessary roads and parking. Also, a 2,000 square foot addition to the operations building is required to house and support additional electronic equipment. The building addition will match the existing construction and will be complete with suspended ceiling, raised floor, and air conditioning. The station's grounding, fire detection/protection and electrical systems will be extended as necessary. The electronics equipment involved is not a part of this project.

5. MISCELLANEOUS PROJECTS LESS THAN $25,000 EACH 225,000

TOTAL $1,720,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

It is estimated that between $3 and 5 million per year will be required for the continuation of this essential facilities minor construction work at NASA field installations and Government-owned industrial plants engaged in NASA activities.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

FACILITY PLANNING AND DESIGN

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INSTALLATION SUMMARY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 BUDGET ESTIMATES

(Dollars in thousands)

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

PROJECT LINE ITEM	COGNIZANT OFFICE	FY 1959 THRU CURRENT YR	FY 1973 (Estimated)	FUTURE YEARS (Estimated)	TOTAL ALL YEARS (Estimated)
Facility Planning and Design	O&M	70,374	8,000		Not Applicable
TOTAL			8,000		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1973 ESTIMATES

PROJECT TITLE Facility Planning and Design	
	FY 1973 CoF ESTIMATE $8,000,000

The funds requested are to provide for the following advance planning and design activities related to facilities projects:

a. Preparation of preliminary engineering reports, cost estimates, and design and construction schedules.

b. Preparation of final construction contract plans, specifications, and associated cost estimates and schedules that are required to implement the construction project.

c. Accomplishment of necessary development and master planning for field installations.

d. Accomplishment of facilities siting and other investigations, as well as special facilities studies and reports.

The $8,000,000 request for facility planning and design for FY 1973 is made up of two major segments:

a. Regular requirements - $3,500,000

b. Other requirements - $4,500,000

Regular requirements encompass the basic purposes outlined above and "other requirements" while also in support of these purposes cover those special needs which are related to large, complex projects which are considered to be future potential requirements. For these larger projects significant planning work should be accomplished prior to their inclusion in a budget request and normally this planning lead time is exceptionally long.

Regular Requirements

a. Necessary updating of development and master plans for field installations and required facilities studies, investigations, and reports which will define facility parameters within which subsequent preliminary engineering efforts will be based. Master plans are revised on an average of once every three years for each installation, with about one-third of the installations being involved in any one fiscal year. $550,000

b. Preparation of preliminary engineering reports, investigations and studies related to proposed facilities projects to be included in the subsequent FY 1975 Construction of Facilities program are provided for by this amount. These reports are required to permit the early and timely development of the best project required to meet the stated functional need and to provide the related basic data, cost estimates and schedules related to any such future budgetary proposals. 950,000

c. The amount requested will provide for the preparation of design, plans, drawings and specifications necessary for the accomplishment of the subsequent FY 1974 Construction of Facilities program. 2,000,000

Subtotal, Regular Requirements $3,500,000

Other Requirements

These other facilities planning and design requirements are generated by potential future projects, large in size and of a complex nature. These are associated with future aeronautical and space programs which require a long planning cycle. Early and progressive design work is essential to insure the ultimate best design, cost estimates and schedules. These projects then require added planning effort and associated design lead time well beyond that normally associated with preliminary engineering reports and general type facilities projects. For this reason, these requirements must be provided for over and above the regular and more recurrent facility planning and design needs.

Space Shuttle Facilities $3,750,000

a. This requirement is in part associated with the preparation of preliminary engineering reports, the conduct of facilities type investigations and the execution of facilities studies related to proposed space shuttle facilities projects to be included in the subsequent FY 1975 Construction of Facilities program. This preliminary work is to be carried out in relation to such future space shuttle related projects as: (1,000,000)

1. Launch, landing and refurbishment facilities. Studies will be directed toward providing new facilities or modifying existing capabilities to meet the requirements for launch of the integrated booster/orbiter vehicle, servicing and refurbishing of the booster after landing, and checkout and mating of the launch vehicles prior to reuse.

2. Testing facilities. Studies will be directed toward modifying existing facilities to provide for dynamic tests of the vehicles, fatigue testing, vehicle checkout, and vehicle separation simulation facilities.

This preliminary effort is necessary to permit the early and timely development of the best project required to meet each stated functional need and to provide the related basic data, cost estimates and schedules.

b. This requirement is associated with the preparation of final design, drawings and specifications necessary for the accomplishment of subsequent space shuttle facilities to be included in a FY 1974 Construction of Facilities request. This final design work is to be carried out in relation to such future space shuttle related projects as: (2,750,000)

1. Modification of existing facilities for final checkout of the assembled vehicles.

2. Modification of existing facilities for propulsion and structural testing of the vehicle.

3. Provision for landing and "safing" facilities at the launch and landing site.

4. Facilities required for the servicing, maintenance and checkout of the orbiter vehicle before and after landing.

Large Aeronautical Facilities	$750,000

Prior year resources applied to the large aeronautical facilities have been used primarily for development of the first phase of a Preliminary Engineering Report (PER) and related parametric studies of a Full Scale Subsonic Tunnel. The parametric studies have been conducted to support the selection of an optimum facility configuration. Preliminary studies of the power section, drive system, test section and model handling system have been undertaken and in some cases completed. They provide the necessary data for a proper evaluation of the proposed concepts.

Fiscal year 1973 funds are required to conduct cost optimization studies, complete final design of the drive system and to initiate design of selected components of the facility. Optimization studies of the inlet and outlet sections of the facility could lead to a substantial reduction in the cost of the final structure.

Preliminary design of selected components will be initiated to establish the main structural and mechanical systems. These efforts will advance the state of design in sufficient depth to analyze alternative design concepts for the development of a project to embody the most economical and prudent engineering methods to fulfill the basic functional requirements.

Subtotal, Other Requirements	$4,500,000
Total, FY 1973 Request	$8,000,000

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