National Aeronautics and Space Administration

BUDGET ESTIMATES

FISCAL YEAR 1976

Volume II

CONSTRUCTION OF FACILITIES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 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 program for 1976, in many aspects, reflects a continuation of prior years' endeavors, especially in regard to:

a. Space shuttle facilities

b. Facility rehabilitation and modification and minor construction programs

c. Facility planning and design.

As has been forecast, FY 1976 space shuttle facility requirements are less than the amounts approved for FY 1975 and FY 1974. These requirements for unique shuttle facilities are time sensitive and are to meet specific milestones established for the first horizontal and manned orbital flights.

Each of the non-shuttle discrete facility projects requested for FY 1976 represent a specific need in support of: (1) Scientific Investigations in Space, (2) Aeronautical Research and Technology, and (3) Supporting Activities.

The FY 1976 Rehabilitation and Modification of Facilities program continues the objective of preserving and enhancing the utilization of existing facilities. This is a most effective program in terms of results achieved and essential in light of the extensive amount of work of this nature yet to be undertaken. The inclusion of foreseeable programmatic facility projects is more evident this year, reflecting the relative increased urgency of these requirements. The Minor Construction program is largely programmatic as in the past, either directly or as indirect program support, and is also an essential program providing the means to accomplish the smaller facility projects of this type.

The FY 1976 request for Facility Planning and Design funds reflects the future years redirection in forecasting space shuttle facility requirements.

The request for FY 1976 is $84,620,000, a decrease of $55,535,000 under the amount appropriated for FY 1975. Outlays are estimated to be $108,100,000 in FY 1976, an increase of $8,100,000 over the estimate for FY 1975.

An additional amount of $14,500,000 is requested to continue Rehabilitation and Modifications, Minor Construction and Facility Planning and Design during the transition period from July 1, 1976 through September 30, 1976.

CONSTRUCTION OF FACILITIES

[For advance planning, design, rehabilitation, modification and construction of facilities for the National Aeronautics and Space Administration, and for the acquisition or condemnation of real property, as authorized by law, $140,155,000 including (1) $3,660,000 for addition to flight and guidance simulation laboratory, Ames Research Center; (2) $890,000 for rehabilitation and modification of science and applications laboratories, Goddard Space Flight Center; (3) $1,220,000 for modifications for fire protection and safety, Goddard Space Flight Center; (4) $150,000 for acquisition of land, Jet Propulsion Laboratory; (5) $3,790,000 for addition for integrated systems testing facility, Jet Propulsion Laboratory; (6) $935,000 for modification of water supply system, Lyndon B. Johnson Space Center; (7) $515,000 for modification of 6,000 p.s.i. air storage system, Langley Research Center; (8) $2,990,000 for rehabilitation of 16-foot transonic wind tunnel, Langley Research Center; (9) $2,580,000 for modification of propulsion systems laboratory, Lewis Research Center; (10) $660,000 for modification of rocket engine test facility, Lewis Research Center; (11) $4,060,000 for construction of X-ray telescope facility, Marshall Space Flight Center; (12) $1,370,000 for modification of beach protection system, Wallops Station; (13) $6,040,000 for construction of infrared telescope facility, Mauna Kea, Hawaii; (14) $1,430,000 for modifications for fire protection and safety at various tracking and data stations; (15) $77,020,000 for Space Shuttle facilities at various locations, as follows: (A) modification of the vibration and acoustic test facility, Lyndon B. Johnson Space Center, (B) modifications for crew training facilities, Lyndon B. Johnson Space Center, (C) construction of materials test facility, White Sands Test Facility, (D) modifications for dynamic test facilities, Marshall Space Flight Center, and NASA Industrial Plant, Downey, California, (E) modifications for solid rocket booster structural test facilities, Marshall Space Flight Center, (F) construction of Orbiter landing facilities, John F. Kennedy Space Center, (G) construction of Orbiter processing facility, John F. Kennedy Space Center, (H) modifications to launch complex 39, John F. Kennedy Space Center, (I) $1,940,000 for construction of an Orbiter Horizontal Flight Test Facility, Flight Research Center; (16) $14,900,000 for minor rehabilitation and modification of facilities at various locations; (17) $4,500,000 for minor construction of new facilities and additions to existing facilities at various locations; (18) $10,900,000 for facility planning and design not otherwise provided for; and (19) $4,880,000 for an addition to the Systems Development Laboratory (SDL) at the Jet Propulsion Laboratory (JPL); to remain available for obligation until June 30, 1977: *Provided*, That, notwithstanding the limitation on the availability of funds appropriated under this head by this appropriation act, and except with respect to items (16) through (18) above, when any activity, for which appropriations under this head made by this act are available, has been initiated by the incurrence of obligations therefor, the amount available for such activity shall remain available until expended.] *For construction, rehabilitation and modification of facilities, minor construction of new facilities and additions to existing facilities, and for facility planning and design not otherwise provided, for the National Aeronautics and Space Administration, and for the acquisition or condemnation of real property, as authorized by law, $84,620,000, to remain available for obligation until September 30, 1978: Provided, That, notwithstanding the limitation on the availability of funds appropriated under this head by this appropriation act, when any activity has been initiated by the incurrence of obligations therefor, the amount available for such activity shall remain available until expended, except that this provision shall not apply to the amounts appropriated pursuant to the authorization for rehabilitation and modification of facilities, minor construction of new facilities and additions to existing facilities, and facility planning and design.*

For "Construction of facilities," to be available July 1, 1976, $14,500,000, to remain available for obligation until September 30, 1979. (42 U.S.C. 2451, et seq.; Department of Housing and Urban Development; Space, Science, Veterans, and Certain Other Independent Agencies Appropriation Act, 1975; additional authorizing legislation to be proposed for fiscal year 1976, and for the period beginning July 1, 1976.)

Construction of Facilities

Program and Financing (in thousands of dollars)

Identification code 27-00-0107-0-1-999	Budget plan (amounts for construction of facilities actions programed)			Costs and obligations		
	1974 actual	1975 estimate	1976 estimate	1974 actual	1975 estimate	1976 estimate
Program by activities:						
1. Manned space flight	56,300	77,185	47,220	30,244	61,200	71,000
2. Scientific investigations in space	2,030	18,770	2,490	11,883	7,900	8,600
3. Space applications	980			1,027		
4. Space research and technology		660		151	200	200
5. Aeronautical research and technology	2,410	9,745	4,635	7,775	7,600	5,200
7. Supporting activities	39,380	36,295	30,275	26,208	35,100	28,000
Total program costs, funded	101,100	142,655	84,620	77,288	112,000	113,000
Change in selected resources (undelivered orders)				21,068	42,000	−8,500
10 Total	101,100	142,655	84,620	98,356	154,000	104,500
Financing:						
21 Unobligated balance available, start of year, for completion of prior year budget plans				−73,997	−76,734	−65,389
24 Unobligated balance available, end of year, for completion of prior year budget plans				76,734	65,389	45,509
25 Unobligated balance lapsing				7		
Budget authority	**101,100**	**142,655**	**84,620**	**101,100**	**142,655**	**84,620**
Budget authority:						
40 Appropriation	101,100	140,155	84,620	101,100	140,155	84,620
42 Transferred from other accounts		2,500			2,500	
43 Appropriation (adjusted)	101,100	142,655	84,620	101,100	142,655	84,620
Relation of obligations to outlays:						
71 Obligations incurred, net				98,356	154,000	104,500
72 Obligated balance, start of year				68,203	91,432	145,432
74 Obligated balance, end of year				−91,432	−145,432	−141,832
90 Outlays				75,127	100,000	108,100

Note.—Reconciliation of budget plan to obligations:

	1974 actual	*1975 estimate*	*1976 estimate*
Total budget plan	101,100	142,655	84,620
Deduct portion of budget plan to be obligated in subsequent years	36,975	31,755	16,620
Add obligations of prior year budget plans	34,231	43,100	36,500
Total obligations	98,356	154,000	104,500

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SUMMARY OF THE BUDGET PLAN BY LOCATION

Location	Fiscal Year 1974	Fiscal Year 1975	Fiscal Year 1976	Transition Period
Ames Research Center....	---	$3,660,000	$2,695,000	---
Goddard Space Flight Center.....	$1,403,000	2,110,000	---	---
Jet Propulsion Laboratory.....	1,320,000	8,820,000	---	---
Johnson Space Center....	---	935,000	2,490,000	---
Langley Research Center.	4,030,000	3,505,000	1,940,000	---
Lewis Research Center...	---	3,240,000	---	---
Marshall Space Flight Center.....	---	4,060,000	---	---
Wallops Flight Center...	1,112,000	1,370,000	---	---
Various Locations.....	3,950,000	7,470,000	---	---
Space Shuttle Facilities	56,300,000	77,185,000	47,220,000	---
Rehabilitation and Modification.....	14,785,000	14,900,000	16,000,000	$8,750,000
Minor Construction.....	4,600,000	4,500,000	5,000,000	2,950,000
Facility Planning and Design.....	13,600,000	10,900,000	9,275,000	2,800,000
Total Plan.....	$101,100,000	$142,655,000	$84,620,000	$14,500,000

SUMMARY OF THE BUDGET PLAN BY PROGRAM OFFICE

Office of Manned Space Flight.....	$57,385,000	$78,120,000	$47,220,000	---
Office of Space Science.	4,815,000	22,400,000	2,490,000	---
Office of Aeronautics and Space Technology..	4,030,000	10,405,000	4,635,000	---
Office of Tracking and Data Acquisition.....	1,885,000	1,430,000	---	---
NASA Comptroller.....	32,985,000	30,300,000	30,275,000	$14,500,000
Total Plan.....	$101,100,000	$142,655,000	$84,620,000	$14,500,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

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BUDGET PLAN BY LOCATION AND PROJECT

Prog Off		(Thousands of Dollars) FY 1974	FY 1975	FY 1976	Transition Period
	Ames Research Center	---	$3,660	$2,695	---
AST	Modification of 11-by 11-foot transonic wind tunnel.....	---	---	2,695	---
AST	Addition to flight and guidance simulation laboratory.....	---	3,660	---	---
	Goddard Space Flight Center	$1,403	2,110	---	---
SS	Rehabilitation and modification of science and applications laboratories	---	890	---	---
SS	Modifications for fire protection and safety....	---	1,220	---	---
SS	Replacement of transportation facility..	693	---	---	---
SS	Rehabilitation of vibrations facility.....	710	---	---	---
	Jet Propulsion Laboratory	1,320	8,820	---	---
SS	Acquisition of land.....	---	150	---	---
SS	Addition to systems development labotatory (SDL)....	---	4,880	---	---
SS	Addition for integrated systems testing facility.	---	3,790	---	---
SS	Modification of and addition to 25-foot space simulator building.....	740	---	---	---
SS	Modification of planetary mission support facilities.....	580	---	---	---

Prog Off		FY 1974	FY 1975	FY 1976	Transition Period
		(Thousands of Dollars)			
	Johnson Space Center	---	$935	$2,490	---
SS	Addition to lunar sample curatorial facility.....	---	---	2,490	---
MSF	Modification of water supply system.....	---	935	---	---
	Langley Research Center	$4,030	3,505	1,940	---
AST	Addition for composite model and metal finishing shops.....	---	---	1,940	---
AST	Modification of 6,000 p.s.i. air storage system.....	---	515	---	---
AST	Rehabilitation of 16-foot transonic wind tunnel....	---	2,990	---	---
AST	Rehabilitation and modification of 600 p.s.i. air supply system.....	2,410	---	---	---
AST	Construction of systems and engineering building.	1,620	---	---	---
	Lewis Research Center	---	3,240	---	---
AST	Modification of propulsion systems laboratory.....	---	2,580	---	---
AST	Modification of rocket engine test facility.....	---	660	---	---
	Marshall Space Flight Center	---	4,060	---	---
SS	Construction of X-ray telescope facility.....	---	4,060	---	---
	Wallops Flight Center	1,112	1,370	---	---
SS	Modification of beach protection system.....	---	1,370	---	---
SS	Rehabilitation of airfield pavement.....	599	---	---	---
SS	Rehabilitation of communications system.....	513	---	---	---

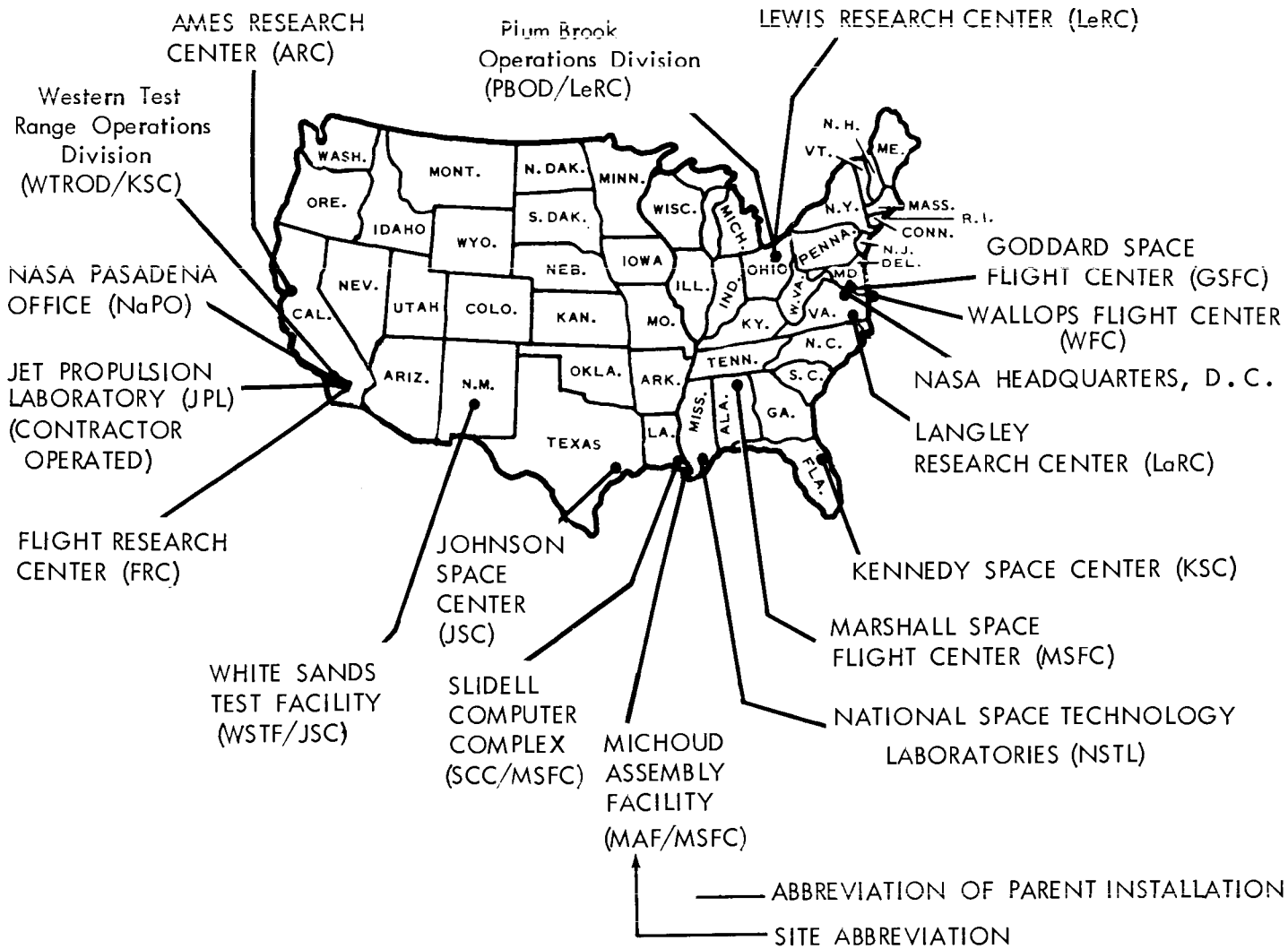
Prog Off		(Thousands of Dollars) FY 1974	FY 1975	FY 1976	Transition Period
	Various Locations	$3,950	$7,470	---	---
SS	Construction of infrared telescope facility.....	---	6,040	---	---
TDA	Modifications for fire protection and safety at various tracking stations.	1,885	1,430	---	---
SS	Modification of space launch complex 2 West, Vandenberg Air Force Base.....	980	---	---	---
MSF	Modification of power system, Slidell Computer Complex.....	1,085	---	---	---
MSF	Space Shuttle Facilities	56,300	77,185	$47,220	---
	Modifications to launch complex 39 (KSC).....	---	35,355	13,110	---
	Construction of orbiter processing facility (KSC).	---	13,380	8,160	---
	Modifications for solid rocket booster processing facilities (KSC).....	---	---	5,240	---
	Modifications for hypergolic checkout and refurbishment facilities (KSC).....	---	---	6,940	---
	Modifications for launch equipment test facilities (KSC).....	---	---	1,960	---
	Construction of orbiter approach and landing test facilities (FRC, Calif. and Palmdale, Calif.)1/...	---	2,940	1,680	---
	Construction of shuttle/carrier aircraft mating facilities (FRC, Calif. and Palmdale, Calif.).....	---	1,500	3,890	---
	Modifications for crew training facilities (JSC).	---	420	830	---
	Modification of the vibration and acoustic test facility (JSC).....	---	410	2,410	---

1/ Project identified in 1975 Authorization and Appropriation Acts as "Construction of Orbiter horizontal flight test facilities".

Prog Off		(Thousands of Dollars) FY 1974	FY 1975	FY 1976	Transition Period
	Space Shuttle Facilities (Cont'd)				
MSF	Modifications for solid rocket booster component manufacturing and assembly facilities (location to be designated).....	---	---	$3,000	---
	Construction of orbiter landing facilities (KSC).	$17,300	$15,880	---	---
	Modifications for dynamic test facilities (MSFC; Downey, Calif.).....	---	3,920	---	---
	Construction of materials test facility (WSTF).....	---	790	---	---
	Modifications for solid rocket booster structural test facilities (MSFC)...	---	2,590	---	---
	Modifications for auxiliary propulsion and power systems test facilities (WSTF).....	1,290	---	---	---
	Modifications for shuttle avionics integration laboratory (JSC).....	1,240	---	---	---
	Modifications for radiant heating verification facility (JSC).....	1,260	---	---	---
	Modifications for the orbiter propulsion system test facilities (MTF).....	11,300	---	---	---
	Modifications for external tank structural test facilities (MSFC).....	4,400	---	---	---
	Modification of manufacturing and subassembly facilities for the orbiter, NASA industrial plant, Downey, Calif.....	2,650	---	---	---

Prog Off		(Thousands of Dollars) FY 1974	FY 1975	FY 1976	Transition Period
MSF	Space Shuttle Facilities (Cont'd)				
	Modification of and addition to final assembly and checkout facilities for the orbiter, Air Force Plant #42, Palmdale, Calif.....	$7,350	---	---	---
	Modification of manufacturing and final assembly facilities for external tanks (MAF).....	9,510	---	---	---
COMP	Rehabilitation and Modification of Facilities at Various Locations	14,785	$14,900	$16,000	$8,750
COMP	Minor Construction of New Facilities and Additions to Existing Facilities at Various Locations	4,600	4,500	5,000	2,950
COMP	Facility Planning and Design	13,600	10,900	9,275	2,800
	TOTAL PLAN.....	$101,100	$142,655	$84,620	$14,500

LOCATION OF NASA MAJOR AND COMPONENT INSTALLATIONS



RECORDED VALUE OF CAPITAL-TYPE PROPERTY
IN-HOUSE AND CONTRACTOR HELD
AS OF JUNE 30, 1974
(DOLLARS IN THOUSANDS)

Reporting Installation	Real Property: Land	Real Property: Buildings	Real Property: Other Structures and Facilities	Real Property: Leasehold Improvements	Real Property: Total	Equipment (a)	Fixed Assets in Progress	Grand Total
Ames Research Center	$ 2,928	$ 183,260	$ 4,496	$ -	$ 190,684	$ 110,274	$ 24,774	$ 325,732
ARC-Moffett Field, CA	2,928	183,260	4,496	-	190,684	105,995	24,774	321,453
Various Locations (b)	-	-	-	-	-	4,279	-	4,279
Flight Research Center	-	9,175	2,833	-	12,008	61,307	884	74,199
FRC-Edwards, CA	-	9,175	2,833	-	12,008	57,723	884	70,615
Various Locations (b)	-	-	-	-	-	3,584	-	3,584
Goddard Space Flight Center	1,661	92,607	62,067	172	156,507	555,188	12,562	724,257
GSFC-Greenbelt, MD	1,308	75,493	15,564	172	92,537	198,417	-	290,954
Tracking Stations (Two Networks)	353	17,113	46,458	-	63,924	288,127	12,562	364,613
Various Locations (b)	-	1	45	-	46	68,644	-	68,690
Jet Propulsion Laboratory	1,067	62,966	61,955	514	126,502	221,808	14,216	362,526
JPL - CA	1,067	53,651	8,179	514	63,411	138,250	14,216	215,877
Deep Space Network	-	9,315	53,776	-	63,091	83,558	-	146,649
Johnson Space Center	9,029	183,042	54,824	115	247,010	639,702	27,298	914,010
JSC - Houston, TX	5,459	149,289	32,050	27	186,825	342,822	27,298	556,945
White Sands Test Facility								
WSTF-LasCruces, NM	-	8,690	17,780	-	26,470	36,438	-	62,908
Various Locations (b)	3,570	25,063	4,994	88	33,715	260,442	-	294,157
Kennedy Space Center	72,172	291,853	310,336	-	674,361	616,791	16,034	1,307,186
KSC - FL	72,172	291,853	310,336	-	674,361	249,298	15,895	939,554
Western Test Range Operations Div.								
WTR - Lompoc, CA	-	-	-	-	-	5,962	139	6,101
Various Locations (b)	-	-	-	-	-	361,531	-	361,531
Langley Research Center	116	127,837	153,628	-	281,581	166,062	40,486	488,129
LaRC - Hampton, VA	110	112,433	153,603	-	266,146	129,284	40,486	435,916
Various Locations (b)	6	15,404	25	-	15,435	36,778	-	52,213
Lewis Research Center	3,657	202,332	73,113	139	279,241	142,504	21,904	443,649
LeRC - Cleveland, OH	316	118,195	54,175	139	172,825	79,338	21,490	273,653
Plum Brook Operations Div.								
PBOD-Sandusky, OH	3,341	84,137	18,938	-	106,416	11,670	414	118,500
Various Locations (b)	-	-	-	-	-	51,496	-	51,496
Marshall Space Flight Center	7,568	193,595	103,552	3,288	308,003	485,165	27,035	820,203
MSFC - Huntsville, AL	-	115,080	52,618	-	167,698	245,759	6,828	420,285
Michoud Assembly Facility								
MAF - New Orleans, LA	7,505	66,046	26,682	-	100,233	57,263	519	158,015
Slidell Computer Complex								
SCC - Slidell, LA	63	4,492	879	-	5,434	20,400	-	25,834
Various Locations (b)	-	7,977	23,373	3,288	34,638	161,743	19,688	216,069
National Space Technology Laboratories	18,703	60,848	165,460	-	245,011	68,236	9,655	322,902
NSTL - Bay St. Louis, MS								
Wallops Flight Center	1,179	23,817	47,366	-	72,362	50,275	2,697	125,334
WFC - Wallops Island, VA	1,179	23,817	47,366	-	72,362	48,702	2,697	123,761
Various Locations (b)	-	-	-	-	-	1,573	-	1,573
NASA Headquarters	-	-	-	-	-	34,656	-	34,656
Washington, D.C.	-	-	-	-	-	2,429	-	2,429
Various Locations (b)	-	-	-	-	-	32,227	-	32,227
GRAND TOTAL	$ 118,080	$ 1,431,332	$ 1,039,630	$ 4,228	$ 2,593,270	$ 3,151,968	$ 197,545	$ 5,942,783

(a) Includes Contractor-Held Special Test Equipment ($707,199)
(b) Includes Capital Type Property in Possession of Contractors at Various Locations.

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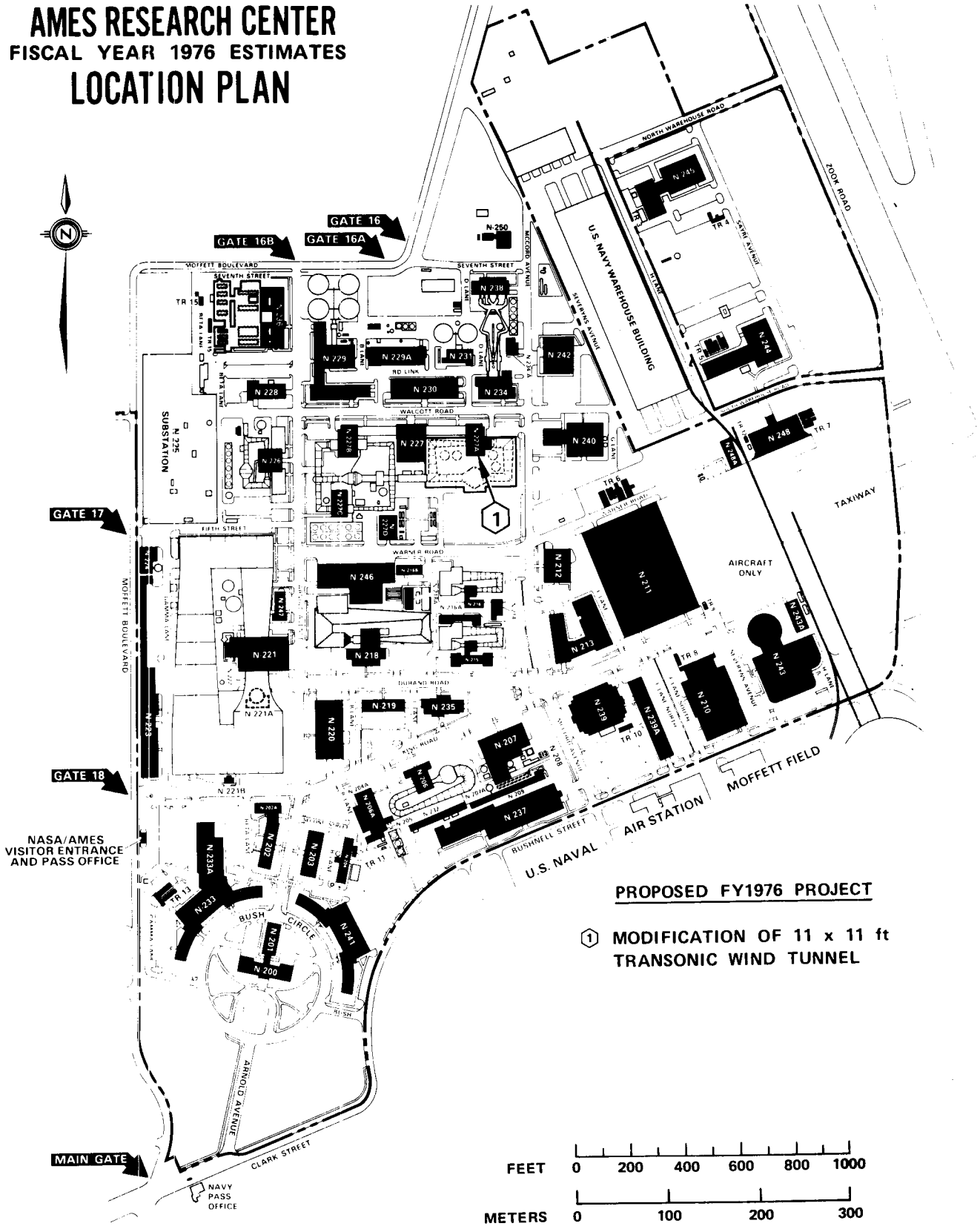
SUMMARY

Ames Research Center

	Amount	Page No.
Location plan.....		CF 1-1
Office of Aeronautics and Space Technology:		
Modification of 11-by 11-foot transonic wind tunnel.....	$2,695,000	CF 1-2

AMES RESEARCH CENTER
FISCAL YEAR 1976 ESTIMATES
LOCATION PLAN



PROPOSED FY1976 PROJECT

(1) MODIFICATION OF 11 x 11 ft TRANSONIC WIND TUNNEL

PROJECT TITLE	Modification of 11- by 11- Foot Transonic Wind Tunnel
LOCATION	Ames Research Center
	FY 1976 CoF ESTIMATE $2,695,000

COGNIZANT INSTALLATION: Ames Research Center

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

COGNIZANT PROGRAM OFFICE: Office of Aeronautics and Space Technology

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$170,000
Construction	11,420,000
Total FY 1975 and Prior Years	$11,590,000

SUMMARY PURPOSE AND SCOPE:

This project primarily involves the modification of the tunnel data acquisition system which will increase the operational efficiency of the 11 x 11-Foot (3.4 x 3.4m) Transonic Wind Tunnel and thus better accommodate requirements of the facility users. The modification of this transonic wind tunnel will provide for increased data acquisition speed, improved data system accuracy, increased reliability, and decreased maintenance. In addition, test "set up" time will be reduced. Monitoring and display of tunnel conditions and aerodynamic parameters will be provided on a "real time" basis as well as the capability to control certain wind tunnel operations.

This transonic test facility is a major element of the Ames "Unitary Wind Tunnel" which also encompasses two smaller supersonic test sections. The drive motors are common to all three test sections.

The proposed data system will include a data gathering system and a "real time" computer system with display and plotting equipment. Also, included in this project is the construction of a computer room to house the

data acquisition system, rehabilitation of the existing control room, and necessary repairs to the facility test chamber, Building N-227A.

PROJECT JUSTIFICATION:

Experimental investigations conducted in the 11-Foot (3.4m) Transonic Wind Tunnel include projects requested by: The Department of the Defense (DOD) relating to advanced aircraft and missiles; the aircraft industry relating to commercial transports testing for which the Government is reimbursed; in-house research organizations relating to advanced NASA programs; and other NASA Centers and Government organizations covering a broad range of advanced aircraft and aerospace projects. In response to such requests, this Unitary Plan Wind Tunnel (UPWT) facility is normally operated 24 hours per day, 6 days per week. During the past seven years, more than 60 percent of the available UPWT facility test occupancy hours have been utilized for investigations in the transonic test section. During the past five years, efforts to increase facility utilization and accommodate projects of high national importance and urgency have included weekend operations and test installations. In order to further relieve the especially heavy workload proposed for the 11-Foot (3.4m) tunnel, the 14-Foot (4.3m) Transonic Wind Tunnel has recently been reactivated to accommodate certain test work not requiring the high Reynolds number capability of the 11-Foot (3.4m) facility. With the present emphasis on aeronautics, especially in the transonic speed range, it is foreseen that the demand for experimental investigations in these transonic facilities will not only continue, but will probably increase.

The existing static data acquisition system and strain gage signal conditioning equipment can be properly described as being "mostly obsolete". Some necessary repair parts are no longer manufactured. Reliability is deteriorating and maintenance requirements are increasing and more time is required to achieve test objectives. Scheduling problems are also compounded particularly in the 11-Foot (3.4m) facility. The existing dynamic data acquisition system does not provide "on-line" data reduction, a feature essential to more safe and efficient conduct of certain wind tunnel investigations. The proposed data system modification will provide not only the necessary increased reliability and decreased maintenance, but will also provide improved data system accuracy, increased data acquisition speed, reduced test "set up" time, preliminary data reduction, and "real time" monitoring, thereby effectively increasing facility operational efficiency.

It is estimated that this increased operational efficiency would permit relatively the same test loading as is now being conducted within a given year and in addition will make available some added 600 occupancy hour capability. This estimated 600 occupancy hours is made up of about 350 hours from increased acquisition speed, some 50 hours from decreased maintenance and about 200 hours equally divided between reduced test set up time and improved monitoring. It is our present plan to move appropriate tests from the 14-Foot Transonic Wind Tunnel over to the 11-Foot to provide for a more efficient and effective overall operation in the 11-Foot Tunnel.

566-538 O - 75 - 2

This will result in an overall annual savings of approximately $600,000 per year applicable to both tunnels of which approximately $440,000 relates directly to electrical power costs. Of course, this added capability can be translated into a capability to accomplish more priority testing of this approximate magnitude.

A new computer room is required to house the data acquisition computer. The proposed building rehabilitation includes the major items required to bring the facilities up to an acceptable and usable level.

PROJECT DESCRIPTION:

This modification project involves replacement of the present data acquisition system in the 11 x 11-Foot (3.4m x 3.4m) Transonic Wind Tunnel. The proposed replacement data system will consist of flexible high performance data gathering processor, a "real time" processor, and associated peripheral devices. Data gathering and real time monitoring of tunnel test progress will be provided. The data acquisition equipment, including necessary signal conditioning, under control of the data gathering processor, converts the tunnel analog data into continuous digital samples. This continuous stream of data is recorded on analog magnetic tape. The "real time" processor will provide control, continuous processing, and display of selected parameters such as lift and drag coefficients. Displays will be provided in the control room which will indicate these parameters in engineering units. These displayed data will then allow the test engineer to select those test conditions for which the entire complement of input data are to be recorded for subsequent processing. Upon command by the test engineer, the selected static and dynamic data are recorded in industry standard format on digital magnetic tapes as well as on magnetic discs. The magnetic discs are used for "real time" processing and for data editing.

As a function of data acquisition, the system will also verify that all input channels are functioning properly. Any channels which are inoperative or "out-of-limits" will initiate an error message to the operator.

Wind tunnel test "set up" will be accomplished by means of an "initialize" mode of operation. In this mode, the number and types of data channels will be assigned by the operator. This assignment will be made via a card deck and control switch settings. The operator will be allowed to alter the assignment during tunnel operation to accommodate equipment failures. Prerun system checkout will also be provided by means of a checkout mode of operation. In this mode, the analog input channels are automatically stepped through known input voltages by the computer to verify operational status, amplifier gain and amplifier offset.

The proposed data system will be provided and installed as a "turn key" system by a single prime contractor. The design will use "off-the-shelf" modules where possible so as to reduce the total cost for special interfaces, design, installation, testing and training.

Enlargement and rehabilitation of the existing wind tunnel control room will be required to accommodate the new data system. The enlargement consists of construction of a computer room area below the existing control room. This computer room will be air conditioned and equipped with conditioned electrical power for the computer. Rehabilitation of the existing control room will include installation of additional air conditioning and electrical power for the additional control room equipment. The power conditioning equipment required for the proposed data system is included as a part of this project. Also included in this project is the rehabilitation of 11-Foot (3.4m) Transonic Wind Tunnel, Building N-227A, including elements such as rest room facilities, interior partitions, roof, and the repainting of interior and exterior walls.

PROJECT COST ESTIMATE:

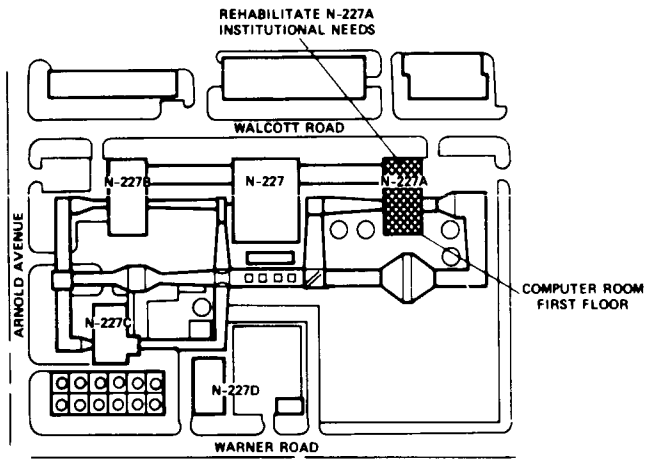
	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$425,000
Rehabilitation and modification of building	LS	---	---	420,000
Utilities (outside 5' line)	LS	---	---	5,000
Equipment				$2,270,000
Provision of data gathering processor	LS	---	---	850,000
Provision of "real time" processor	LS	---	---	665,000
Data system installation and check out	LS	---	---	755,000
Fallout Shelter (Not Feasible)	---	---	---	---
	TOTAL			$2,695,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

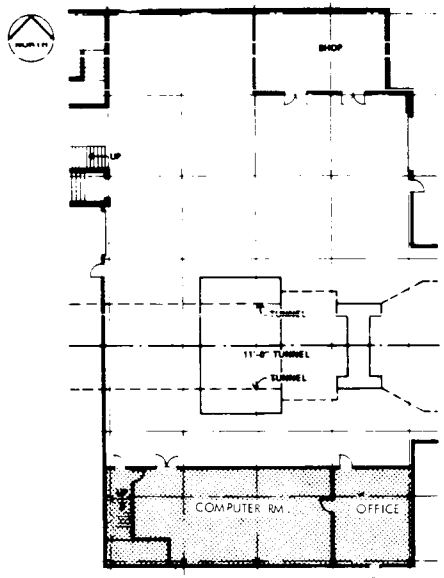
There are presently no known future requirements to complete this work on the 11-Foot (3.4m) Transonic Wind Tunnel.

AMES RESEARCH CENTER
FISCAL YEAR 1976 ESTIMATES

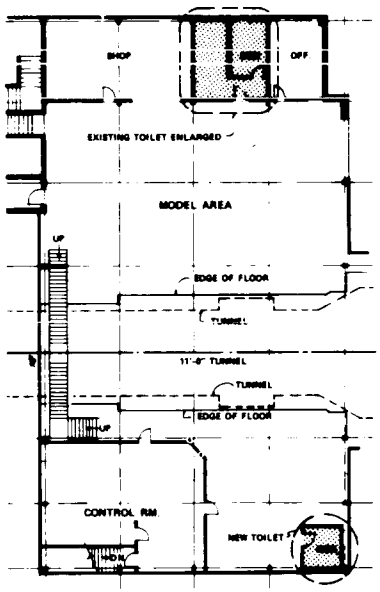
MODIFICATION OF 11-BY 11-FT. TRANSONIC WIND TUNNEL



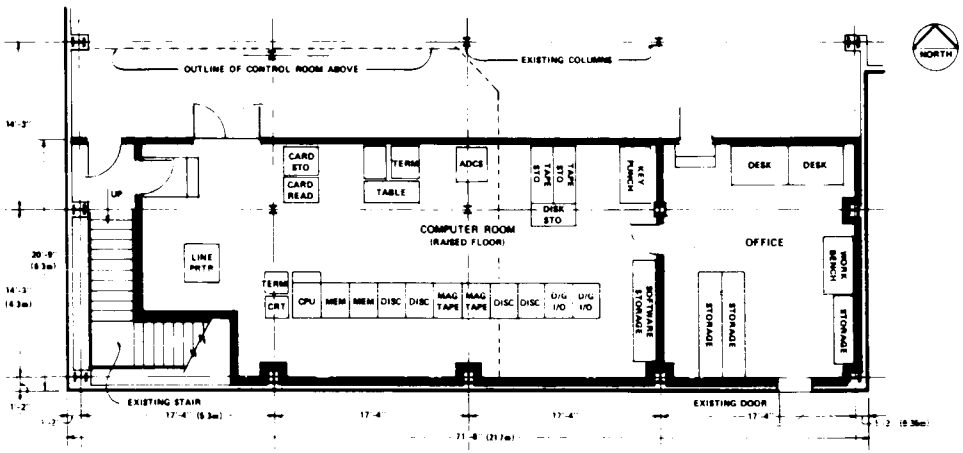
SITE PLAN



FIRST FLOOR PLAN



SECOND FLOOR PLAN



PLAN - COMPUTER ROOM

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

SUMMARY

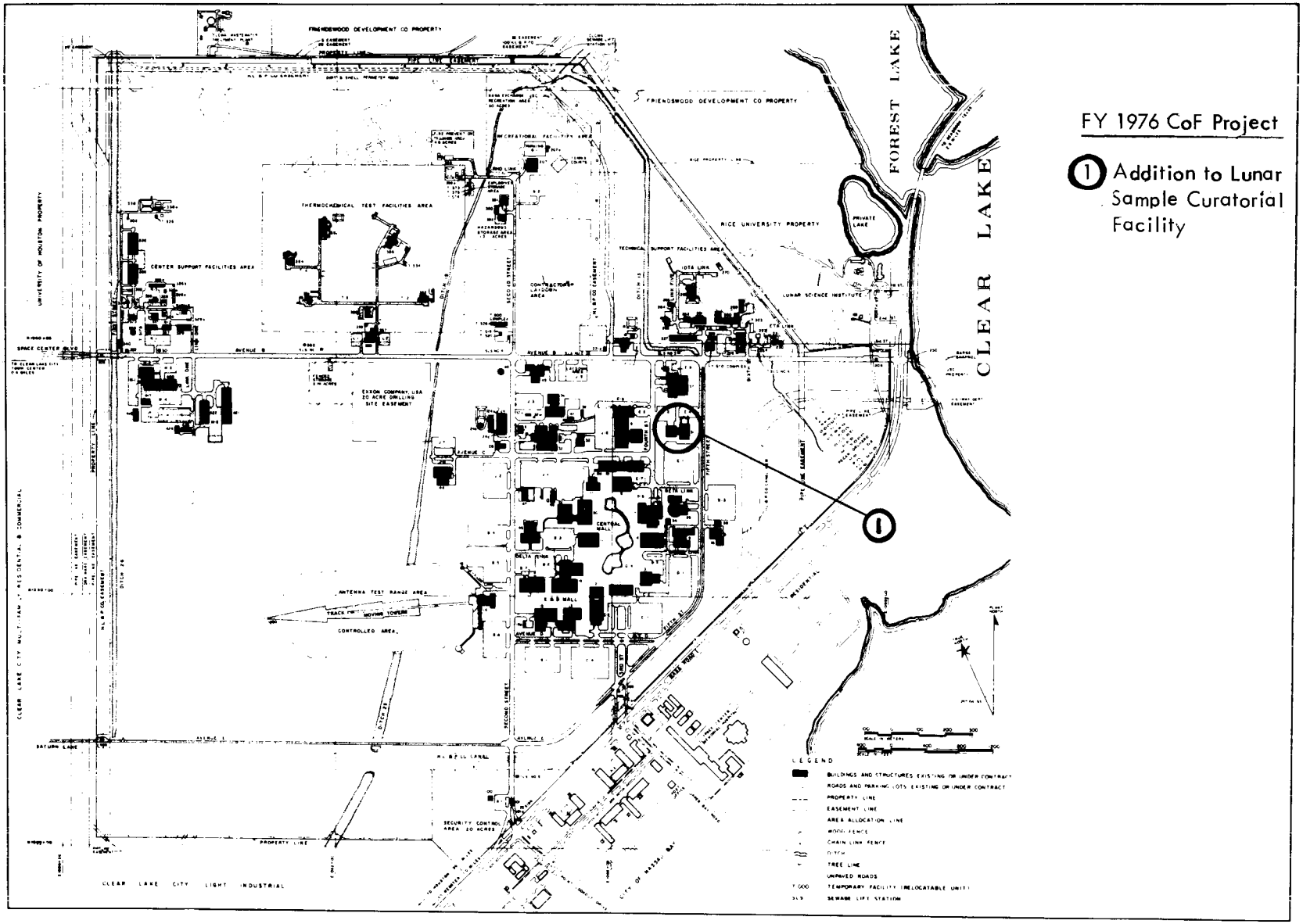
Johnson Space Center

	Amount	Page No.
Location plan.....		CF 2-1
Office of Space Science:		
Addition to lunar sample curatorial facility...	$2,490,000	CF 2-2

LYNDON B. JOHNSON SPACE CENTER

FISCAL YEAR 1976 ESTIMATES

LOCATION PLAN



FY 1976 CoF Project

1 Addition to Lunar Sample Curatorial Facility

PROJECT TITLE	Addition to Lunar Sample Curatorial Facility
LOCATION	Lyndon B. Johnson Space Center
	FY 1976 CoF ESTIMATE $2,490,000

COGNIZANT INSTALLATION: Lyndon B. Johnson Space Center

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT PROGRAM OFFICE: Office of Space Science

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$519,000
Construction	2,895,000
Total FY 1975 and Prior Years	$3,414,000

SUMMARY PURPOSE AND SCOPE:

This project provides for a 15,000 square foot (1,394 m^2) addition to the existing Lunar Curatorial Facility, Building 31, at JSC, to improve the effectiveness, safety and security of this facility used for the storage and handling of lunar samples.

PROJECT JUSTIFICATION:

The 840 pounds (381 kg) of lunar material brought to earth by the Apollo program are a tangible product of an enormous national effort, constituting an invaluable scientific resource that will be analyzed and studied for many years. The material has been cataloged into nearly 40,000 samples, which are being studied by approximately 150 principal investigators and 1,000 other scientists. The experience gained since 1969 in procedures for cataloging, handling and studying lunar samples has now culminated in an ability to better define requirements for further improved maintenance of sample cleanliness and more adequate measures to prevent degradation of these samples by the earth's atmosphere.

The Lunar Receiving Laboratory (LRL), Building 37 at JSC, was constructed in 1968 to handle the receipt of lunar samples. Its primary function was to provide a place for the quarantine of lunar rocks and astronauts. To a very

limited degree, it also provided for the processing of the samples for scientific examination. Because the LRL was not intended nor designed to handle the vast amount of lunar material, the Lunar Mission and Space Exploration Facility, Building 31, was modified in 1971 to provide more laboratory space and a more secure storage facility. This was in response to the increased amount of lunar material then envisioned and the very limited experience to that date with the inherent security and storage problems. There is presently some 10,162 square feet (944m^2) of space dedicated to lunar sample curatorial use at JSC. Of this amount, 4,623 square feet (429m^2) is for office space use, 4,963 square feet (461m^2) as laboratory and technical and support space, and 576 square feet (54m^2) are vaults for sample storage. The limited facility provided in Building 31, however, does not now meet all of the essential requirements for this total activity. More efficient and more closely integrated curatorial facilities are now needed. Among the other factors considered are safe secure storage as well as adequate laboratory space for visiting scientists.

As an interim and temporary measure, a large portion of the lunar material is presently in "temporary" vaults outside Building 31. These samples should be returned to the principal working collection as soon as possible for routine inspection by curatorial personnel and for ready accessibility by scientists. This is an example of the restrictive accommodations under which present operations must be carried out.

The quantity of lunar samples and the number of interested scientists are much greater than originally anticipated. Building 31, although reasonably adequate for sample processing, has no available laboratories which visiting scientists can use to examine pristine lunar samples. These samples cannot be removed because of the associated unacceptable risks. Building 31 does not provide properly sized, secure, clean storage vaults and the resultant problem of dispersed storage has been indicated above. The lunar facilities in Building 31 are not sufficiently elevated to afford adequate protection from any severe flood which might result from hurricanes or tropical storms. Additional protection is also deemed prudent to better deal with the potential problem of building and ground shock waves, sabotage or vandalism.

In light of the potential of these risks regardless of the protection, it is also planned that approximately 20% of the lunar sample collection will be relocated to a remote site. The modifications to reconfigure this site for this special storage are estimated to cost $250,000 and will be implemented through a prior years rehabilitation and modification project.

This separate FY 1976 CoF project provides the necessary addition to Building 31 for laboratories and storage vaults to increase efficiency in handling lunar material and to preclude the possibility of a major loss of samples from natural or manmade hazards. With this new capability we will have a total of approximately 24,260 square feet (2,254m^2) of space for lunar sample curatorial functions. This will include about 4,400 square feet (409m^2) of office area, 16,350 square feet (1,519m^2) of laboratory and technical area, and 2,400 square feet (223m^2) of vault storage space (not including the remote site). It is, therefore, seen that the major improvements involve laboratory/technical and vault storage space.

PROJECT DESCRIPTION:

The project will provide for the construction of a two-story addition to the existing Lunar Curatorial Facility, Building 31 at JSC. Each story will contain 7,500 square feet (697 m^2) for a total of 15,000 square feet (1,394 m^2).

The addition will include an ultraclean and highly secure vault, one section of which will be for storage of pristine lunar samples, and one section of which will be for samples that have been investigated. The vault will be located approximately 40 feet (12.2 m) above sea level for protection from floods. Small processing laboratories for visiting scientists, an equipment elevator, support rooms and laboratories, and data storage will be provided.

The necessary local and remote audible and visual alarms for secure lunar sample storage will be provided. Utilities for the annex will be extended from the existing utility tunnel for Building 31.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$2,490,000
Site preparation and utilities	LS	---	---	300,000
Structural and architectural (including vault)	LS	---	---	1,035,000
Mechanical systems	LS	---	---	790,000
Electrical system	LS	---	---	250,000
Sprinkler system	LS	---	---	20,000
Elevator	LS	---	---	95,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
	TOTAL			$2,490,000

An estimated $260,000 of new noncollateral equipment to include lunar sample storage and processing cabinets and other equipment is required to make the facility operational. This will be procurred from R&D resources. Existing gaseous nitrogen storage and processing cabinets and laboratory equipment, with an estimated value of $370,000, will also be used in the annex.

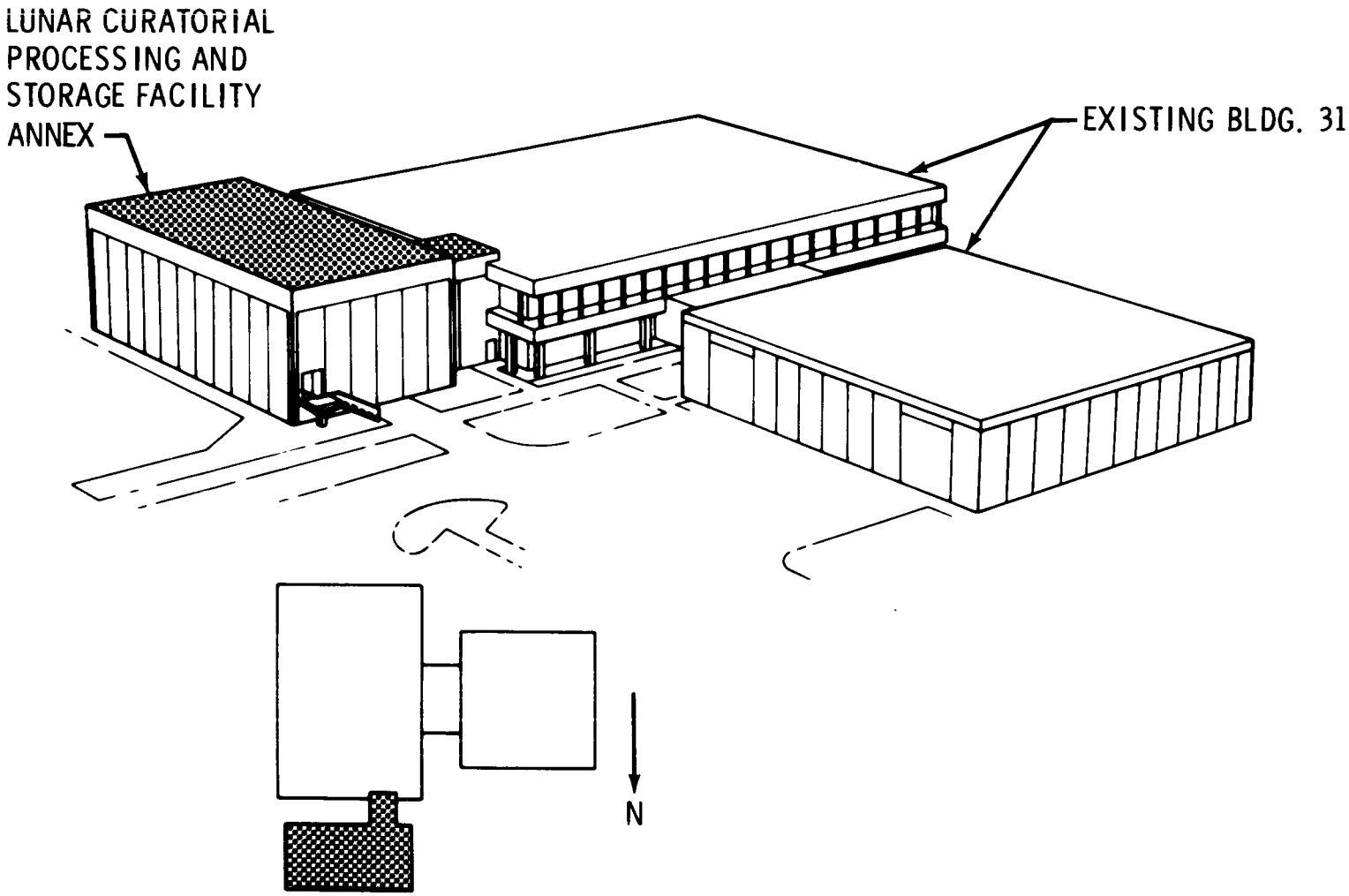
FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

It is presently estimated that no future program funding requirements are necessary to complete this project.

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1976 ESTIMATES

ADDITION TO LUNAR SAMPLE CURATORIAL FACILITY

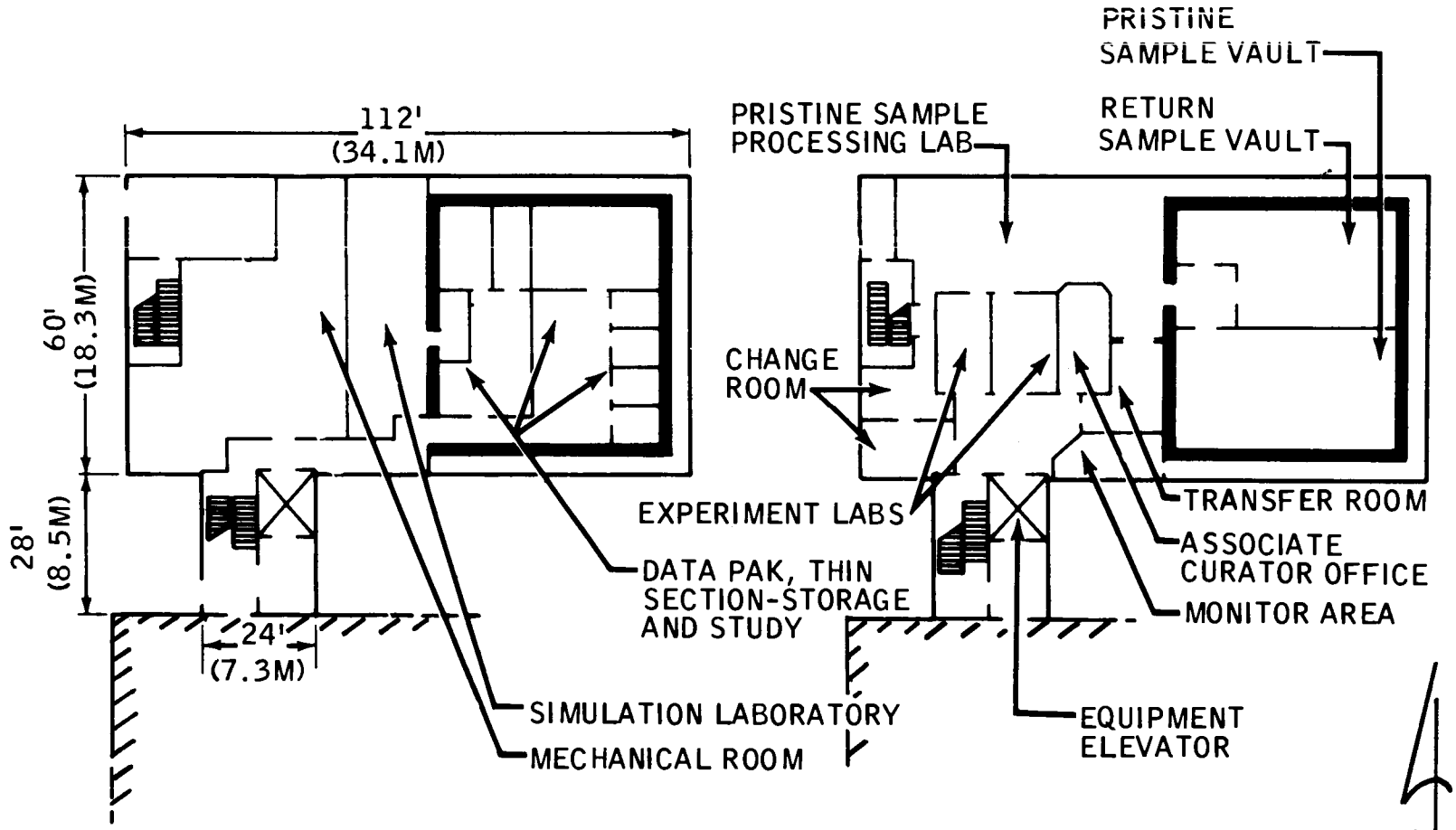
BUILDING 31



LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1976 ESTIMATES

ADDITION TO LUNAR SAMPLE CURATORIAL FACILITY

BUILDING 31



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

SUMMARY

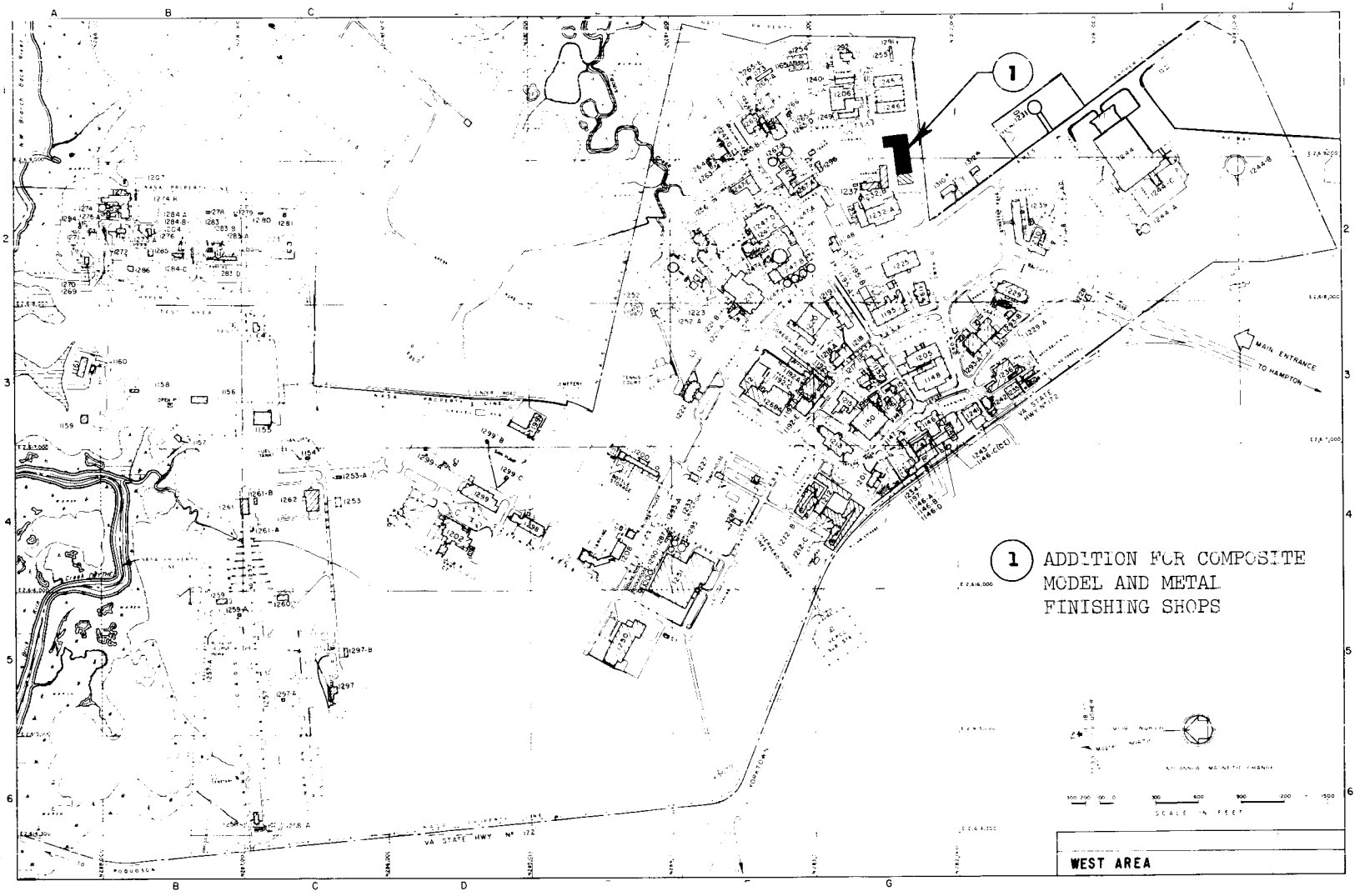
Langley Research Center

	Amount	Page No.
Location plan.....		CF 3-1
Office of Aeronautics and Space Technology:		
Addition for composite model and metal finishing shops.....	$1,940,000	CF 3-2

LANGLEY RESEARCH CENTER

FISCAL YEAR 1976 ESTIMATES

LOCATION PLAN



CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE	Addition for Composite Model and Metal Finishing Shops
LOCATION	Langley Research Center
	FY 1976 CoF ESTIMATE $1,940,000

COGNIZANT INSTALLATION: Langley Research Center

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT PROGRAM OFFICE: Office of Aeronautics and Space Technology

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$20,000
Construction	---
Total FY 1975 and Prior Years	$20,000

SUMMARY PURPOSE AND SCOPE:

This replacement project provides the essential shop space needed to properly support the functions of the Composite Model Development Shop and the Metal Finishing Shop. The existing shops were largely improvised over several years and are now functionally obsolete and improperly located. For years these very inadequate facilities have been used because no other facilities were available. The proposed facility will replace existing facilities built in 1940-41 which have deteriorated beyond economical rehabilitation and are not sufficiently adaptable to meet the present needs of the composite model and metal finishing work at Langley. With the growth of Langley Research Center over the years and the changes in the designs and materials used in the aeronautical programs, the progressively increasing responsibility and workload of the Model Development and Metal Finishing Branches has necessitated an increase in the amount and size of models and equipment to be produced or worked on. However, the space available in these structures has remained static throughout the Center's growth years.

This 36,000 square foot (3,344 sq. m) addition to an existing facility will permit consolidation of scattered and inadequate shop operations into

one shop complex at Langley, thereby improving fabrication efficiency and coordination, reducing safety hazards, and improving the cleanliness and quality of the projects produced or worked on in these shops. The proposed facility is a planned addition to the Laser and Optics Shop which is bordered on Durand Road where the new shop operations are now located. This proposed facility completes the final phase to relocate all shops at Langley into a single complex.

PROJECT JUSTIFICATION:

The proposed Composite Model Shop of about 30,000 square feet (2,787 sq. m) is required to replace the existing temporary 37,000 square foot (3,437 sq. m) structural complex built in 1940-41. This old building has now deteriorated to such a point that extensive upgrading is required to prolong usefulness of the facility for aerospace research. An adequate facility is needed for the fabrication of precise and complex research models. Present day model fabrication techniques involve the use of many types of resin and foam systems which require cleanliness in handling, exhausting of toxic fumes and stringent temperature-humidity-dust controls during fabrication. Close supervision must be provided to satisfy the model modifications required for the research test facilities since such model modifications are often made during the test programs. The proposed structure will provide a facility with the capability to produce test models of various sizes and complexity for aeronautics, structures, and a significant number of other activities at the Langley Research Center.

The Metal Finishing Shop with an area of about 6,000 square feet (557 sq. m), will provide for the chemical processes that encompass electrodeposition and surface chemistry technologies such as electroplate, electroform, anodize, chemical milling and cleaning, and chemical analyses which are currently being accomplished in two substandard buildings in a densely populated area. The existing facilities are severely limited in floor area, only 4,300 square feet (400 sq. m), which negates effective process segregation necessary to achieve optimum process control. The existing facilities lack adequate service utilities, optimum waste disposal, and environmental control.

This total Center facility shop improvement and equipment relocation is the final phase in Langley Research Center's long term plan to consolidate scattered and inadequate shop operations into a master planned shop complex located along Durand Road. The proposed addition will provide minimum accommodations for approximately 100 people who perform the various types of shop fabrication. These workers produce and maintain wind tunnel research models. They construct aerospace models, test components, inflatable and erectable structures of pliant materials. They also do fabrication research in advance fibers and resins and ceramic and heat transfer models. The integration of these various operations into a complex of shops will greatly improve the efficiency and coordination within these shops.

PROJECT DESCRIPTION:

This facility will be a one-story L-shaped structure with a high bay ceiling having a gross area of approximately 36,000 square feet (3,344 sq. m). The building will consist of two main areas, one the Composite Model Shop, 30,000 square feet (2,787 sq. m) and the other the Metal Finishing Shop, 6,000 square feet (557 sq. m). The total structure will house the fabrication operations of precise and complex research test models constructed of wood, ceramics, fiber glass and advanced composite materials as well as the chemical processing of metals. The facility will have a lumber conditioning room, storage area, fiber glass spraying and grinding area, clean fabrication area, clean room and dust collection area. Also included with this project are offices for about 12 personnel, rest rooms, air conditioning and all necessary utilities.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,915,000
Site development	LS	---	---	55,000
Architectural and structure	SF	36,000	24.72	890,000
Electrical (inside 5' line)	SF	36,000	8.20	295,000
Mechanical	SF	36,000	15.14	545,000
Utilities (outside 5' line)	LS	---	---	130,000
Equipment				25,000
Relocation of existing equipment	LS	---	---	25,000
Fallout Shelter (Not Feasible)	---	---	---	---
	TOTAL			$1,940,000

The Addition for the Composite Model and Metal Finishing Shops will involve approximately $1,100,000 of shop equipment of a noncollateral nature which will be relocated from the existing shops.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

At the present time there are no foreseeable requirements for future CoF funding for this project.

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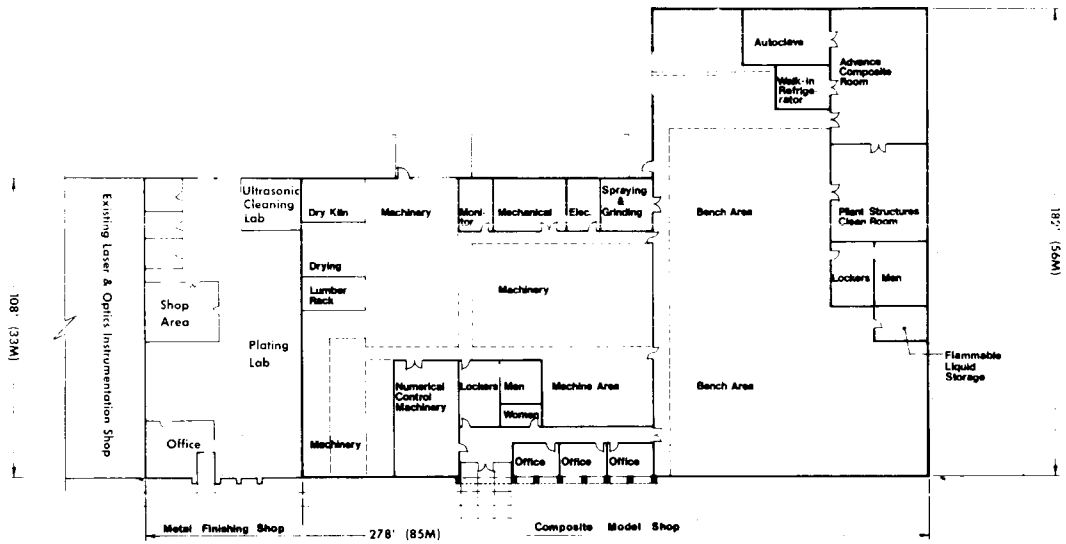
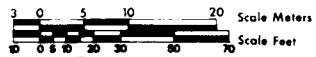
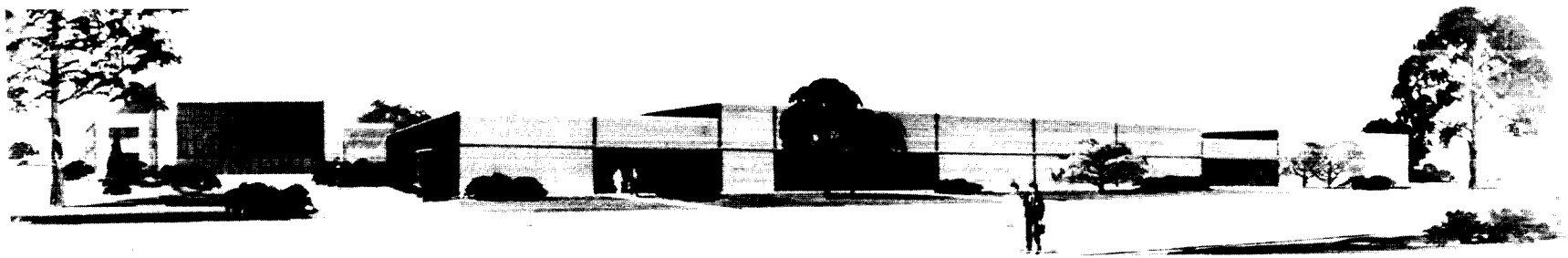
LANGLEY RESEARCH CENTER
FISCAL YEAR 1976 ESTIMATES

ADDITION FOR COMPOSITE MODEL AND METAL FINISHING SHOPS



Floor Plan





perspective

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

SPACE SHUTTLE FACILITIES

	Amount	Page No.
Office of Manned Space Flight:		
Summary		CF 4-1
Launch and Landing Facilities	$35,410,000	
Modifications to Launch Complex 39, Kennedy Space Center, Florida	13,110,000	CF 4-5
Construction of Orbiter Processing Facility Kennedy Space Center, Florida	8,160,000	CF 4-12
Modifications for Solid Rocket Booster Processing Facilities, Kennedy Space Center, Florida	5,240,000	CF 4-18
Modifications for Hypergolic Checkout and Refurbishment Facilities, Kennedy Space Center, Florida	6,940,000	CF 4-25
Modifications for Launch Equipment Test Facilities, Kennedy Space Center, Florida	1,960,000	CF 4-31
Ground Test Facilities	8,810,000	
Construction of Orbiter Approach and Landing Test Facilities, Flight Research Center, Calif. and Palmdale, Calif.	1,680,000	CF 4-38
Construction of Shuttle/Carrier Aircraft Mating Facilities, Flight Research Center, Calif. and Palmdale, Calif.	3,890,000	CF 4-44
Modifications for Crew Training Facilities, Johnson Space Center	830,000	CF 4-49
Modification of the Vibration and Acoustic Test Facility, Johnson Space Center	2,410,000	CF 4-53
Manufacturing and Assembly Facilities	3,000,000	
Modifications for Solid Rocket Component Manufacturing and Assembly Facilities (Location to be designated)	3,000,000	CF 4-59
TOTAL	$47,220,000	

PROJECT TITLE	Space Shuttle Facilities	
	FY 1976 CoF Estimate	$47,220,000

COGNIZANT INSTALLATION: Various Locations

LOCATION OF PROJECT: Locations are identified in the following documentation

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$22,325,000
Construction	180,310,000
Total FY 1975 and Prior Years	$202,635,000*

*For unique space shuttle facilities provided under the CoF program only.

SUMMARY PURPOSE AND SCOPE:

The purpose of these projects is to modify and add to existing Government-owned facilities and to construct those limited new facilities necessary to support the space shuttle program. As in prior years, this shuttle facility package includes all major facility requirements which are unique to the space shuttle program. All requirements are tied to a shuttle program milestone or "need date". Included in this package are all facility requirements needed to achieve that initial operational capability or capacity as set forth in the project documentation and/or the outline assumptions on which total shuttle facility needs have been based and projected.

In FY 1976 the shuttle facilities are again primarily for launch and landing requirements at John F. Kennedy Space Center (KSC). The work includes continuing the modifications to Launch Complex 39 and construction of the Orbiter Processing Facility, which were initiated with FY 1975 resources; modifying existing facilities to provide for launch equipment testing, and for checkout and maintenance of hypergolic fueled pods; and modifying existing Air Force facilities at the Cape for processing the solid rocket boosters (SRB's) before launch.

Fiscal Year 1976 requirements at other locations include continuation of construction and modifications for orbiter approach and landing test facilities, shuttle/carrier aircraft mating facilities, crew training facilities, vibro-acoustic facilities, and facility modifications for SRB component manufacturing and assembly operations.

PROJECT JUSTIFICATION:

Fiscal Year 1975 and prior years' Construction of Facilities projects for the space shuttle program authorized modifications and construction for technological facilities, engine test facilities for the shuttle, major manufacturing facilities, ground test facilities, and launch and landing facilities. Final design of all these facilities is underway and major portions of this design effort are complete. Construction work on a number of these early projects is now complete and several facilities are operational.

The FY 1976 request is intended primarily to continue modifications to provide launch capability for the shuttle at KSC. These facilities are needed for the initial operation at the launch and landing site. Included, is continuation of two projects begun with FY 1975 resources - modifications to Launch Complex 39 and construction of an Orbiter Processing Facility. Included also are the modifications to existing facilities to support solid rocket booster processing at the launch site, hypergolic pods checkout and maintenance, and launch equipment testing. With the exception of launch equipment testing, construction of the facilities must be completed 6-12 months before the first manned orbital flight. This schedule is required in order to support the necessary extensive activation, launch processing system installation, prelaunch test and checkout activities. The launch equipment test facility is needed by mid-CY 1977 to start testing swing and holddown arms that must be developed and verified in time for launch operations.

The remaining projects in the FY 1976 request are intended primarily to support vital ground and flight test activities and the manufacture and assembly of SRB components. They include continuing four FY 1975 projects intended to provide facilities for approach and landing tests, shuttle/carrier aircraft mating facilities, crew training and vibro-acoustic tests.

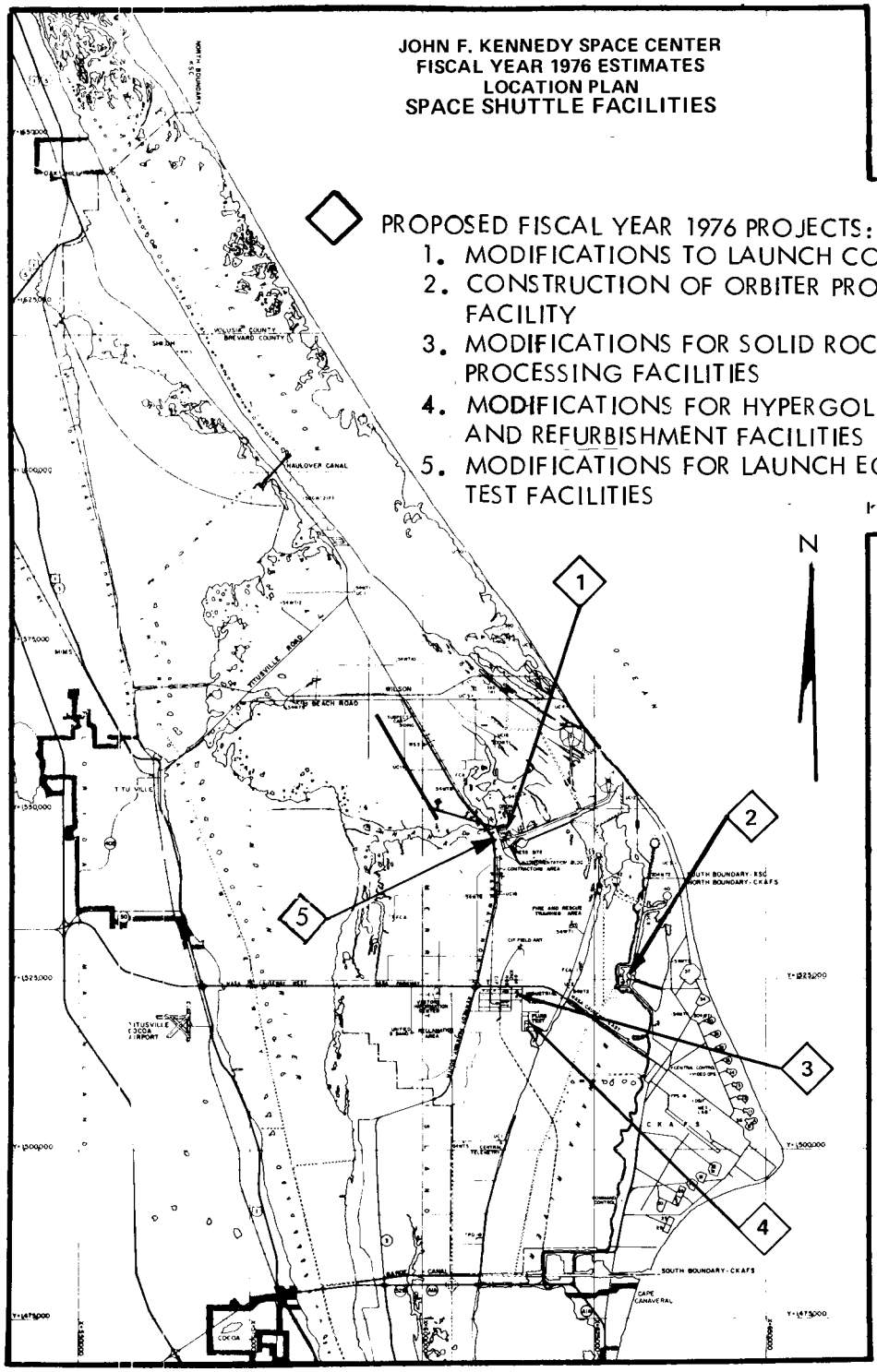
Current space shuttle planning is based on achieving an orbiter first captive flight in the second quarter of CY 1977 and a first manned orbital flight in the second quarter of CY 1979. This FY 1976 request is necessary to support these major milestones. Each project is required to meet a specific target or intermediate milestone directly related to the major milestones. The individual project descriptions specify those respective milestones to which the facility is related.

SUMMARY PROJECT COST ESTIMATE:

Launch and Landing Facilities	$35,410,000
Ground Test Facilities	8,810,000
Manufacturing and Assembly Facilities	3,000,000
TOTAL	$47,220,000

PROJECT COST ESTIMATE:

Launch and Landing Facilities	35,410,000
Modifications to Launch Complex 39, Kennedy Space Center, Florida	13,110,000
Construction of Orbiter Processing Facility, Kennedy Space Center, Florida	8,160,000
Modifications for Solid Rocket Booster Processing Facilities, Kennedy Space Center, Florida	5,240,000
Modifications for Hypergolic Checkout and Refurbishment Facilities, Kennedy Space Center, Florida	6,940,000
Modifications for Launch Equipment Test Facilities, Kennedy Space Center, Florida	1,960,000
Ground Test Facilities	8,810,000
Construction of Orbiter Approach and Landing Test Facilities, Flight Research Center, California, and Palmdale, California	1,680,000
Construction of Shuttle/Carrier Aircraft Mating Facilities, Various Locations	3,890,000
Modifications for Crew Training Facilities, Johnson Space Center, Houston, Texas	830,000
Modification of the Vibration and Acoustic Test Facility, Johnson Space Center, Houston, Texas	2,410,000
Manufacturing and Assembly Facilities	3,000,000
Modifications for Solid Rocket Booster Component Manufacturing and Assembly Facilities (location to be designated)	3,000,000


JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES
LOCATION PLAN
SPACE SHUTTLE FACILITIES
PROPOSED FISCAL YEAR 1976 PROJECTS:
1. MODIFICATIONS TO LAUNCH COMPLEX 39
2. CONSTRUCTION OF ORBITER PROCESSING FACILITY
3. MODIFICATIONS FOR SOLID ROCKET BOOSTER PROCESSING FACILITIES
4. MODIFICATIONS FOR HYPERGOLIC CHECKOUT AND REFURBISHMENT FACILITIES
5. MODIFICATIONS FOR LAUNCH EQUIPMENT TEST FACILITIES
N
1
2
3
4
5
SOUTH BOUNDARY - KSC
NORTH BOUNDARY - CKAFS
SOUTH BOUNDARY - CKAFS
CAPE CANAVERAL
TITUSVILLE
MIMS
WILSON
BAULOVER CANAL
TITUSVILLE ROAD
TITUSVILLE COCOA AIRPORT
COCOA

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE	Modifications to Launch Complex 39
LOCATION	John F. Kennedy Space Center
	FY 1976 CoF ESTIMATE $13,110,000

COGNIZANT INSTALLATION: John F. Kennedy Space Center

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$3,070,000
Construction	536,893,000
Total FY 1975 and Prior Years	$539,963,000

SUMMARY PURPOSE AND SCOPE:

This project is a continuation and extension of the modification work provided for in FY 1975 for Launch Complex 39. This FY 1976 project provides for modifying the Launch Control Center to provide facilities for accommodating instrumentation and control equipment required for checkout and launch. It also provides for the added resources necessary to complete the total work initially presented in the related FY 1975 project request.

PROJECT JUSTIFICATION:

The FY 1975 budget request was for modification to Pad A, one mobile launcher, and two high bays in the Vehicle Assembly Building (VAB). The FY 1975 resources ultimately provided were at a lower amount and this, coupled with escalating construction costs, made it necessary to defer certain work initially planned in FY 1975. This work consisted of launch systems, including propellant and high-pressure gas systems at the pad, the mobile launcher, and the VAB. This FY 1976 project provides for completing the pad, the mobile launcher, and the two high bays in the VAB.

To attain launch capability from Launch Complex 39, regardless of the number of flights, it is necessary to modify and adapt the Launch Control Center (LCC) to accommodate the shuttle launch processing system. This

system, to be developed and procured from R&D resources, provides the necessary electronic checkout, monitoring, and control functions during prelaunch operations as well as launch control of the shuttle system during countdown through lift-off. This project provides the necessary modification to the LCC to adapt it for shuttle launch operations.

To achieve the first manned orbital flight milestone as currently planned, the launch facilities must be operational no later than mid-CY 1978. This is necessary to allow for the extensive prelaunch activities, including receipt and checkout of the orbiter, external tank and solid rocket boosters; mating and integration; and flight-readiness firing of the orbiter engines, now scheduled several weeks before the first manned orbital flight. The launch facilities are large and complex, with critical interfaces with ground support equipment and the launch processing system, thus requiring extensive construction and activation periods. For these reasons, this project must be undertaken as scheduled in FY 1976.

PROJECT DESCRIPTION:

This project includes continuation of the work begun in the FY 1975 project and modifying the LCC.

Completion of Pad A, the Mobile Launcher and the VAB (two bays)

The FY 1975 increment of this project included extensive modifications of one launch pad, one mobile launcher, and two high bays of the VAB. This project provides for completing the modifications of these facilities. The work provides for extensive modifications of the launch systems, including the environmental control, propellant, and pneumatic systems on the mobile launcher; the environmental control, pneumatic, fuel, and high-pressure gas systems on Pad A, and the environmental control, pneumatic, and high-pressure gas systems in the VAB.

Modifications to the Launch Control Center

The second floor of the LCC and two firing rooms on the third floor will be modified to provide shuttle launch support. The second floor will contain the heart of the computer system. One firing room will directly support major integrated shuttle vehicle checkout and control, and individual shuttle vehicle ground support activities. A second firing room will be used for controlling nondirect vehicle systems, including control of the facility systems at Launch Complex 39, the Orbiter Processing Facility, and the Solid Rocket Booster Processing Facilities. An area will be provided for management control functions. The modifications include removing and/or modifying racks, partitions, walls, and doors; relocating and installing air conditioning equipment; modifying raised floors and chilled water systems; and providing a fire extinguishing system. Extensive electrical modifications will be required to adapt this facility for shuttle.

Standardized layouts for the control consoles, which will monitor separate functions of the shuttle launch and be tied into the central launch processing system on the second floor, will be used in the firing rooms. Cutouts in the flooring will be required to accommodate them. Existing racks and their associated underfloor cables, wireways, and receptacles will be removed; partitions, walls, doors, raised floors, and air conditioning and electrical systems will be modified. Additional air handling units will be installed to insure adequate cooling for the computer system.

Emergency power will also be provided. Instrumentation and power circuits will be expanded and reconnected to accommodate the new arrangement of the consoles. The existing air conditioning units for the launch processing system rooms and the central data system will be disconnected from their existing power source and reconnected to the emergency power to insure uninterrupted operation during a power failure. The chilled water system will also be modified to provide adequate cooling in the event of a power failure.

The area adjacent to the Firing Room 1 will be modified to provide an electronically-shielded communications security work room (COMSEC) and equipment room for Department of Defense missions. Existing doors will be removed and wall openings permanently closed; additional walls and new access doors will be provided. Double entry shielded doors and the electromagnetic shielding for the floor, walls, and ceiling of the COMSEC and equipment rooms are required. The electrical and air conditioning systems will be modified.

Although fire detection and alarm systems currently exist in the areas to be modified, a fire control and extinguishing system does not. Therefore, a fire extinguishing system, which will incorporate the present detection and alarm systems, will be installed in each area or room to be modified. In the event of a fire, the system will provide total freon flooding of areas above ceilings, under raised floors, and inside racks and consoles, thus permitting personnel to continue operations. This system is necessary to protect the high value equipment to be housed in the Launch Control Center.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$13,110,000
Modifications to launch control center	LS	---	---	2,810,000
Removal of racks, partitions, walls and doors	LS	---	---	(120,000)

	Unit of Measure	Quantity	Unit Cost	Total Cost
Modify raised floors	LS	---	---	(140,000)
Modify air conditioning system	LS	---	---	(170,000)
Modify electrical system	LS	---	---	(1,280,000)
Modification for COMSEC	LS	---	---	(270,000)
Fire protection and safety system	LS	---	---	(830,000)
Launch systems for Pad A, mobile launcher and VAB	LS	---	---	10,300,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
	TOTAL			$13,110,000

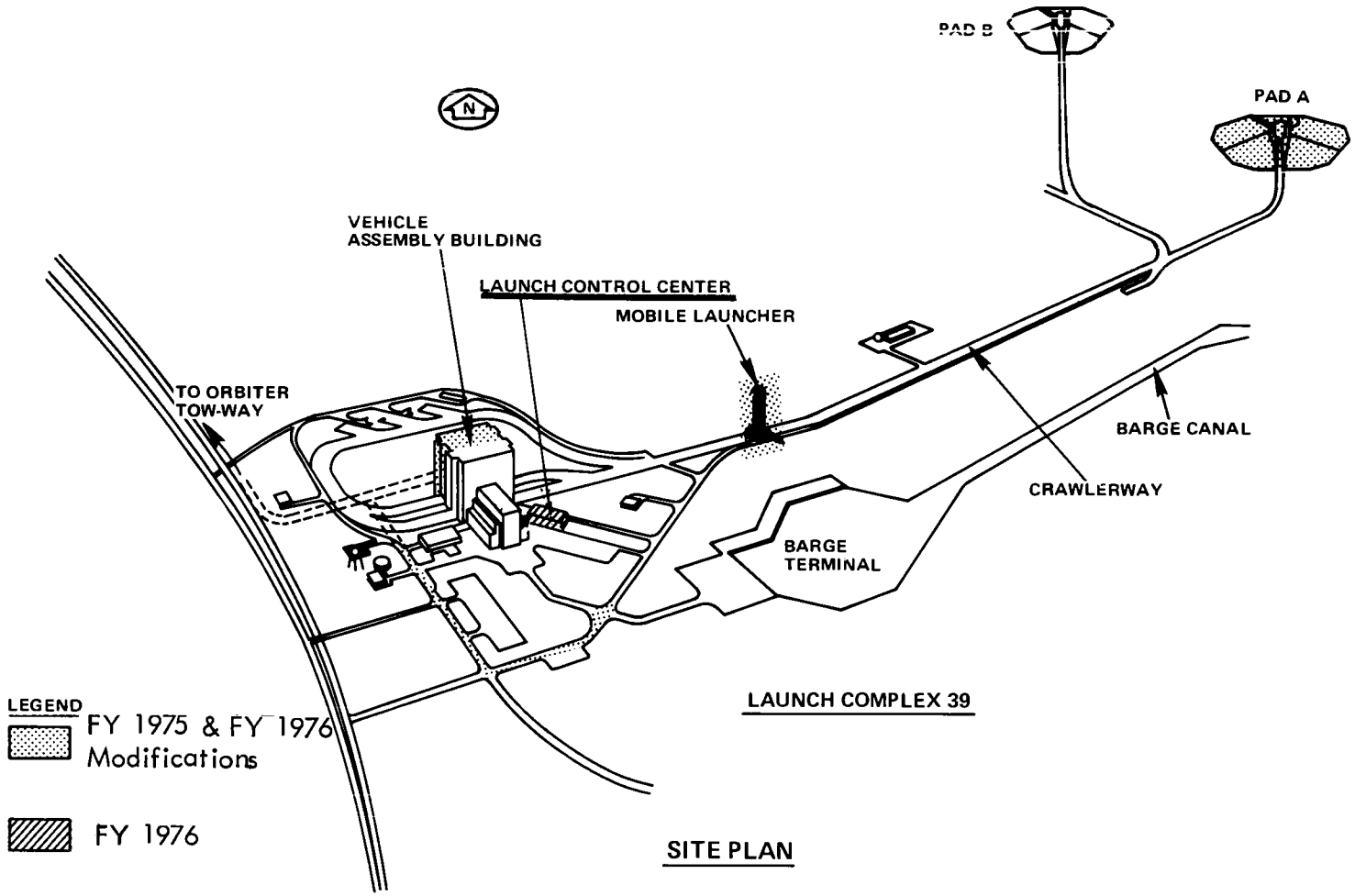
It is anticipated that approximately $38 million to $40 million worth of R&D resources will be required to provide the noncollateral communications, control and monitoring equipment required for initial operations.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

It is estimated that $55 million to $65 million will be required in future CoF programs to complete this project and provide additional launch facilities necessary to support the higher rate of flights anticipated. These CoF resources would be used to provide modifications for another pad, at least a second mobile launcher, two more high bays in the VAB, and possibly a third firing room in the LCC, and lightning protection for the space shuttle vehicle during transportation to the launch pad.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES

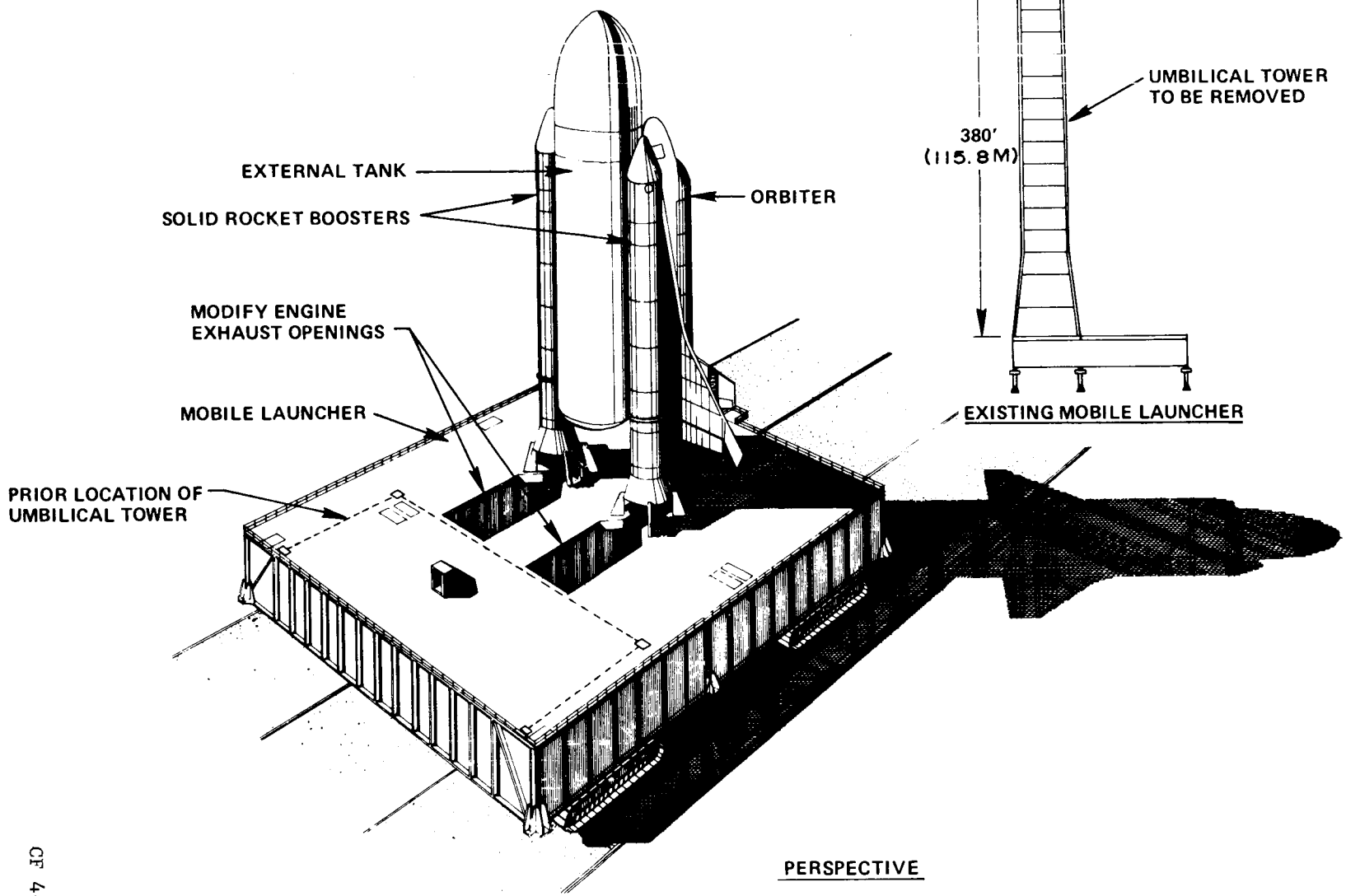
MODIFICATIONS TO LAUNCH COMPLEX 39



SITE PLAN

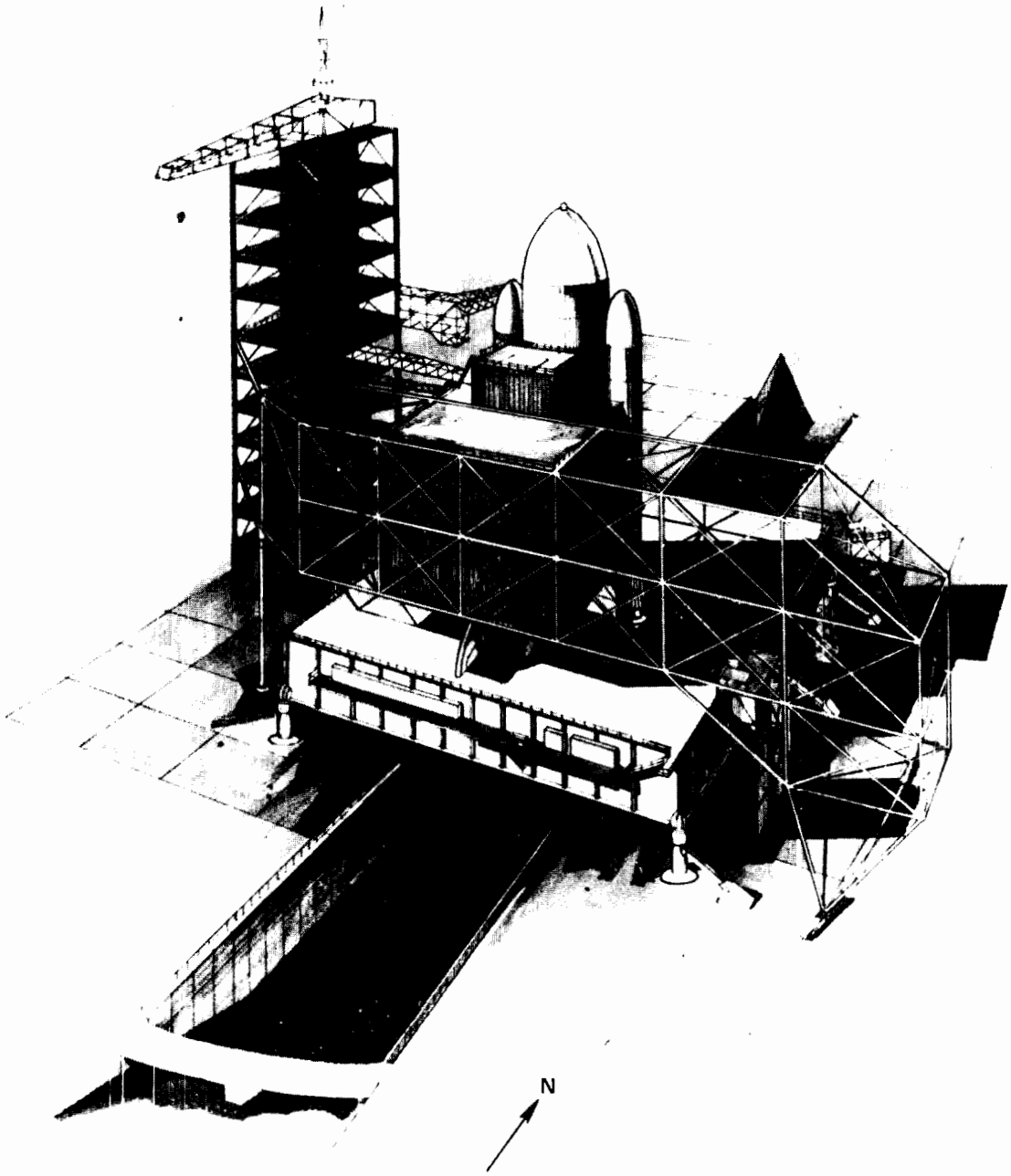
JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES

MODIFICATIONS TO LAUNCH COMPLEX 39



MOBILE LAUNCHER

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES
MODIFICATIONS TO LAUNCH COMPLEX 39



PERSPECTIVE

PAD A

CF 4-11

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE	Construction of Orbiter Processing Facility
LOCATION	John F. Kennedy Space Center
	FY 1976 CoF ESTIMATE $8,160,000

COGNIZANT INSTALLATION: John F. Kennedy Space Center

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$955,000
Construction	13,380,000
Total FY 1975 and Prior Years	$14,335,000

SUMMARY PURPOSE AND SCOPE:

This project is a continuation and extension of the construction work provided for in FY 1975 for the Orbiter Processing Facility at the Kennedy Space Center. The FY 1975 project included one large high bay area and a low bay required for "safing", maintenance and checkout of the space shuttle orbiter. This FY 1976 increment provides for the construction of the basic second high bay structure to complete the building construction as initially envisioned and now required. Outfitting the second high bay with the necessary air conditioning, gaseous and other special systems will be provided for in a future year program to support the developmental missions and, subsequently, the higher flight rates.

PROJECT JUSTIFICATION:

Upon returning from a space mission, the orbiter must undergo "safing", maintenance and checkout operations before it can be made ready for reuse. The major operations include drainage and purging of all fuel systems, removal of ordnance, removal of payloads brought back from space, inspection of the payload bay and crew cabin, repair and replacement of damaged components and

refurbishment of the thermal protection system. The hypergolic modules that make up the reaction control system, the orbital maneuvering system and components of the auxiliary power unit are removed in this facility; serviced and checked out in a separate facility; and then returned to the Orbiter Processing Facility for reinstallation into the orbiter. After these operations are completed, the mission payloads are inserted into the payload bay and the orbiter receives integrated system checkout before movement to the Vehicle Assembly Building for integration and checkout with the external tanks and the boosters. These are vital functions that take approximately two-thirds of the total orbiter processing time between missions. To effectively carry out these operations, the Orbiter Processing Facility is required.

The FY 1975 program provided the initial increment of the necessary facilities. That increment provided the first high bay area for orbiter operations and the low bay area for the support functions. This FY 1976 project will provide the basic structure for the second high bay area essential to complete all building construction. It is now planned to outfit the second high bay with the essential air conditioning, high pressure gas systems and special systems as a future year's program requirement. At that time, the facility will be capable of supporting the orbiter processing functions during the developmental phase of the shuttle as well as during the operational phase that follows.

Shuttle program plans require the use of the two high bays interchangeably to carry out all delineated orbiter processing operations. It has been recognized, however, that certain operations, particularly the "safing" operations, are very hazardous in nature. Others, such as thermal protection system refurbishment, are somewhat "dirty" by their nature and somewhat incompatible with the clean environment required for the removal and insertion of payloads into the orbiter payload bay. The facility is being designed to handle these complex tasks. However, a period of "learning" is absolutely vital to train personnel and to develop the detailed operational procedures required to do all these functions safely and efficiently using the same work stations. For these reasons, it is necessary to have both high bays available during the developmental phase of the shuttle program.

When completed, the first bay is planned to receive the orbiter and carry out the normal "safing", maintenance, and checkout operations as well as the payload inspection, insertion and removal functions. In the event these operations are found to be significantly incompatible, particularly for the initial developmental missions, the second bay will then provide the capability to separate these functions until a long term solution and/or vehicle maturity evolves. These plans will then allow sufficient time to train the operators and develop the procedures to permit each bay to carry out the total processing functions to support the higher mission profile projected in 1981 and beyond.

An analysis was made as to how best to construct the full planned scope of the orbiter processing facilities. As a result of this analysis, it has been determined that constructing the second high bay structure with FY 1976 resources is the optimum way in terms of facility engineering and at the same time accommodating the program requirements. Initiating construction of this second high bay in this time frame will preclude the potential interference between construction of this high bay and operation in the first; it will allow for consistency and standardization in facility construction that will result in optimizing the operation; and it clearly provides the most economical means of completing the total construction in time to meet the needs. To achieve these objectives, FY 1976 resources are necessary to implement the project as planned.

To meet the first manned orbital flight as currently scheduled, the first orbiter must be delivered to Kennedy Space Center in the third quarter of CY 1978 for the extended prelaunch activities and integration into the launch and landing complex. The first high bay, programmed in FY 1975, must be operationally ready by that time to meet this milestone. The second high bay, proposed in this project, must be completed and operable in the second quarter of 1979 to support the first manned orbital flight and the shuttle developmental flights that follow. To meet this schedule, construction of the basic structure must start in the third quarter of CY 1975, thus necessitating FY 1976 programming.

PROJECT DESCRIPTION:

This project is a continuation and extension of the construction work provided for in FY 1975 for the Orbiter Processing Facility at the Kennedy Space Center. The FY 1975 increment provided for the construction of a 29,100-square foot (2,703.4-m^2) high bay, a 25,000-square foot (2,322.5-m^2) low bay, and associated site work and utilities. The FY 1975 increment also provided the site work and limited foundations for the second high bay as well as for fully outfitting the first bay for its intended use. This FY 1976 project will provide for construction of the basic second high bay structure to complete the building construction. A future year program will provide for outfitting the second high bay with the special air conditioning, hydraulic and propellant systems, as well as the high-pressure gas and fuel systems required to support program requirements.

This second high bay will be identical to the first bay in size and in architectural motif. Like the first high bay, construction will consist of structural steel framing with insulated metal panel exterior walls. The building will be equipped with two 30-ton (27.2 metric tons) capacity bridge cranes with a hook height of approximately 70 feet (21.3 m) and floor area of approximately 29,100 square feet (2,703.4-m^2). An underground floor trench

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system will be provided to accommodate utility and special gaseous and fuel systems that will be later installed. The basic utility systems, including water, electrical and lighting, and a deluge fire protection system will also be provided.

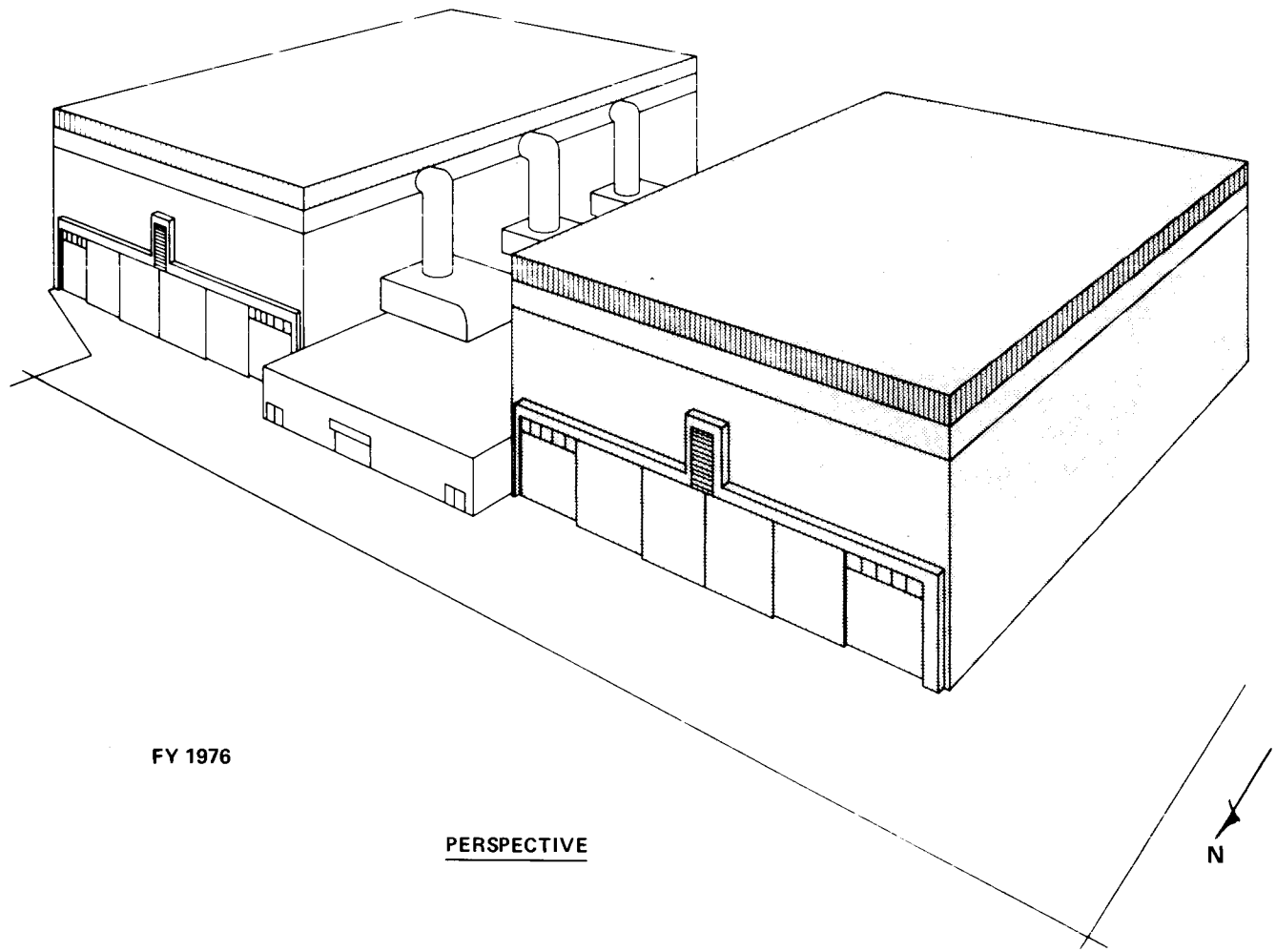
PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$7,370,000
Second high bay	CF	2,706,000	1.90	5,150,000
Site preparation, foundations	LS	---	---	590,000
Utility extensions	LS	---	---	1,350,000
Fire protection system	LS	---	---	280,000
Equipment	---	---	---	790,000
30-ton bridge crane	Each	2	395,000	790,000
Fallout Shelter (Not Feasible)	---	---	---	---
			TOTAL	$8,160,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

It is estimated that $5-6 million will be required in the future CoF programs to "outfit" this facility and make it an operational facility to support the shuttle developmental flights and the later scheduled higher flight rates. The outfitting will include the special air conditioning, high-pressure gas, hydraulic, propellant, instrumentation and control systems.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES
CONSTRUCTION OF ORBITER PROCESSING FACILITY

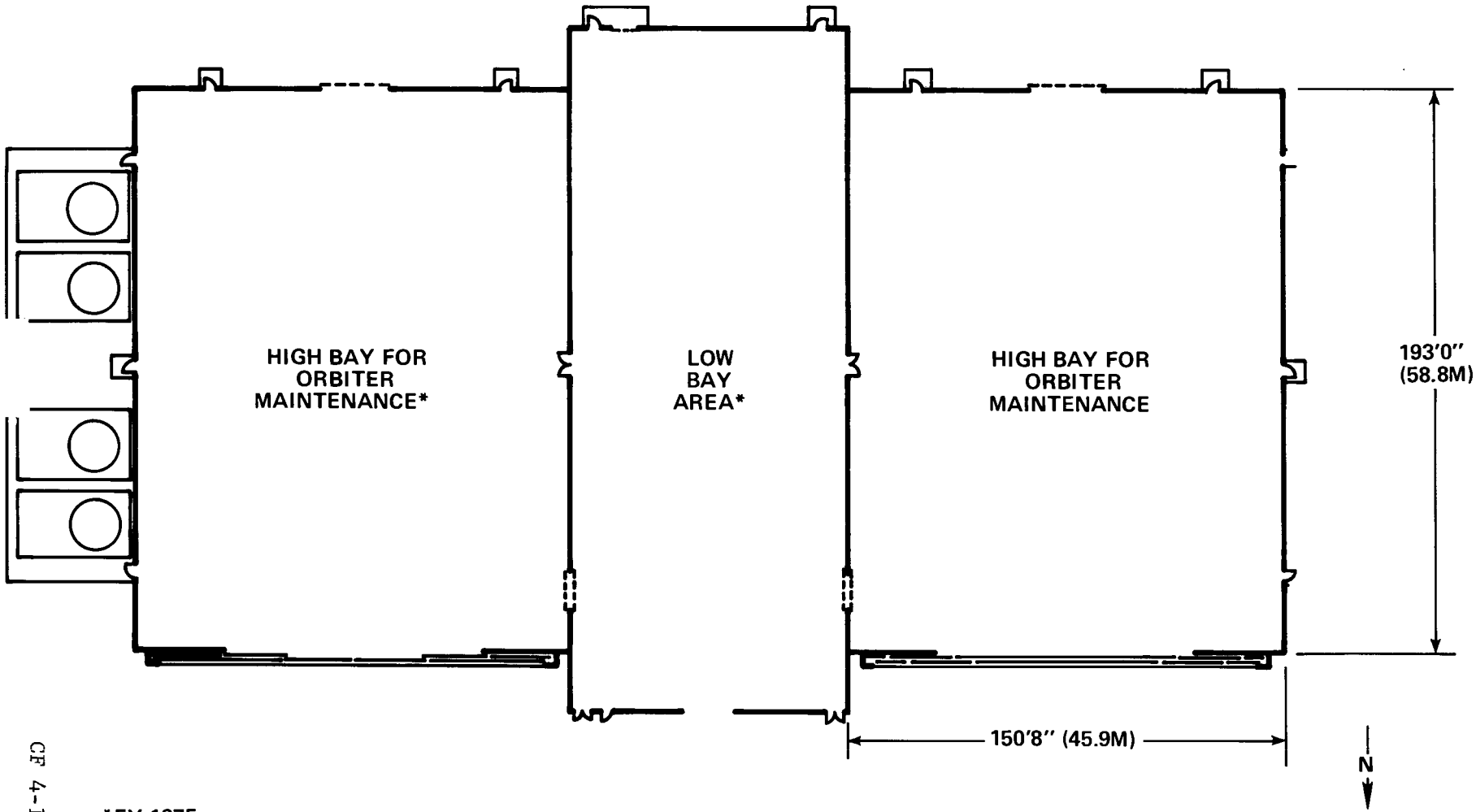


FY 1976

PERSPECTIVE

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES

CONSTRUCTION OF ORBITER PROCESSING FACILITY



*FY 1975

FLOOR PLAN

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE	Modifications for Solid Rocket Booster Processing Facilities
LOCATION	John F. Kennedy Space Center
	FY 1976 CoF ESTIMATE $5,240,000

COGNIZANT INSTALLATION: John F. Kennedy Space Center

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$720,000
Construction	---
Total FY 1975 and Prior Years	$720,000

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to provide modifications to existing Air Force Titan III solid rocket motor facilities at Cape Canaveral for receiving, storing, and assembling solid rocket booster (SRB) sections before movement to the Vehicle Assembly Building (VAB) for stacking, mating, and integrating with the external tank and orbiter.

The project includes modifying a portion of the high bay and low bay of the Solid Motor Assembly Building (SMAB) for receiving and off loading of solid rocket motor (SRM) segments, and for assembly of the forward and aft sections of the solid rocket booster (SRB); modifying portions of the Missile Inspection and Storage Building (MIS) for subassembly and storage of inert SRB components; and modifying the Segment Arrival Storage Area (SAS) to provide outside storage for the SRM segments. In addition to modifying these facilities to meet operational requirements, the existing road system from the Titan III area to the VAB will also be modified.

PROJECT JUSTIFICATION:

The shuttle vehicle consists of the orbiter, an external tank, and two solid rocket boosters. The two boosters provide the major portion of the thrust, approximately 2.5 million pounds, that is needed to place the orbiter in orbit. Each booster is composed of four solid rocket motor segments, forward and aft skirts, a nose cone, a nozzle, a thrust vector control mechanism, separation motors, parachute recovery system, and attachment structure. This hardware will be manufactured at various plants in the United States and delivered directly to the launch site where it will undergo essential processing operations before launch. These processing operations include receipt, inspection, and storage of the hardware, as well as detailed assembly of the various components into large sections before relocation to the VAB for stacking and intgration with the orbiter and external tank.

The solid rocket motor segments will arrive at Kennedy Space Center by rail and will be moved via an existing railroad system directly to the modified Titan III SMAB. Inside this facility the shipping covers will be removed and the segments will be inspected to assure that no damage has occurred during shipping. A large bridge crane will then be used to remove the motor segments from their railroad car transporter, rotate them from the horizontal to the vertical position, and place them into workstands or on pallets mounted on transporters for movement to the Segment Arrival Storage Area. The remaining SRB components upon arrival will be received and off-loaded in the SMAB or the existing MIS for inspection, storage, and later minor assembly. Capability to perform minor repairs to parts and components will also be provided.

After the SRM segments and SRB components are received, inspected and stored, critical major assembly operations on the forward and aft segments in the SMAB follow. The objective is to assemble these motor segments and components into two large sections for later movement to the VAB. The first is the forward subassembly section, which will include the nose cap, frustrum, parachute pack, forward thrust structure, forward skirt and forward SRM segment. When assembled, this section will be approximately 57 feet (17.4 m) long and will weight approximately 168 tons (152.4 metric tons). The second section is the aft subassembly section, which will weigh approximately 179 tons (162.4 metric tons) when completed. It will consist of the aft skirt, thrust vector control, separation rockets, nozzle extension, aft attachment ring, the aft SRM segment and the nozzle. Following the assembly operations, the large sections undergo alignment, pressure, electrical continuity, and other tests and are then hoisted from the assembly position onto transporters that move them to the VAB for the stacking and integration activities. To accomplish these important functions, modifications to the existing Titan III facilities are required.

The first manned orbital flight is currently scheduled for the second quarter of CY 1979. To achieve this goal, SRB components, including SRM's, should be delivered to KSC in the third quarter of CY 1978 for the start of the assembly operations. Consequently, the SRB processing facilities must be operationally ready at that time to meet program requirements. Modification and activation lead times, estimated at 32-34 months, require that construction must be started in the fourth quarter of CY 1975, thus necessitating FY 1976 programming.

PROJECT DESCRIPTION:

This project provides for modifying three existing Air Force Titan III facilities to receive, inspect, store and assemble major SRB segments before movement to the VAB for stacking and integration with the remaining shuttle vehicle.

The major work includes modifications to approximately 10,000 sq. ft. (929 m^2) of the 230 ft. (70.1 m) high bay area and approximately 14,000 sq. ft. (1,301 m^2) of the 140 ft. (42.7 m) high bay support area in the SMAB. This space, with the exception of 6,000 sq. ft. (557.4 m^2) of the 230 ft. (70.1 m) high bay area, will be used exclusively in support of the shuttle program. The remaining 6,000 sq. ft. (557.4 m^2) will be shared with Air Force on a noninterference basis to their programs. In addition, the existing MIS and SAS or two other comparable facilities will be modified to provide for receiving and storage of SRB components. Existing roads will be modified and extended to support movement of large SRB sections between the Titan III facilities and the VAB.

Modification work in SMAB primarily includes removal of the Titan III stands and provision for four new work stands specially configured to assemble the forward and aft sections of the SRB's. Each of the aft work stands will be equipped with four 5-ton (4.5 metric tons) hoists to perform subassembly operations. Associated extension of electrical and mechanical utilities is also included. The existing 300-ton (272.2 metric tons) bridge crane will undergo major modifications to adapt it for the SRB assembly functions. The modifications will include provisions for a new drum and cabling to increase vertical travel capability from 20 ft. to 80 ft. (6.1 m to 24.4 m). In addition, a second 300-ton (272.2 metric tons) hoist, and hoist trolley will be provided.

The 140 ft. (42.7 m) high bay support area will be used for processing and subassembly of smaller components including nozzle, nose cones and parachutes and for providing a work area, tool crib, storage, and necessary administrative and engineering space. To support these functions, four subassembly workstands will be constructed. The work also includes strengthening the floors to support the increased loading, and modifications and extension of utilities throughout the area. A new compressed

air system and extension of fire protection system will be provided. Also included are modifications to the ceilings, lighting and air conditioning to provide the necessary engineering and administrative space.

To provide the necessary access between the Titan III facilities and the VAB, the existing road system will be modified. The work includes upgrading and repairing approximately 8 miles (12.9 km) of the existing roadways, and constructing a new 24 foot wide (7.3 meters) by 3,000 foot (914.4 meters) long road to bypass Pad 41, and provision of passing turnouts as required.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$3,300,000
Modify SMAB	LS	---	---	2,500,000
Remove Titan stands	LS	---	---	(530,000)
Four new workstands in 230 foot high bay	LS	---	---	(900,000)
Four workstands in 140 foot high bay	LS	---	---	(220,000)
Modify mechanical systems	LS	---	---	(280,000)
Modify electrical systems	LS	---	---	(400,000)
Fire protection system	LS	---	---	(170,000)
Modify MIS	LS	---	---	80,000
Modify SAS	LS	---	---	250,000
Road modifications and extensions	LS	---	---	470,000
Equipment				1,940,000
Modify 300-ton bridge crane	LS	---	---	1,860,000
5-ton hoist	Each	8	10,000	80,000
Fallout Shelter (Not Feasible)	---	---	---	---
	TOTAL			$5,240,000

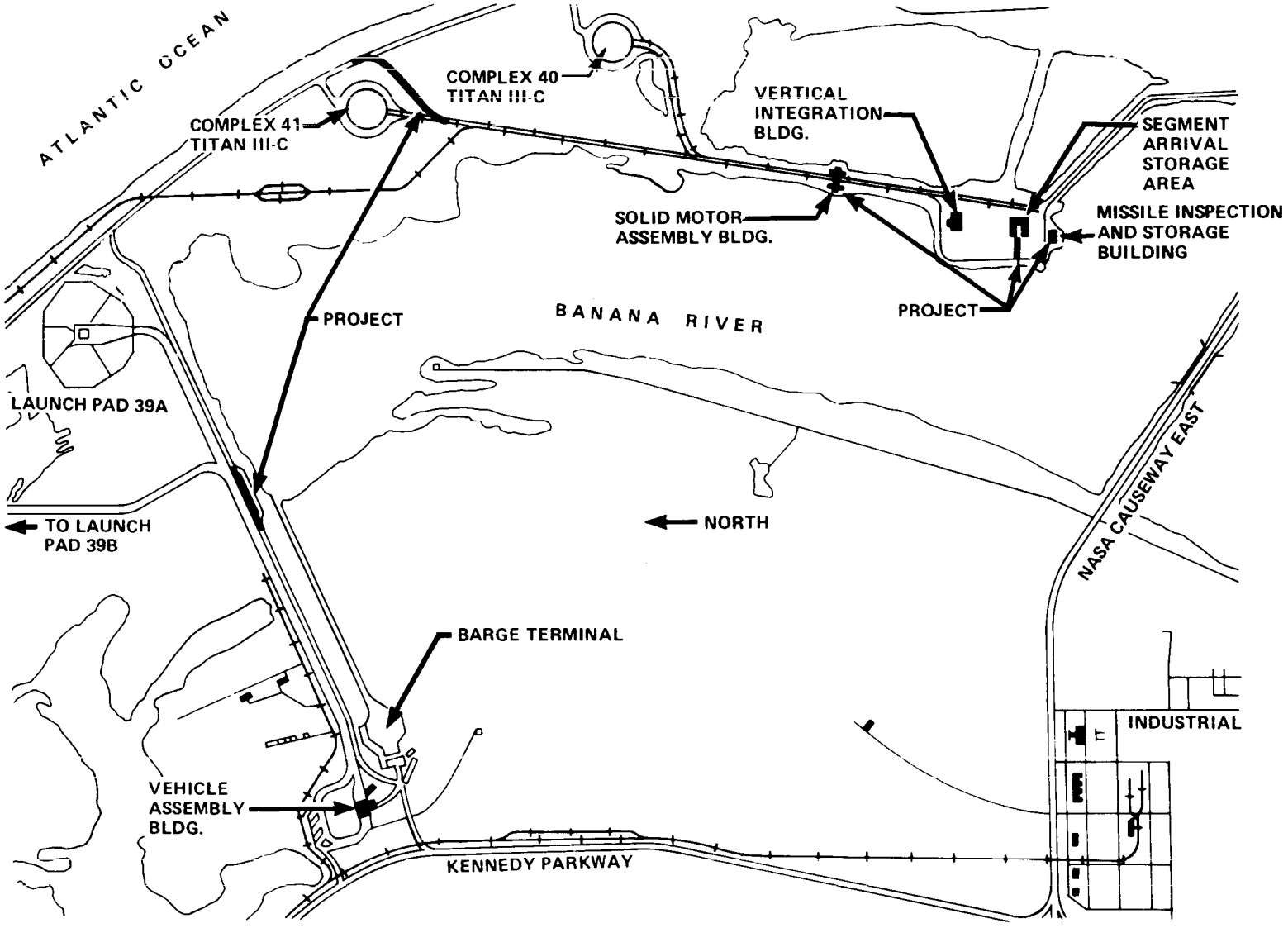
It is anticipated that approximately $8 to $9 million of R&D resources will be required to provide noncollateral equipment (e.g., assembly tooling equipment, special test sets, special handling equipment, and other ground support equipment) for this facility needed for initial operations.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Additional work area may be required for processing SRB's to support the later scheduled higher flight rates. The need and scope of work required cannot be determined at this time. However, it is estimated that $8 to $10 million will be required in future CoF programs to provide a recovery facility for receipt, disassembly, washdown, and inspection of SRB's recovered after reentry.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES

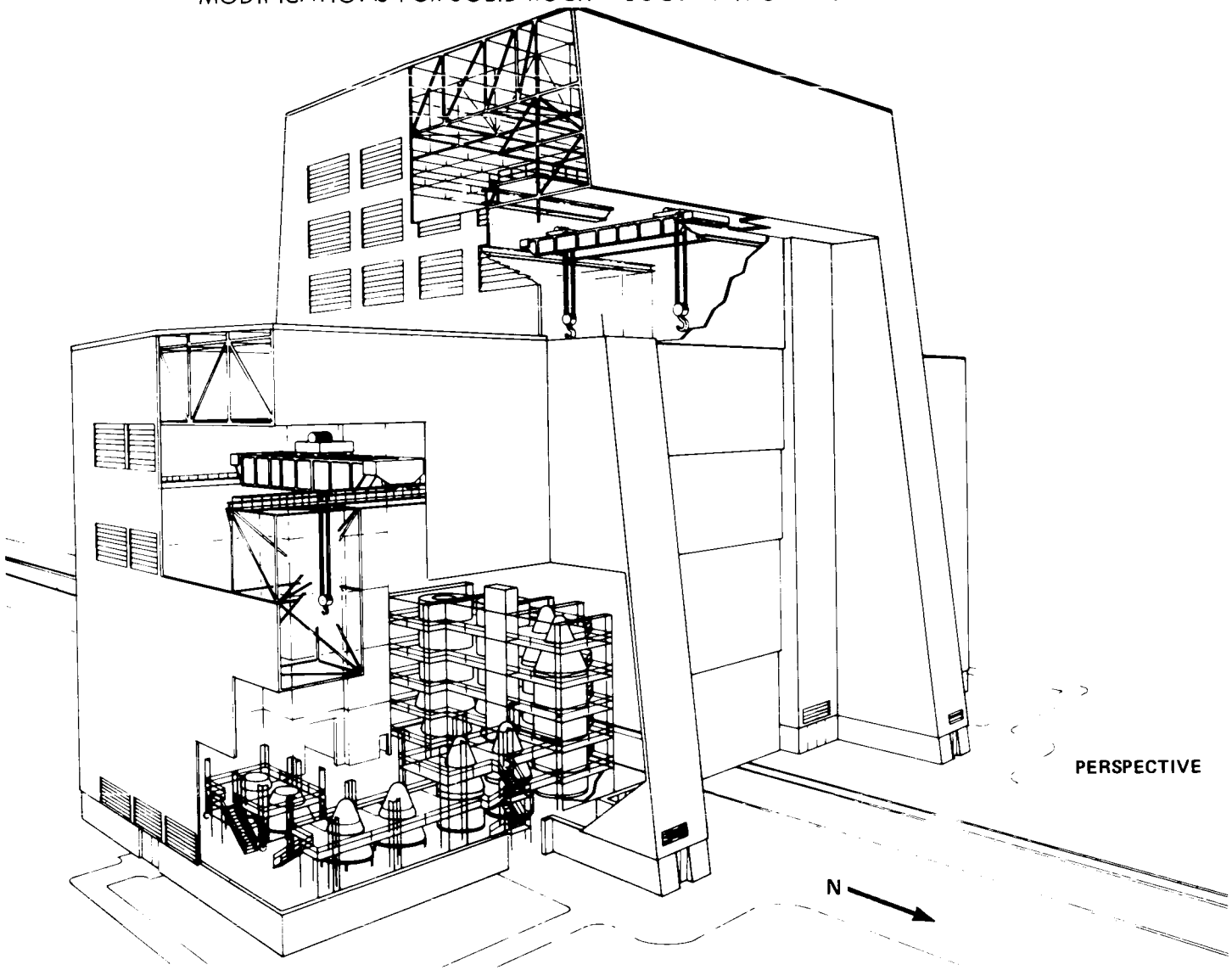
MODIFICATIONS FOR SOLID ROCKET BOOSTER PROCESSING FACILITIES



PLOT PLAN

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES

MODIFICATIONS FOR SOLID ROCKET BOOSTER PROCESSING FACILITIES



SOLID MOTOR ASSEMBLY BUILDING

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE	Modifications for Hypergolic Checkout and Refurbishment Facilities
LOCATION	John F. Kennnedy Space Center
	FY 1976 CoF ESTIMATES $6,940,000

COGNIZANT INSTALLATION: John F. Kennedy Space Center

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$545,000
Construction	6,233,000
Total FY 1975 and Prior Years	$6,778,000

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to provide modifications to existing facilities necessary to accomplish vital functions required for decontamination, maintenance, testing, and storage of hypergolic propellant modules after they have been removed from the orbiter during the "safing" operations in the Orbiter Processing Facility (OPF). After the above outlined processes are completed, the hypergolic modules will be returned to the OPF for reinstallation in the orbiter. The project provides for structural, mechanical, and electrical modifications to five existing buildings in the "fluid test complex" at KSC to provide maintenance and test cells, remote control stations, and support and storage facilities.

PROJECT JUSTIFICATION:

The orbiter will undergo extensive testing before its first manned orbital flight. After returning from a space mission, the vehicle will also undergo comprehensive "safing," refurbishment and checkout operations to ready it for reuse. The majority of these critical operations will be performed in the OPF. However, three of the orbiter systems use hypergolic propellants which are extremely hazardous. These systems include the orbital maneuvering system

(OMS), the reaction control system (RCS), and the auxiliary power unit (APU). In addition, the payload bay kit contains additional hypergolic propellant for the OMS/RCS systems to provide extra velocity change capability. Because of the extremely hazardous nature of the propellants involved, the systems must be tested and refurbished in special and remote facilities. This project provides the capability to meet these objectives.

The hypergolic pods are designed to be removed from the orbiter after each flight. Subsequently, the pods will be transported on dollies to remote facilities, where the modules will be placed in isolated cells. The cells must be designed, equipped, and controlled to handle the very hazardous propellants and the sensitive test and refurbishment operations that must follow. The operations include functional integrity checks for each module and for the system as a whole. The functional tests provide electrical continuity checks, and valve response checks in terms of opening and closing at precisely the right times. Leak checks will be performed for all propellant tanks involved. This is necessary because hypergolic propellant leakage is serious, not only in terms of the hazards and fuel losses, but also in terms of corrosion to adjacent vehicle components that could cause malfunction and failure. Other important operations include decontamination of the modules, engine pressure and functional checks excluding firings, and verification and calibration of the OMS/RCS instrumentation and control systems. To accomplish these significant activities, the proposed facility modifications are required.

The hazardous propellants used in the hypergolic modules necessitate a remote location for checkout, maintenance, and refurbishment operations. Modifying five of the existing buildings in the "fluid test complex" is more economical than building a new hypergolic complex. These five buildings were originally constructed for a similar purpose but need modifications to upgrade them for the more sophisticated requirements and new hardware of the shuttle program.

The first manned orbital flight is currently scheduled for the second quarter of CY 1979. To achieve this goal, the first orbiter should be delivered to KSC in the third quarter of CY 1978 for extended and essential prelaunch activities. Consequently, the hypergolic complex must be operational at that time to meet critical program requirements. Modification and activation lead times, estimated at 30 to 34 months, require that the project be started in early CY 1976, thus necessitating FY 1976 programming.

PROJECT DESCRIPTION:

This project provides for modifying five existing buildings in the"fluid test complex" to checkout, maintain, refurbish and store hypergolic pods. It includes modifying buildings and adjacent exterior areas, removing nonessential systems, installing new mechanical and electrical systems, and constructing fluid drains and holding facilities.

Building M7-961 will be used to process the OMS and aft RCS modules; Building M7-1212 will be used to process the payload bay kit and the forward RCS module. Work includes refurbishing all interior and exterior surfaces, overhead cranes, and door seals; modifying and extending utility systems as required; and removing existing piping and equipment. A new hypergolic piping system and associated spill drains will be installed. A compressed air system, and high pressure gaseous nitrogen and helium systems will also be procured and installed to carry out the pressure tests, leak test and the purging and cleaning of the OMS and RCS modules.

Building M7-1061 will be modified to accommodate and house launch processing system control consoles, self-contained atmospheric protective ensemble support, and to provide space for administration and logistics functions. The necessary work includes refurbishing all interior and exterior surfaces, including a clean room; rehabilitating and extending utility systems; removing existing piping and equipment; and replacing the roof. A new fire protection system, major electrical modifications, installation of pneumatic system and erection of partitions will be required. The project scope also includes the relocation of existing prototype shops to another facility.

Building M7-1410 and M7-1412 will be modified to provide environmentally controlled storage area for the payload bay kit, forward RCS,OMS, and aft RCS modules. Modification work includes rehabilitating the utility systems, high bay roof, vertical sliding doors, and interior and exterior surfaces. Replacing the low bay roof; procuring and installing a pneumatic system; modifying plumbing, ventilating, and air conditioning systems and upgrading the lighting to accommodate functional requirements will also be required.

Exterior work will include providing pads for hypergolic equipment,propellant disposal ponds, spill drains and associated gravity feed piping system. In addition, a 222-square yard (186m^2) asphaltic concrete apron will also be provided.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$6,940,000
Site work	LS	---	---	827,000
Building M7-961	LS	---	---	2,623,000
Building M7-1212	LS	---	---	1,872,000
Building M7-1061	LS	---	---	981,000

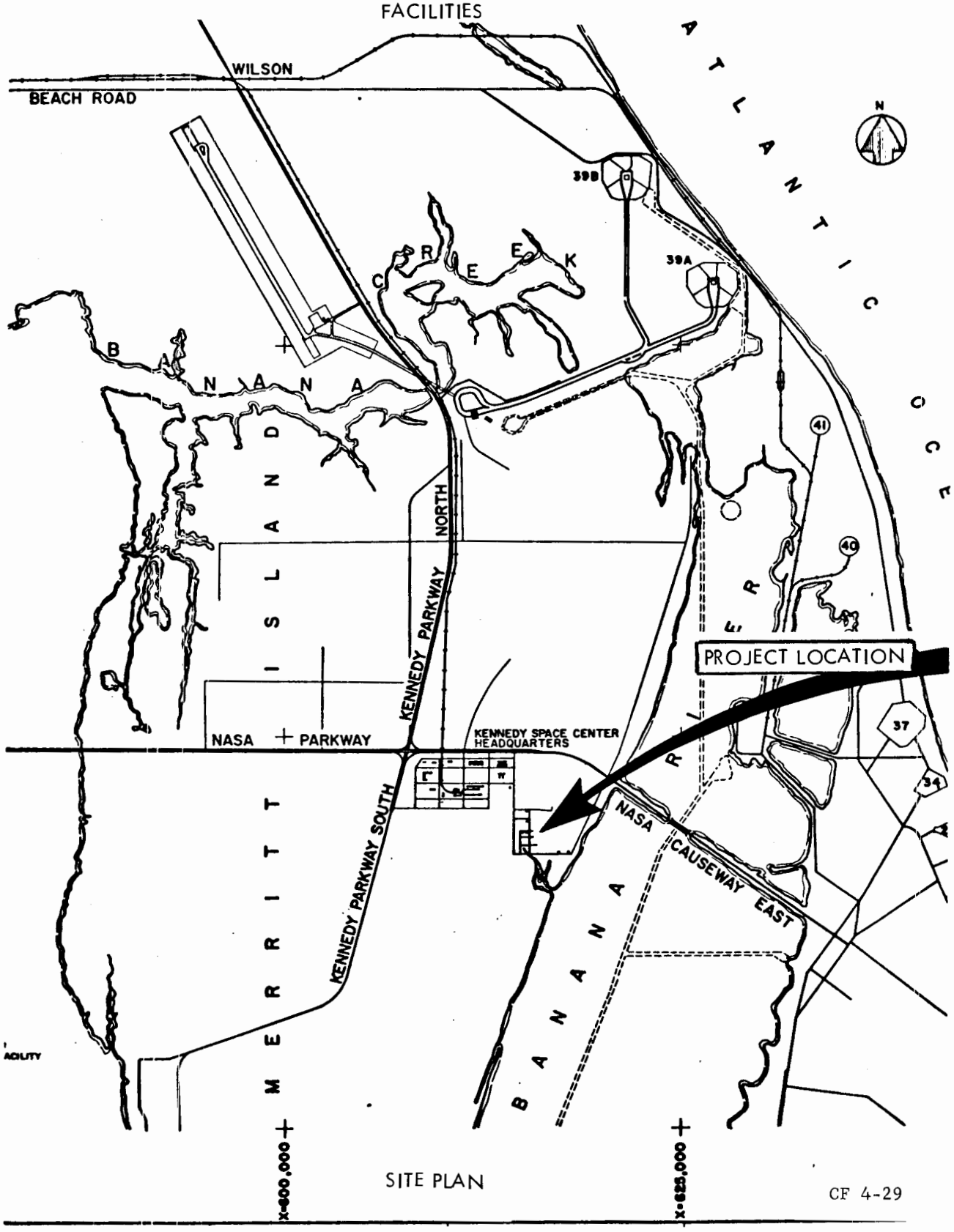
	Unit of Measure	Quantity	Unit Cost	Total Cost
Building M7-1410	LS	---	---	328,000
Building M7-1412	LS	---	---	309,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
		TOTAL		$6,940,000

For initial operations, it is anticipated that approximately $12-$13 million of R&D resources will be required to provide associated noncollateral equipment.

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.

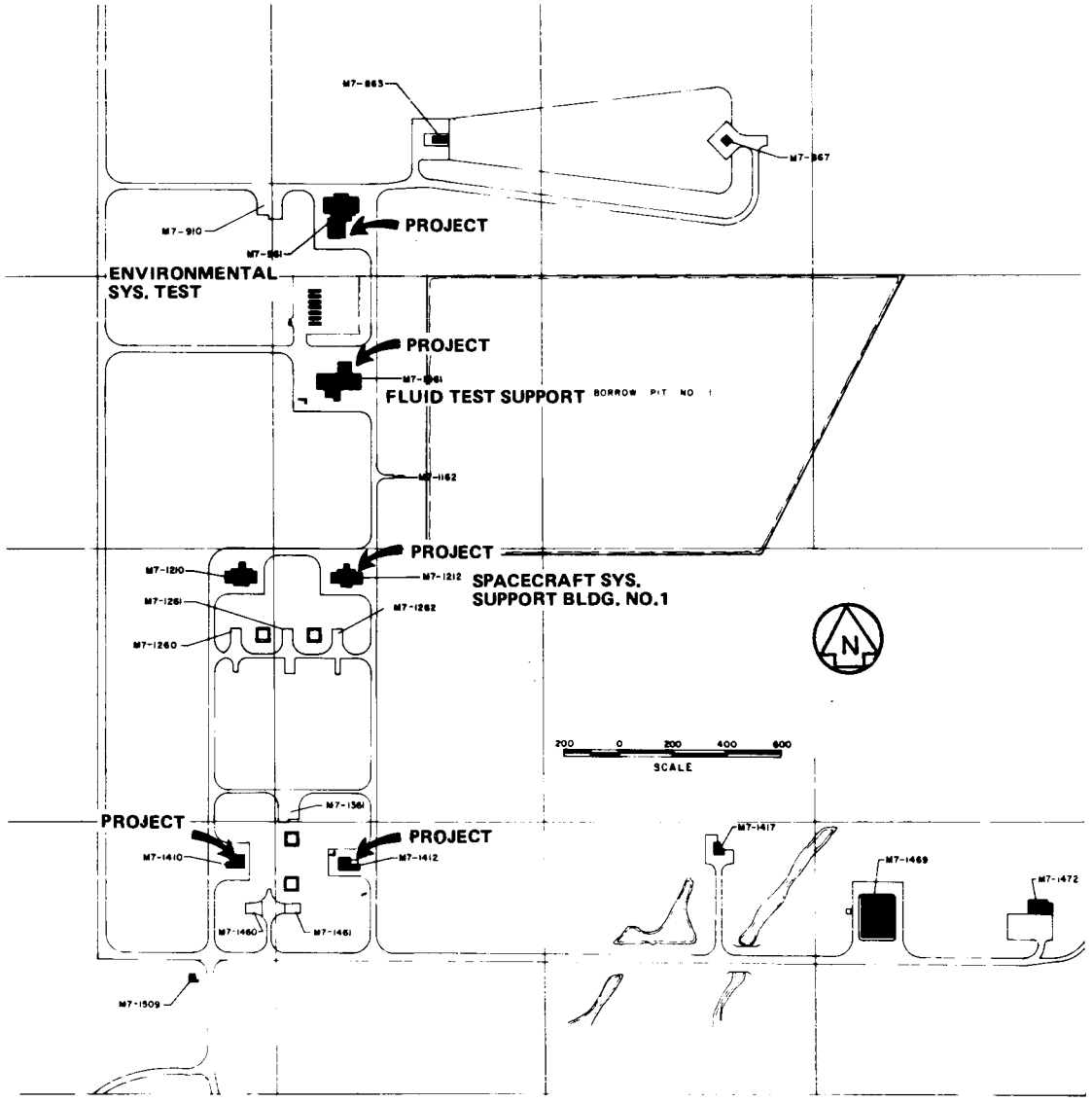
JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES
MODIFICATIONS FOR HYPERGOLIC CHECKOUT AND REFURBISHMENT FACILITIES



SITE PLAN

CF 4-29

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES
MODIFICATIONS FOR HYPERGOLIC CHECKOUT AND REFURBISHMENT FACILITIES



SITE PLAN

566-538 O - 75 - 5

PROJECT TITLE	Modifications for Launch Equipment Test Facilities
LOCATION	John F. Kennedy Space Center
	FY 1976 CoF ESTIMATE $1,960,000

COGNIZANT INSTALLATION: John F. Kennedy Space Center

LOCATION OF PROJECT: Merritt Island, Brevard County, Florida

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$115,000
Construction	2,366,000
Total FY 1975 and Prior Years	$2,481,000

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to provide a facility to develop, test and certify, through structural and operational simulation, reusable launch-critical ground support equipment. This equipment includes umbilical-type launch accessories, holddown arms, and swing arms that will be integrated into the launch facilities to provide operable capability to launch the space shuttle vehicle. The project includes modifications to portions of the Supply, Shipping, and Receiving Facility, Building M7-505, and the adjacent parking lot to accommodate simulators, test equipment, and supporting utilities.

PROJECT JUSTIFICATION:

Repeated launchings of the space shuttle vehicle require ground support equipment to be developed and evaluated by standards far exceeding those of previous space programs. This equipment includes the orbiter access swing arm, which provides the flight crew and mission specialists access to the orbiter's crew module; the orbiter tail umbilical masts; the external tank gaseous hydrogen vent umbilical; the orbiter's environmental control and life support system umbilical; and the solid rocket booster holddown

arms. This critical ground support equipment must be developed, tested, and certified before installation in the launch complex to insure launch integrity and reliability as well as reusability and maintainability throughout the span of the shuttle program. The equipment must operate flawlessly and precisely to insure a successful launch. To provide for developing, testing and certifying this equipment for its critical tasks, this facility capability is necessary.

These launch accessories are subjected to stringent forces and loads before and during the launch. To insure the ability of the equipment to withstand the static and dynamic forces involved, each swing arm and umbilical will be separately subjected to similar loadings in a test facility. At a predetermined exact point in the countdown or at the precise moment of launch, the various accessories must swing, retract and/or fall away from the shuttle vehicle for a successful lift-off. Consequently, these motions must be simulated for the individual items to certify that the equipment is capable of performing its exacting task. To carry out the structural testing and simulation tests involved, this proposed facility capability is necessary. Without this test facility, the vital development and certification testing cannot be performed prior to an actual launch lift-off.

NASA studies show that the most effective way to satisfy these requirements is to modify existing Building M7-505 at KSC and an adjacent paved area. This site offers earliest availability for low-cost construction modifications and is adequately sized to accommodate ground support and related test equipment. It will provide a central facility for engineering, test, and administrative personnel. Proximity to the shuttle launch complex simplifies continuing evaluation of reusable components.

To meet the approved schedule for the first manned orbital flight, work on this project must begin by the end of CY 1975 and be completed during the second quarter of CY 1977. Development, evaluation and acceptance testing of ground support equipment must be completed by early CY 1978 to allow integration into the launch complex for extensive, essential prelaunch activities there. Modifications as presently scheduled will allow sufficient time for testing ground support equipment, and FY 1976 funds are required to comply with the schedule.

PROJECT DESCRIPTION:

This project includes modification to the Supply, Shipping and Receiving Facility, Building M7-505, and the adjacent exterior area to provide capability for testing and certifying critical launch ground support equipment. An existing room, within Building M7-505, will be modified for a data acquisition and control center for acquiring test data and controlling the total test operations. The work includes extension of special electric service, air conditioning modifications, procurement and

installation of cabling and upgrading the existing lighting. The instrumentation and control equipment will be made available from existing inventory.

The exterior area modifications include construction of a pile foundation and erection of a 58-foot high (17.7 m) test tower from existing steel members at the Kennedy Space Center. Four existing hydraulic pumps will be relocated and installed at the base of the tower. These pumps will provide the necessary hydraulic power to operate the motion simulators. The work also includes construction of heavy foundations for the SRB holddown arms, random motion and lift-off simulators and a pad for the tail service masts. A suitable foundation and structure for attaching the orbiter emergency egress arm when it is in the retracted position during development and testing are included. Concrete trenches for instrumentation lines, gaseous nitrogen and hydraulic piping, and power cabling, as well as sufficient electrical modifications to provide power to all test articles, must be provided.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,960,000
Site preparation and utilities	LS	---	---	105,000
Building M7-505 modifications (Data acquisition and control)	LS	---	---	55,000
Erection of 58-foot tower and foundations	LS	---	---	469,000
Electrical, mechanical, and instrumentation systems	LS	---	---	1,088,000
Equipment pads and structures	LS	---	---	243,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
	TOTAL			$1,960,000

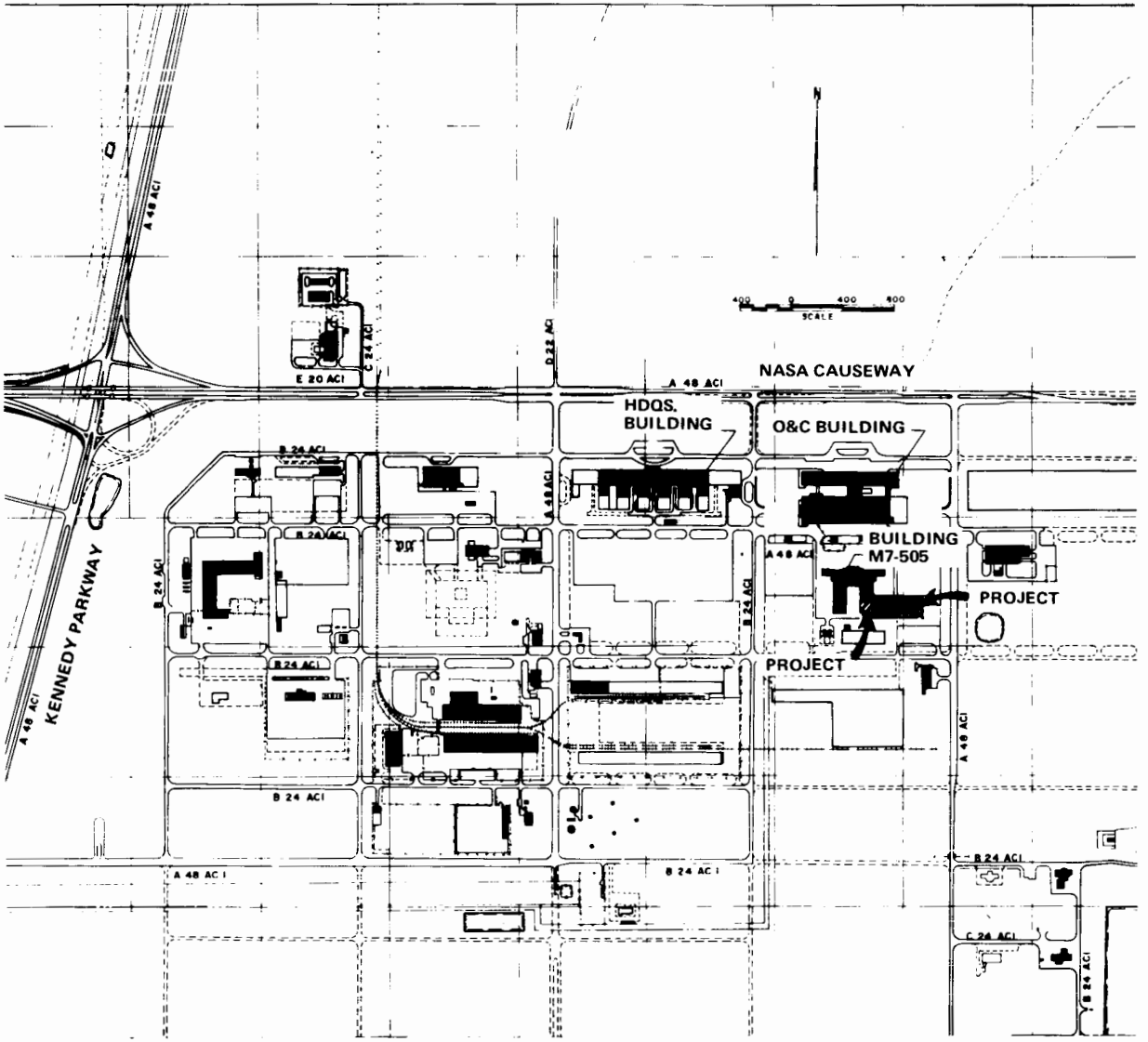
For initial operations, it is anticipated that approximately $550,000 of R&D resources will be required for refurbishment, modification and installation of existing simulators and other noncollateral equipment, and purchase and installation of such new equipment. Much of the hardware and test equipment can be adapted from existing Apollo program equipment available at NASA. Existing noncollateral equipment valued at approximately $1.9 million will be used in this launch facility.

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.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES

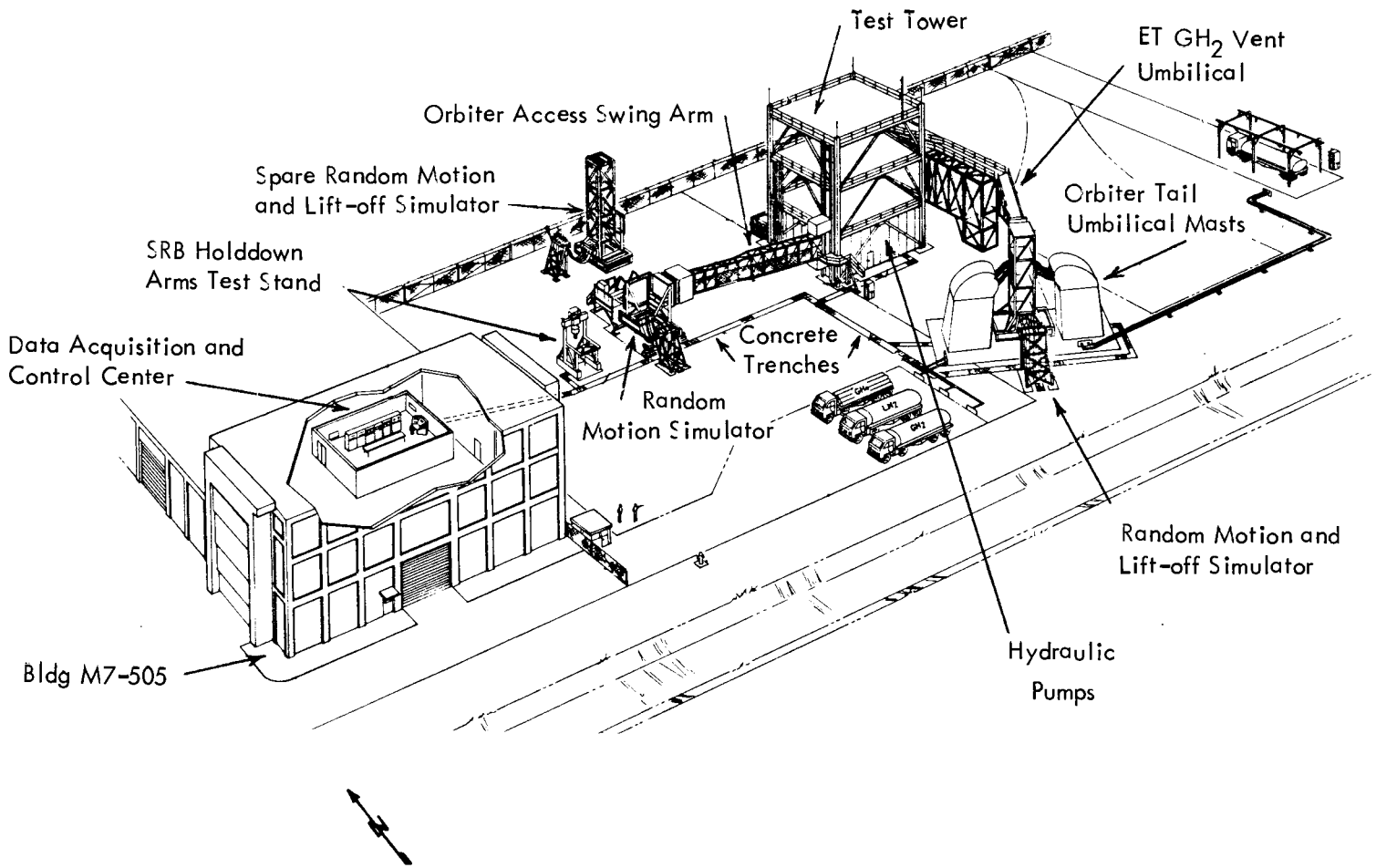
MODIFICATIONS FOR LAUNCH EQUIPMENT TEST FACILITIES



SITE PLAN

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1976 ESTIMATES

MODIFICATIONS FOR LAUNCH EQUIPMENT TEST FACILITIES

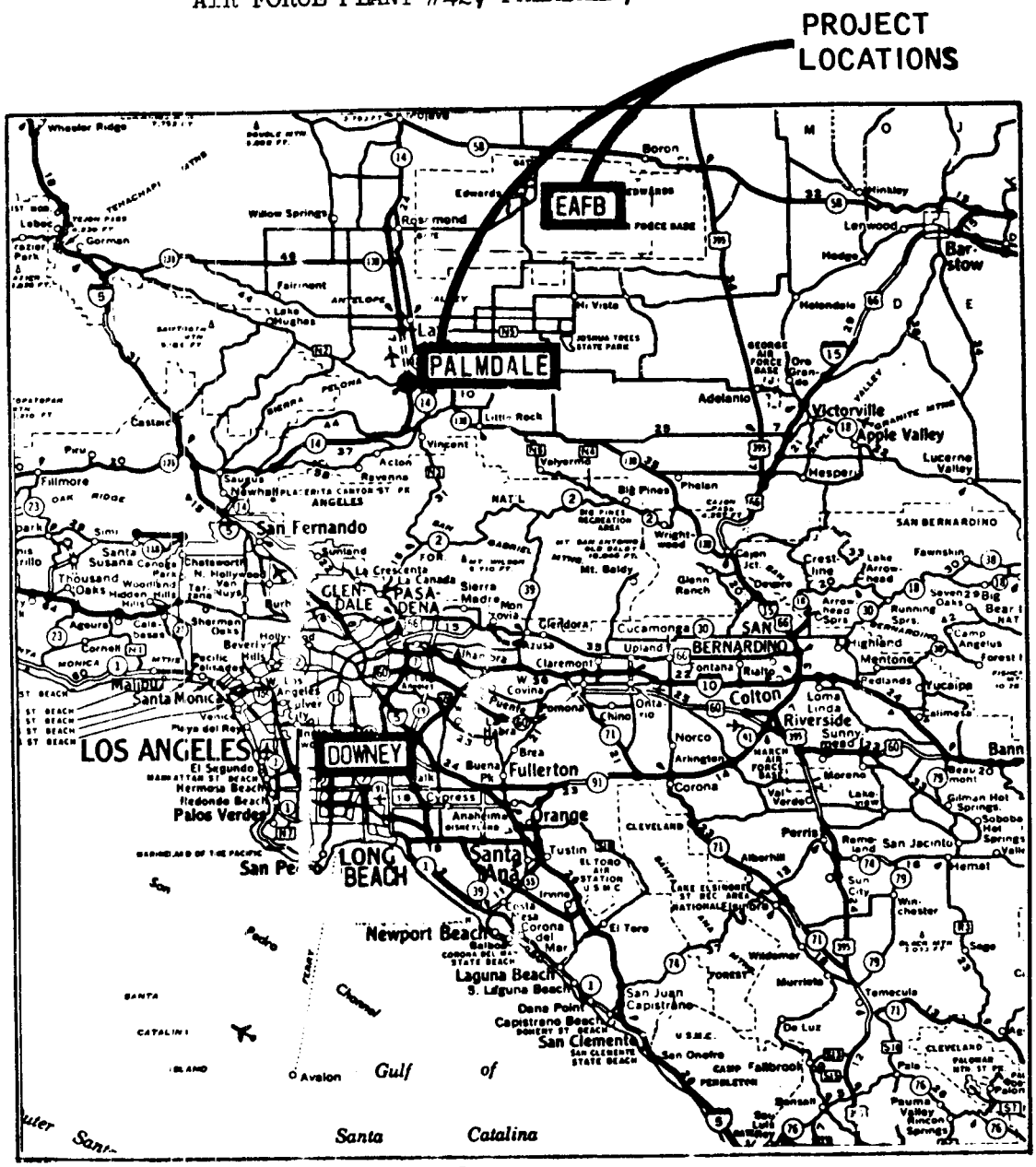


FISCAL YEAR 1976 ESTIMATES

CONSTRUCTION OF ORBITER APPROACH AND LANDING TEST FACILITIES

EDWARDS AFB, CALIFORNIA

AIR FORCE PLANT #42, PALMDALE, CALIFORNIA



VICINITY MAP

PROJECT TITLE	Construction of Orbiter Approach and Landing Test Facilities
LOCATION	Flight Research Center and Air Force Plant #42, Palmdale
	FY 1976 CoF ESTIMATE $1,680,000

COGNIZANT INSTALLATIONS: John F. Kennedy Space Center and Lyndon B. Johnson Space Center

LOCATION OF PROJECT: Edwards, Kern County, California
Palmdale, Los Angeles County, California

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$364,000
Construction	2,940,000
Total FY 1975 and Prior Years	$3,304,000

SUMMARY PURPOSE AND SCOPE:

This project is a continuation and extension of the construction work provided for in FY 1975 for the Orbiter Horizontal Flight Test Facilities. The FY 1975 project provided for an orbiter flight test hangar, shop and office space, and associated site work at Flight Research Center in connection with the use of Edwards Air Force Base for the orbiter approach and landing test (ALT) program. The FY 1976 project will provide shelters for the microwave scanning beam landing system (MSBLS) and hazardous material storage facilities at Flight Research Center (FRC); a new building to house the acceptance checkout equipment (ACE) at Palmdale; and a microwave transmission system between FRC and Palmdale to transmit data for the orbiter approach and landing test program.

PROJECT JUSTIFICATION:

The space shuttle orbiter as originally envisioned was to be equipped with removable air-breathing engines to provide the capability for aerodynamic flight. The decision in early CY 1974 to delete the air-breathing engines

also resulted in a revised concept for testing the orbiter in the airborne mode. The present flight test program calls for the orbiter to fly "piggyback" on top of a Boeing 747 aircraft and be dropped from an altitude of approximately 30,000-feet (9,144 m). The orbiter will then approach the runway and land in an unpowered mode. The test objectives include verifying the vehicle's stability and control, basic aerodynamics, and automatic landing system; and developing checkout and flight procedures. To provide the automatic landing capability for the orbiter, a microwave scanning beam landing system (MSBLS) will be required at Edwards Air Force Base. This is an extremely critical system since there is no "go-around" capability for the orbiter as there is with a conventional aircraft. This FY 1976 project will provide the necessary structures, utilities, and site work necessary to accommodate the MSBLS.

With the deletion of the air-breathing engines, the orbiter must now provide its own electric and hydraulic power to operate the crew cabin systems and the vehicle's control surfaces. The power requirement will be satisfied by installing the hydrazine-fueled auxiliary power unit (APU), hydrogen/oxygen fuel cells, and an ammonia coolant system. These are hazardous materials requiring special handling and imposing the need for extra safety measures. FY 1975 resources provided for a maintenance hangar that will be equipped to process an orbiter containing these hazardous fuels. This FY 1976 project provides the necessary exterior facilities required to safely store and handle the hazardous fluids and associated ground support equipment.

The orbiter will undergo extensive checkout activities to prepare it for its first approach and landing test flight. These activities include checking each subsystem - e.g., guidance and navigation, communication, power, hydraulic, environmental control - to insure that they are flightworthy. A computerized checkout and control capability is required to monitor, evaluate, and control these preflight operations. Similar checkout operations will also be implemented after the orbiter lands and during the safing and post-flight testing that follow. It has been determined that these requirements can best be met by modifying and using ACE previously used for Apollo. This FY 1976 project provides for a new building, at the southeast corner of Building 294 at Palmdale, to house and accommodate this modified ACE. Palmdale was selected as the best location because the experienced and expert manpower required to operate the ACE will be available there to checkout the orbiter during final assembly. In addition, the ACE to be used in the final assembly operations could be readily switched to support the approach and landing test should a failure occur in any of this ALT-dedicated ACE equipment. The ACE equipment will be connected to Flight Research Center via a microwave transmission system.

To achieve the first approach and landing test as presently approved, these facilities must be operable in early CY 1977 to allow sufficient time for checkout of the orbiter prior to the first flight test. Therefore, construction must begin in late CY 1975, making FY 1976 programming necessary.

PROJECT DESCRIPTION:

This project provides for constructing four buildings to house the MSBLS at Edwards Air Force Base, exterior facilities to store hazardous materials at FRC, a new building to house acceptance checkout equipment at Palmdale, and a microwave transmission system connecting FRC to Palmdale.

The MSBLS, which provides guidance and control for automatic landing of the orbiter, will be housed in four air conditioned buildings. Two of the buildings will be constructed on each end of the main runway at Edwards AFB; one of the two on each end will be for the azimuth system, the other for the elevation system. Each building will be approximately 20 feet long by 16 feet wide by 10 feet high (6.1-m x 4.9-m x 3.0-m), with one side of the building constructed of material compatible with microwave frequencies. An uninterruptible power supply system essential for the operation of equipment and associated utilities will be provided at each site.

The hazardous storage facilities will be located in a remote area approximately 1,500 feet (457.2-m) to the west of the proposed hangar location. The site will consist of two 120-foot by 200-foot (36.6-m x 67.1-m) concrete slabs for handling and storing the hazardous fuels and the ground support equipment. Catch basins, sump pumps, fire protection systems, explosion-proof electrical systems for lights and power receptacles, and security fencing will also be provided.

The new building to house the acceptance checkout equipment at Palmdale will be located immediately adjacent to existing Building 294, at Air Force Plant #42. The site was selected to shorten utility and communication lines between this facility and Building 294. The building will be a masonry structure of approximately 4,000 square feet (371.6 m^2), with raised flooring, a suspended ceiling, and a fire detection and protection system. A 100-ton air conditioning system, with associated cooling tower and two 50-ton chillers, to handle the high heat loads from the computer equipment will be installed. A 1,000-KVA power substation will also be installed. A platform from Building 294 to the roof of the new ACE building will be constructed to provide access to the air conditioning equipment. A microwave transmission system will also be provided to transmit data between this ACE building at Palmdale and FRC.

PROJECT COST ESTIMATE:

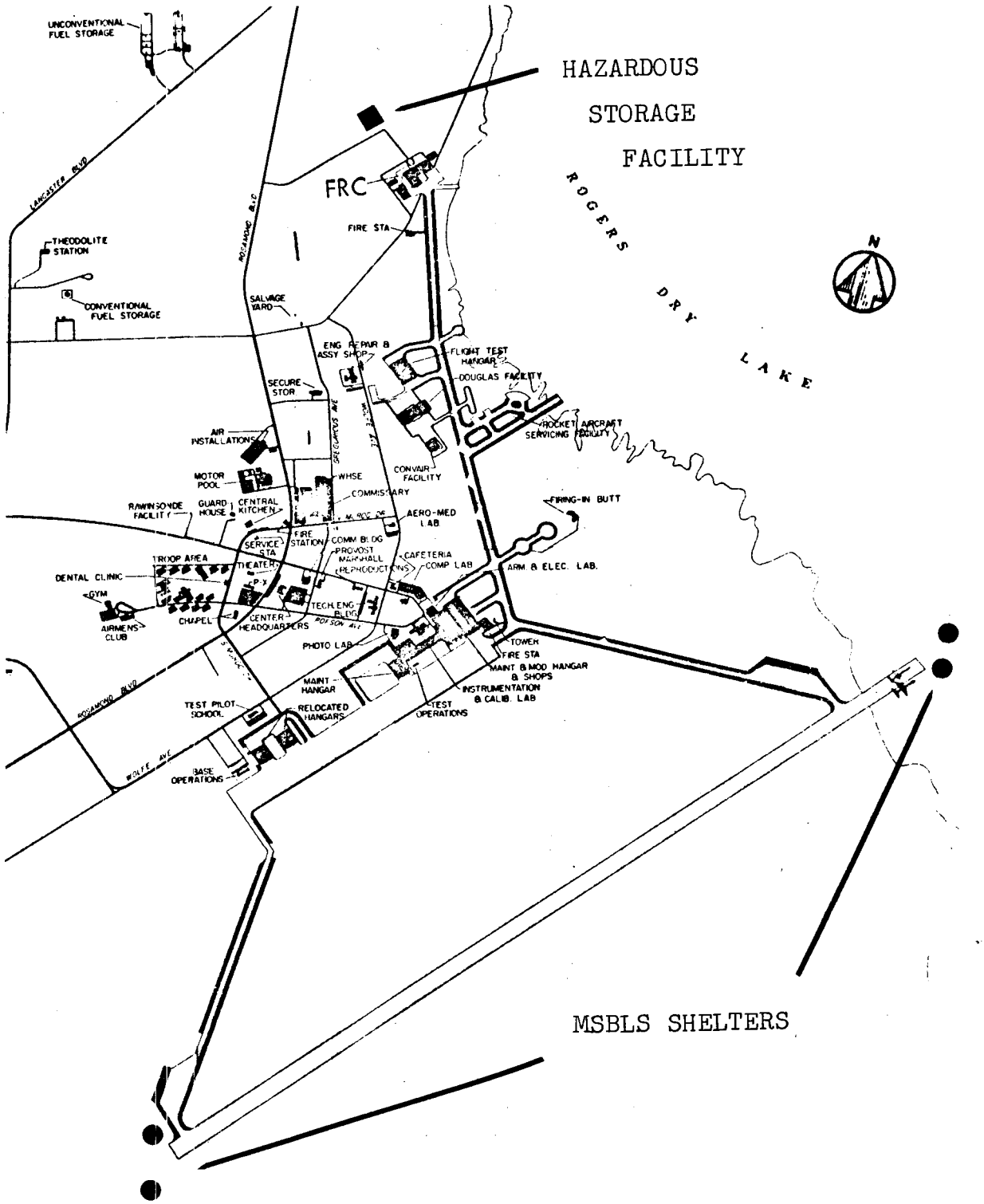
	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,680,000
MSBLS (FRC)				300,000
Generators and shelters	Each	8	12,000	(96,000)
MSBLS structures	Each	4	51,000	(204,000)
Hazardous storage facilities (FRC)	Each	2	160,000	320,000
ACE Building (Palmdale)	---	---	---	820,000
Site preparation and foundations	LS	---	---	(20,000)
Architectural and structural	SF	4,000	50.00	(200,000)
Special air conditioning systems	LS	---	---	(265,000)
Fire protection system	LS	---	---	(80,000)
1,000-KVA substation and special electrical systems	LS	---	---	(255,000)
Microwave transmission systems	LS	---	---	240,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
	TOTAL			$1,680,000

For initial operations, it is anticipated that approximately $2 million of R&D resources will be required to provide the MSBLS and communication equipment. Existing acceptance checkout equipment valued at $6-7 million will be installed in the ACE Building at Palmdale.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

For the approach and landing test program, there are no currently foreseen future CoF funding requirements necessary to complete this project. However, additional modifications may be made to the approach and landing test hangar in a future year to meet payload removal requirements, should this site be used as a secondary landing site.

FISCAL YEAR 1976 ESTIMATES
CONSTRUCTION OF ORBITER APPROACH AND LANDING TEST FACILITIES
EDWARDS AIR FORCE AND FLIGHT RESEARCH CENTER



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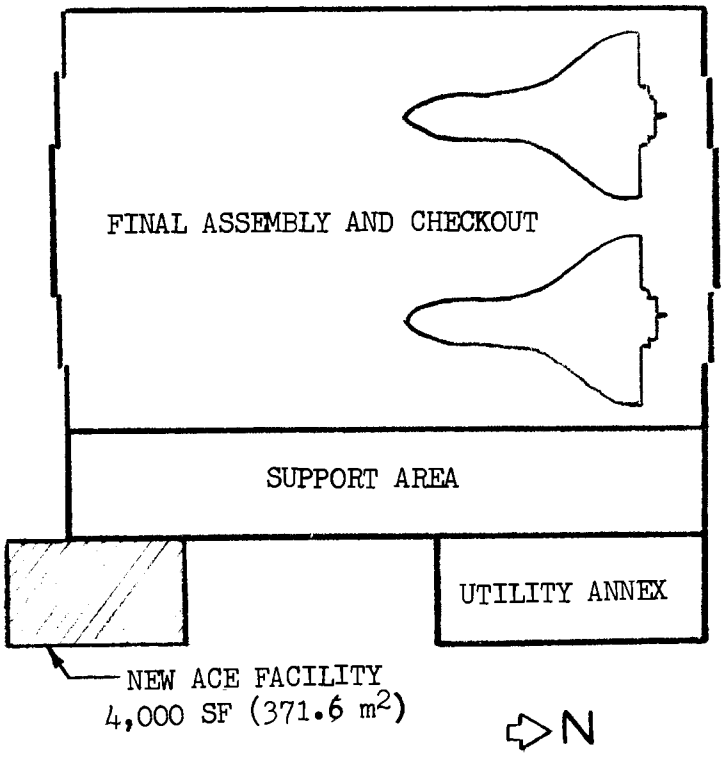
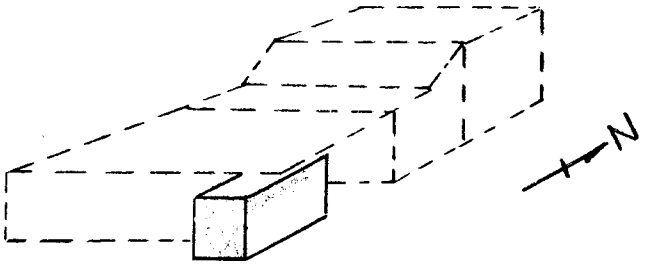
FISCAL YEAR 1976 ESTIMATES

CONSTRUCTION OF ORBITER APPROACH AND LANDING TEST FACILITIES

AIR FORCE PLANT 42, PALMDALE



BUILDING 294 FLOOR PLAN



PERSPECTIVE

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE	Construction of Shuttle/Carrier Aircraft Mating Facilities
LOCATION	Various Locations
	FY 1976 CoF ESTIMATE $3,890,000

COGNIZANT INSTALLATION: John F. Kennedy Space Center and Lyndon B. Johnson Space Center

LOCATION OF PROJECT: Palmdale, Los Angeles County, California; Edwards, Kern County, California

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$483,000
Construction	4,200,000
Total FY 1975 and Prior Years	$4,683,000

SUMMARY PURPOSE AND SCOPE:

This project is a continuation and extension of the construction work for shuttle/carrier aircraft mating facilities at Flight Research Center (FRC) and Palmdale, California, which was provided for with prior years' resources. The earlier project provided for utilities, a towway, and orbiter safing facilities at FRC as well as for the long-lead procurement of steel, hoists, and other necessary materials for the mating facilities at FRC and Palmdale. This FY 1976 project provides for completing shuttle/carrier aircraft mating facilities at FRC and Palmdale.

PROJECT JUSTIFICATION:

The space shuttle orbiter as originally envisioned was to be equipped with removable air-breathing engines. The decision in early CY 1974 to delete the engines resulted in different approaches to transporting and aerodynamic testing of the orbiter. It has now been decided to transport and flight test the orbiter in a "piggyback" arrangement on top of a Boeing 747 aircraft, thus requiring orbiter mating/demating facilities at FRC and Palmdale.

Prior to vertical launch of the space shuttle, the orbiter must undergo atmospheric flight testing to verify its performance during subsonic approach and landing tests. The test program will include verification of orbiter airborne flight systems as well as those of the 747 aircraft performance while carrying the orbiter. To perform this testing, the orbiter will be carried aloft on the back of the 747 aircraft and air dropped from approximately 30,000 feet (9,144-m) in order to verify stability and control, basic aerodynamics, and automatic landing capability; and to develop mating/demating, maintenance, and checkout procedures for the orbiter. Mating/demating facilities must be available at Palmdale to mate the first flight orbiter to the 747 aircraft and must be available at FRC to mate and demate the orbiter during the approach and landing flight test program.

To meet the first approach and landing flight milestone now scheduled for the third quarter of CY 1977, a first captive flight test at FRC must be achieved in the second quarter of CY 1977. This requires that the mating facilities at FRC and Palmdale must be operable in early calendar year 1977 to achieve program objectives. Consequently, prior years resources will be used to initiate the long-lead facility items and FY 1976 resources will be required to complete the facilities.

PROJECT DESCRIPTION:

This project includes continuation and extension of work to be started with prior years' funds to provide operable shuttle/carrier aircraft mating facilities at FRC and Palmdale. The FRC program includes fabricating and erecting the steel structure and installing the hoist mechanism, movable platforms, elevator, and various piping systems to support the safing, deservicing, mating and demating operations. Palmdale work will include site preparation, and supplying utilities and foundation work to anchor the structure to an existing concrete base. Erecting the steel and installing hoist mechanisms and movable platforms must also be accomplished at Palmdale.

The mating/demating facilities will be structural steel, gantry-type, cantilevered structures approximately 100 feet (30.5-m) high, with a hoisting device capable of lifting approximately 225,000 pounds (102,058 kg). The mating facilities will be designed in such a way as to allow disassembly and relocation by air of these structures for use at the launch and landing, final assembly, test sites, or contingency landing sites as necessary to meet shuttle program requirements. Provisions will also be made for accommodation of external tank mating capability to the 747 aircraft to permit transportation of the tanks from the assembly to the launch sites. The additional facilities to achieve such an external tank transportation capability, should that be later required, could then be added in a future CoF program.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$3,890,000
FRC mating facility	LS	---	---	2,060,000
Site preparation, utilities, and foundations at Palmdale	LS	---	---	200,000
Palmdale mating facility	LS	---	---	1,630,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
	TOTAL			$3,890,000

For initial operations, it is estimated that approximately $1.5 million of R&D resources will be required for ground and test support equipment to support the safing, mating and demating operations of the orbiter and the carrier aircraft.

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 work at FRC and Palmdale. Shuttle/carrier aircraft mating facilities will, however, be required at the launch site. These facilities, estimated at $2.5-$3.0 million, will be requested in a future CoF program. In addition, facility modifications estimated at $200,000 per mating facility will be needed if external tank air transportation capability is later required.

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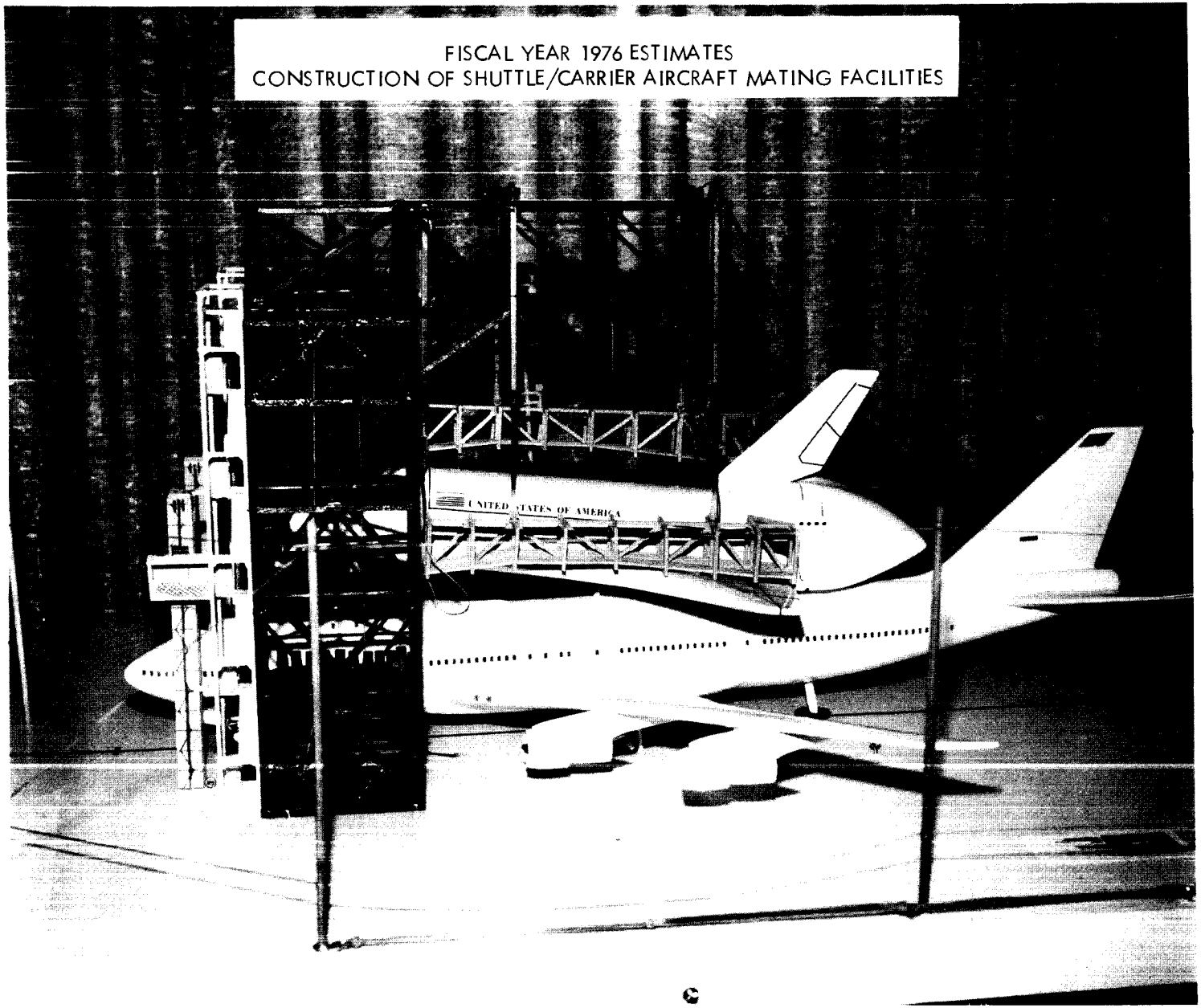
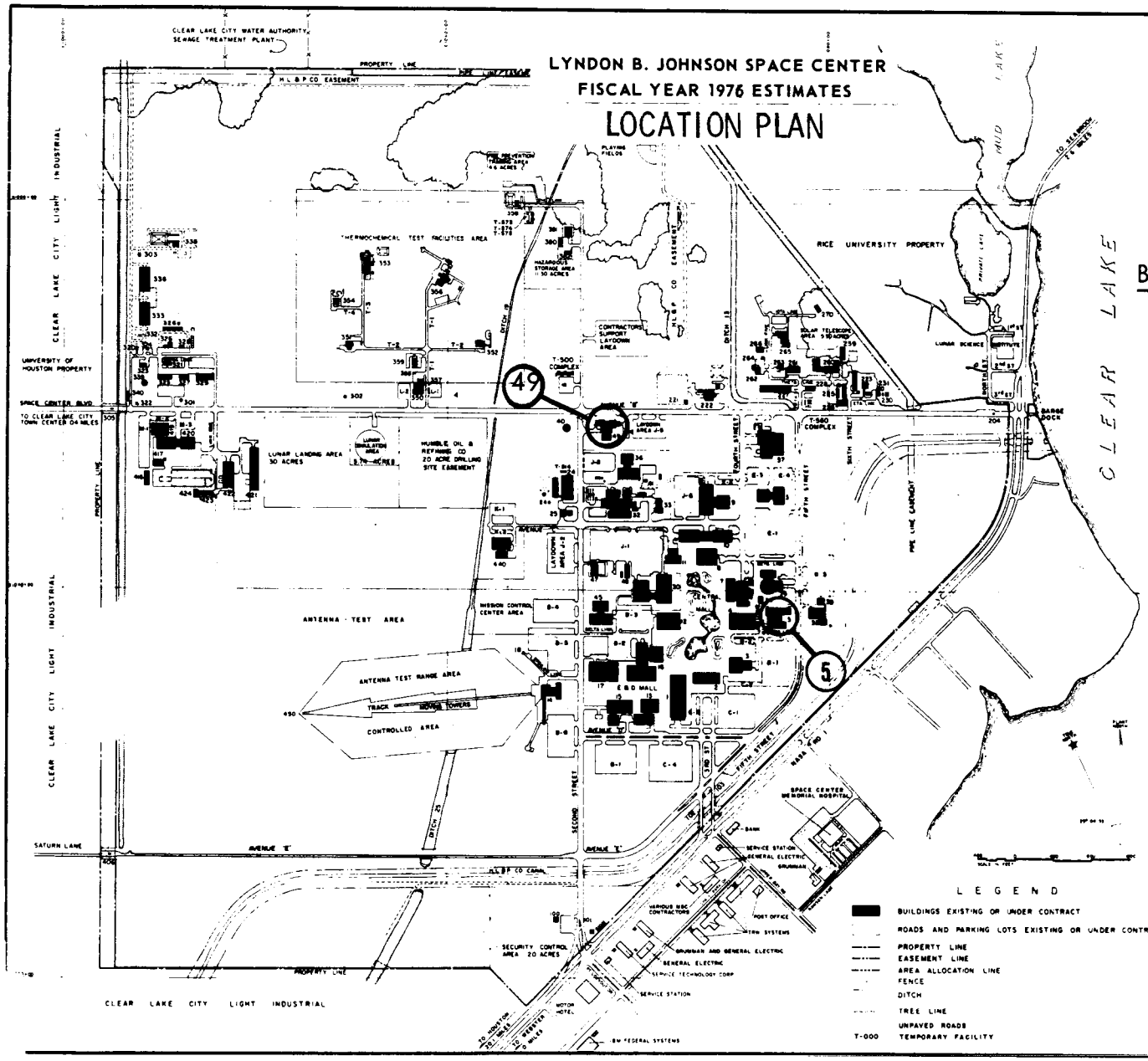

FISCAL YEAR 1976 ESTIMATES
CONSTRUCTION OF SHUTTLE/CARRIER AIRCRAFT MATING FACILITIES
UNITED STATES OF AMERICA



SPACE SHUTTLE FACILITIES

○ PROPOSED FY 1976

BLDG.	PROJECT
5	MODIFICATIONS FOR CREW TRAINING FACILITIES
49	MODIFICATION OF THE VIBRATION AND ACOUSTIC TEST FACILITY

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE	Modifications for Crew Training Facilities
LOCATION	Lyndon B. Johnson Space Center, Texas
	FY 1976 CoF ESTIMATE $830,000

COGNIZANT INSTALLATION: Lyndon B. Johnson Space Center

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$99,000
Construction	3,030,000
Total FY 1975 and Prior Years	$3,129,000

SUMMARY PURPOSE AND SCOPE:

This project is a continuation and extension of the FY 1975 increment, which provided for modifications of existing facilities at the Johnson Space Center to support ground and flight crew training requirements. This FY 1976 increment provides for modification to the Mission Simulation and Training Facility, Building 5, to accommodate the shuttle mission simulator (SMS) and associated visual scene generation system. This work is essential to support ground and flight crew training for shuttle operations.

PROJECT JUSTIFICATION:

Crew training in ground facilities, using unique simulation equipment, has been a key factor in the success of manned space flight programs to date. Existing training facilities at the Johnson Space Center have been specifically constructed and successfully used to support the training activities for Gemini, Apollo and Skylab. To meet the training requirement for shuttle operations, modifications to this facility will be required.

FY 1975 CoF resources provided for the modifications to the Mission Simulation and Training Facility required to accommodate the orbiter aero-flight simulator (OAS), previously designated the horizontal flight test

simulator, and shuttle mission simulator (SMS) computer. The OAS is initially required to provide the crew training necessary to support the orbiter approach and landing testing in the atmosphere. The SMS computer is necessary to initiate software development for simulated flight missions. This FY 1976 project provides those modifications to the same facility now required to accommodate the SMS, which is the principal flight crew ground trainer for the space shuttle program.

The SMS will operate in conjunction with the Mission Control Center to provide training for ground controllers and flight crews in the operation of all orbiter systems in the various mission phases. It will simulate the shuttle flight in the launch, ascent and abort modes as well as during all orbital and recovery maneuvers. Accurate and animated visual scenes for the various mission phases will also be simulated. In addition, the crew and payload specialists will train in operating the payload manipulator used for capturing or releasing payloads during the mission. This project provides for facility modifications necessary to support these training activities.

Current program milestones require that components of the SMS be delivered in the first quarter of CY 1977 for installation into Building 5. Therefore, the facility modifications must be complete by that time to meet these needs. This requires FY 1976 programming.

PROJECT DESCRIPTION:

This project provides modifications to the Mission Simulation and Training Facility, Building 5, to house the shuttle mission simulator and its associated high and low altitude image generation systems.

In Building 5, modifications to approximately 15,200 square feet (1,412m^2) of space will be required. This work includes strengthening the floors for equipment foundations, extensive modifications of electrical power distribution system, procurement and installation of a 3,000-KVA substation with three transformers and associated switchgear, provision of approximately 4,000 square feet (372m^2) of computer flooring, modification to the air conditioning system, procurement and installation of sprinkler system, provision for special lighting for the visual generation equipment, removal of equipment and structures, and changes to interior walls.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$830,000
Simulator area modifications	LS	---	---	180,000
Fire detection and suppression systems	LS	---	---	100,000
Electrical and mechanical mods	LS	---	---	550,000
Equipment	---	---	---	---
Fallout Shelter (Not Feasible)	---	---	---	---
			TOTAL	$830,000

The shuttle mission simulator and associated visual scene generation systems will be developed and procured from the R&D appropriation. Existing simulation equipment, valued at about $5.0 million, will also be used in conjunction with these crew training facilities.

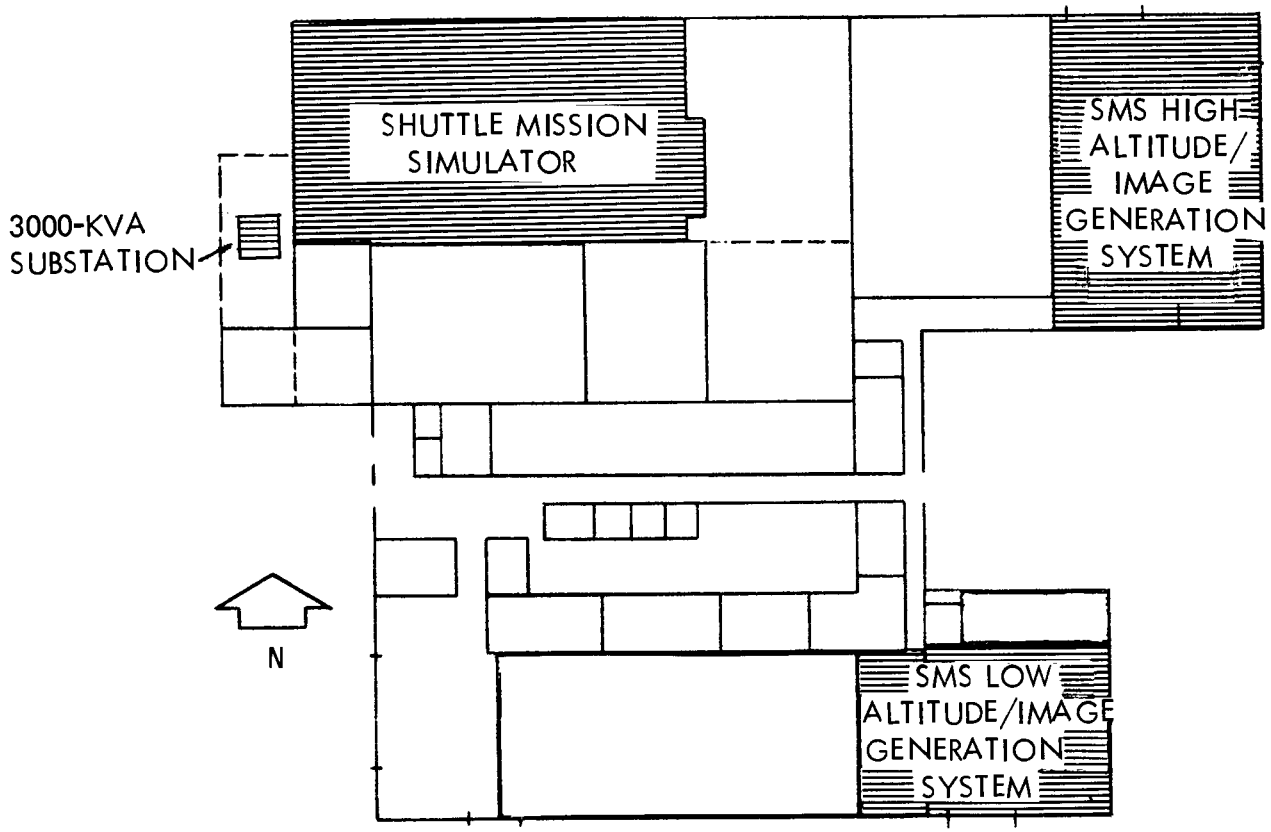
FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

It is estimated that approximately $300,000-$400,000 will be required in future year programs to accommodate shuttle simulators and associated equipment in support of crew training activities.

LYNDON B. JOHNSON SPACE CENTER

FISCAL YEAR 1976 ESTIMATES

MODIFICATIONS FOR CREW TRAINING FACILITIES



BUILDING 5 FIRST FLOOR PLAN

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE	Modification of the Vibration and Acoustic Test Facility
LOCATION	Lyndon B. Johnson Space Center
	FY 1976 CoF ESTIMATE $2,410,000

COGNIZANT INSTALLATION: Lyndon B. Johnson Space Center

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$437,000
Construction	6,792,000
Total FY 1975 and Prior Years	$7,229,000

SUMMARY PURPOSE AND SCOPE:

This project provides for increased acoustic generation capability within the existing reverberant chamber of the Vibration and Acoustic Test Facility (VATF), Building 49, at Johnson Space Center. This capability is necessary to support the vibro-acoustic test requirement for the orbiter aft fuselage.

PROJECT JUSTIFICATION:

The FY 1973 and FY 1975 Construction of Facilities program provided for modifying the VATF in support of the shuttle program. The work included a sonic fatigue test cell addition to carry out acoustic fatigue testing on full-scale sections of the orbiter with the thermal protection system (TPS) and rehabilitation of existing amplifiers. In addition, the FY 1973 project provided for modifying the existing acoustic reverberant chamber to permit test hardware to be subjected to a noise level of 160 decibels (dB), the approximate sound pressure level then estimated as being necessary to meet program requirements. Based on the latest best estimates of support contractors and NASA, this 160 dB level will satisfy the test requirements for all segments of the orbiter except the aft fuselage. It is now estimated that this aft section will encounter noise levels of 164 to 165 dB at lift-off. This project will provide the necessary additional noise generation capability to simulate the maximum level of flight acoustic environment now anticipated for the aft fuselage.

The orbiter will be subjected to severe noise impingement during lift-off and ascent which will significantly affect the structural design of the overall vehicle. To provide for the presently estimated 164 dB sound pressure level that the aft section will encounter at lift-off, the existing reverberant chamber must be modified so as to be able to generate a noise level of approximately 169 dB. The difference (5 dB) is required to offset the additional acoustic losses from sound absorption by the test article itself as well as by TPS insulation material installed on the test article.

The current vibro-acoustic test schedule requires that the orbiter aft section test article be delivered during the first quarter of CY 1978. The acoustic chamber must be operationally ready at that time to meet test requirements. To achieve that milestone, the modifications requested in this FY 1976 project must be initiated in early CY 1976, making FY 1976 programming necessary.

PROJECT DESCRIPTION:

This project provides for modifying the acoustic reverberant chamber of the VATF, Building 49, to provide an increased sound pressure level within the chamber of approximately 169 dB. The work includes procurement and installation inside the chamber of 24 acoustic horns and 20 noise generators, replacement of the interior chamber walls with stronger walls below the 30-foot level (9.1-m), and installation of a compressed gaseous nitrogen (GN_2) system. The new GN_2 system, necessary to operate the new noise generators, will require installing a new vaporizer, extending necessary steam lines to support the vaporizer, and providing a GN_2 distribution and recirculation system. An existing liquid nitrogen storage system will be used.

The project also provides for erecting sound retarding rooms around noisy test equipment within the existing vibration laboratory in order to meet noise criteria especially in relation to exposure of test personnel.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$1,840,000
Nitrogen supply and recirculation system	LS	---	---	1,118,000
Reverberant chamber structural modifications	LS	---	---	317,000
Electrical modifications	LS	---	---	95,000
Mechanical modifications	LS	---	---	260,000

	Unit of Measure	Quantity	Unit Cost	Total Cost
Vibration laboratory modifications	LS	---	---	$50,000
Equipment				$570,000
Noise generators	EA	20	$20,500	410,000
Acoustic horns	EA	24	6,675	160,000
Fallout Shelter (Not Feasible)	---	---	---	---
	TOTAL			$2,410,000

Noncollateral type support fixtures will be procured and installed from the R&D appropriation at an estimated cost of some $300,000. This equipment is closely associated with the test articles and is required to make the facility operational.

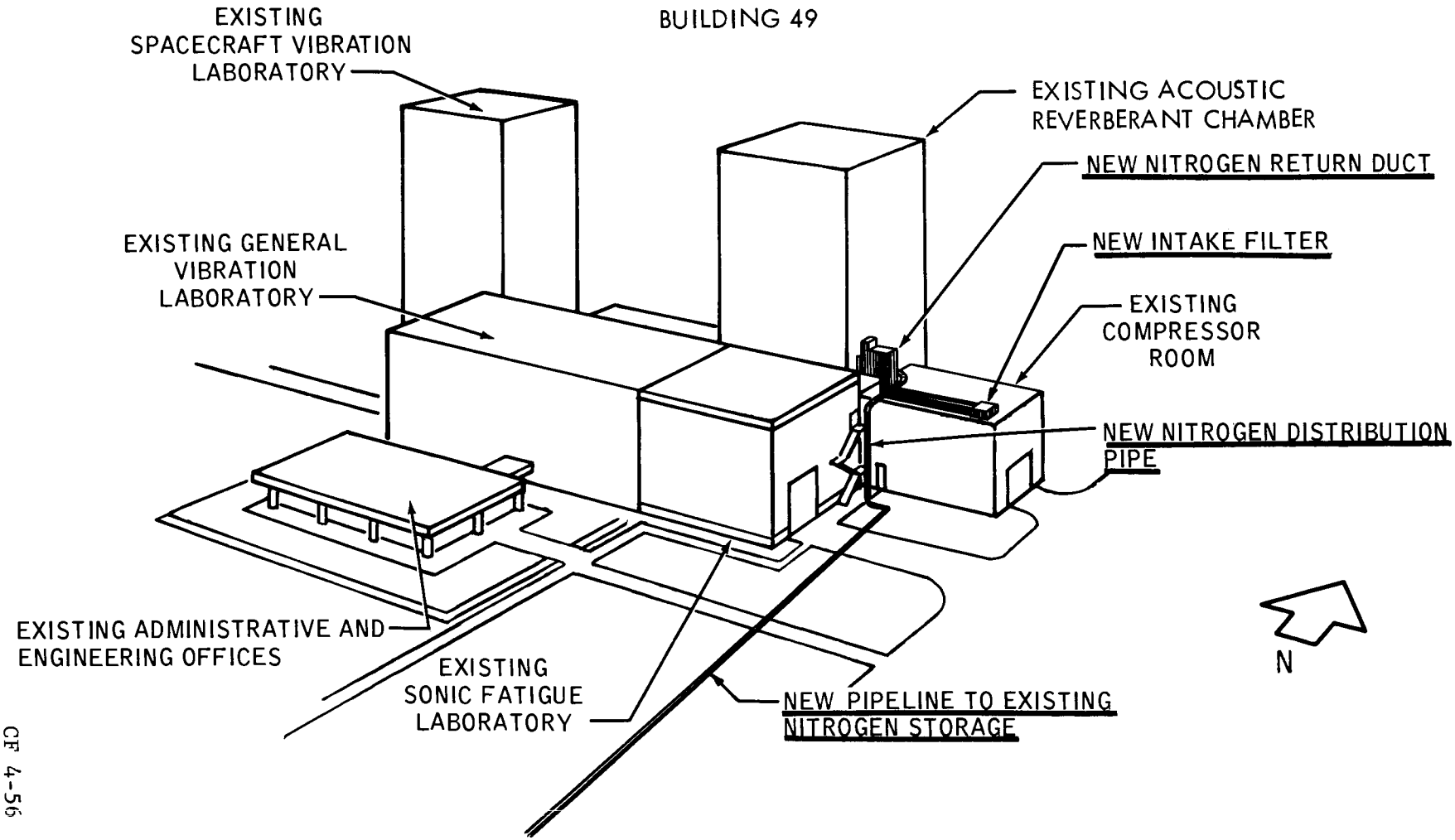
FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

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

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1976 ESTIMATES

MODIFICATION OF THE VIBRATION AND ACOUSTIC TEST FACILITY

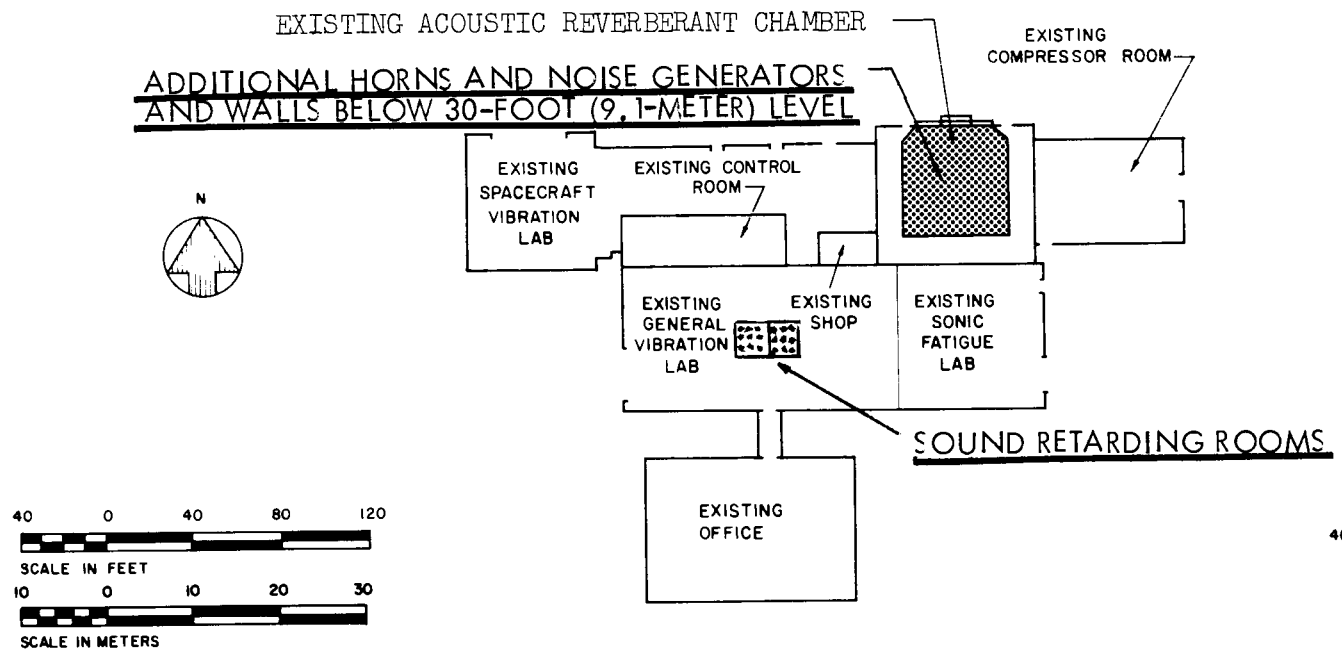
BUILDING 49



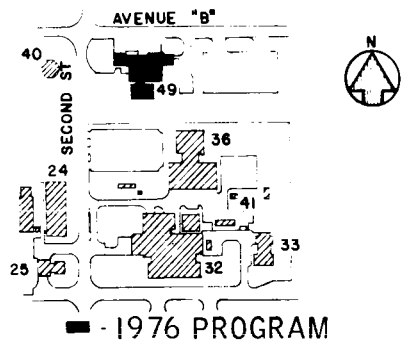
LYNDON B. JOHNSON SPACE CENTER

FISCAL YEAR 1976 ESTIMATES

MODIFICATION OF THE VIBRATION AND ACOUSTIC TEST FACILITY BUILDING 49



FLOOR PLAN

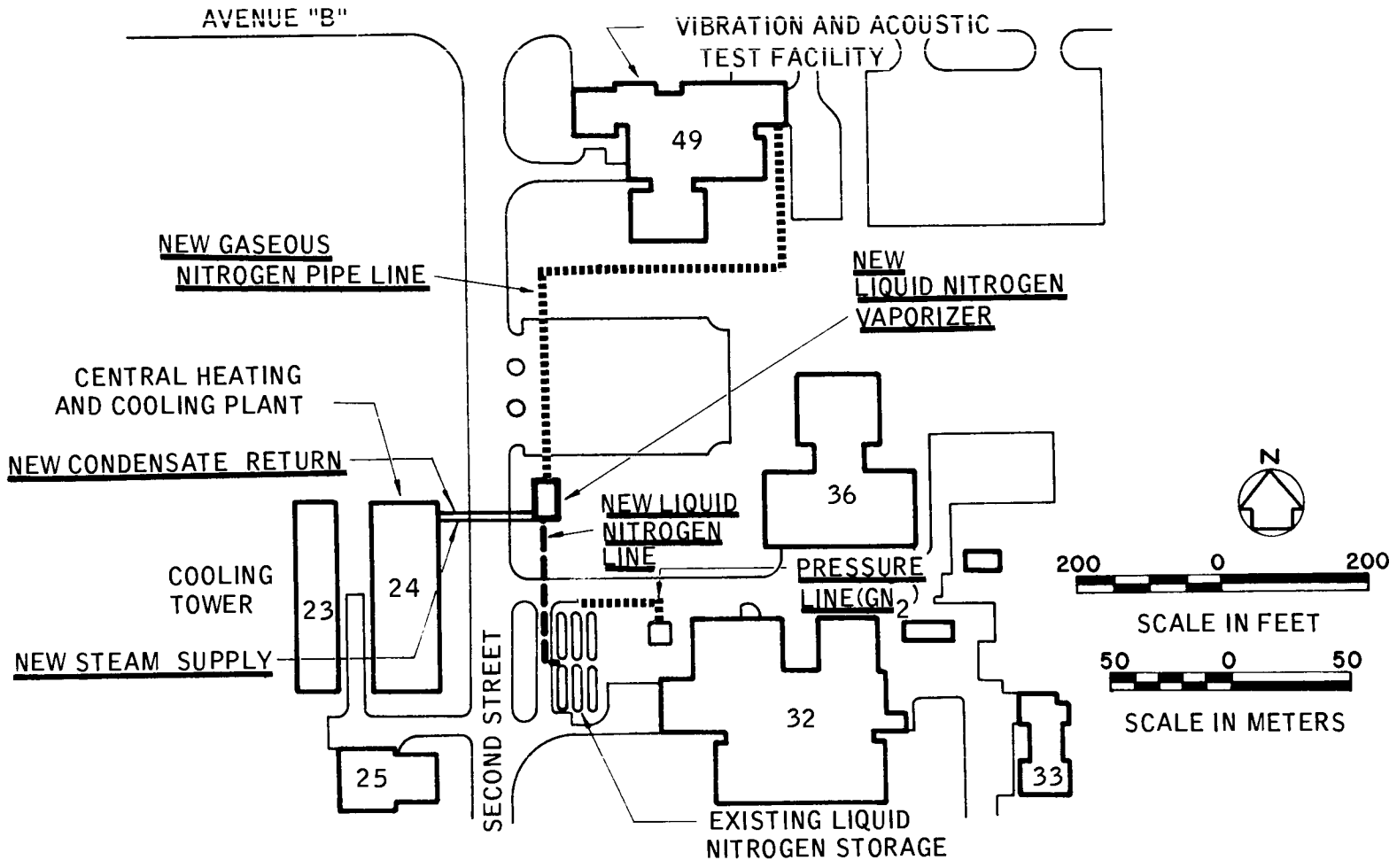


PARTIAL SITE PLAN

LYNDON B. JOHNSON SPACE CENTER

FISCAL YEAR 1976 ESTIMATES

MODIFICATION OF THE VIBRATION AND ACOUSTIC TEST FACILITY
BUILDING 49



COMPRESSED GAS SUPPLY SYSTEM

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE	Modifications for Solid Rocket Booster Component Manufacturing and Assembly Facilities
LOCATION	Various Locations
	FY 1976 CoF ESTIMATE $3,000,000

COGNIZANT INSTALLATION: Marshall Space Flight Center

LOCATION OF PROJECT: To be designated

COGNIZANT PROGRAM OFFICE: Office of Manned Space Flight

FY 1975 AND PRIOR YEARS CoF FUNDING:

Planning and Design	$240,000
Construction	---
Total FY 1975 and Prior Years	$240,000

SUMMARY PURPOSE AND SCOPE:

This project provides for modifying existing facilities, at sites to be determined, for the manufacture and assembly of solid rocket booster (SRB) components. Facility requirements depend in part on the actual SRB contractor to be selected in the second quarter of CY 1975. Although a specific contractor or plant has not yet been selected for this work, facility modifications and their estimated cost have been determined on the basis of an engineering analysis related to this hardware, using Michoud Assembly Facility, New Orleans, as a "baseline."

PROJECT JUSTIFICATION:

The SRB consists of the two solid rocket motors and major structural components. The solid rocket motor contractor, Thiokol, has been selected; motor manufacture and assembly will be carried out in the contractor's plant near Salt Lake City, Utah. Shuttle program requirements include selecting, before mid-CY 1975, SRB contractor(s) to manufacture and assemble the major SRB components - the aft and forward skirts, the nose cone, the external tank/SRB attachment structures, and various brackets.

Major components range from 9 to 20 feet (2.7 to 6.1 m) in length and from 12 to 13 feet (3.7 to 4.0 m) in diameter. To produce these components modifications to existing manufacturing facilities are required. This project provides for the necessary facility modifications to carry out the work involved during the design, development, testing and evaluation (DDT&E) phase of the program.

Current program plans are based on the first manned orbital flight occurring in the second quarter of CY 1979. To achieve this major milestone, delivery of the first SRB test article is required in the second quarter of CY 1977. To achieve this goal, modifications for SRB component manufacturing facilities must be started during the fourth quarter of CY 1975; facilities must be operational by the fourth quarter of CY 1976.

PROJECT DESCRIPTION:

This project involves modifying approximately 190,000 square feet (17,651 m^2) of existing manufacturing and assembly facilities for the production of SRB components. These modifications are necessary to provide work stations especially tailored to the geometry, weight, and size of the individual SRB components to be manufactured. The work includes providing reinforced concrete foundations for tooling, relocating and extending utility systems, modifying the air conditioning system, relocating and rerouting overhead bridge cranes and railings, reinforcing crane and structural trusses, making minor modifications to the plant, and rearranging and upgrading the overall lighting system. The project also provides for procurement and installation of collateral equipment, including a heat treat oven, a cleaning booth, pumps, and a paint spray booth, that is essential to support the manufacturing operations.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Total Cost
Land Acquisition	---	---	---	---
Construction				$2,700,000
Modification of manufacturing space	SF	190,000	$14.21	2,700,000
Equipment	---	---	---	300,000
Fallout Shelter (Not Feasible)	---	---	---	---
	TOTAL			$3,000,000

The project provides only for facility modifications which will provide the capability for assembling the SRB structural components. Special tooling and other noncollateral equipment required in the manufacturing and assembly operations, which are unique to the developmental vehicles and are not affixed to the facility, would be procured with the hardware itself and will therefore be provided for by Research and Development resources. A detailed cost estimate for this tooling and special equipment will not be available until the SRB contract has been awarded. It is intended, however, to make maximum use of the existing Apollo tooling, with modifications whenever feasible.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Additional CoF resources may be required to support rate production beyond DDT&E. A precise estimate cannot be determined until a contractor is selected and the requirements are definitized.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

Rehabilitation and Modification

Summary of Project Amounts by Location	FY 1976 Amount	Page No.
Ames Research Center	$1,565,000	CF 5-3
Goddard Space Flight Center	1,085,000	CF 5-5
Jet Propulsion Laboratory	1,345,000	CF 5-7
Johnson Space Center	1,400,000	CF 5-9
Kennedy Space Center	1,620,000	CF 5-11
Langley Research Center	1,610,000	CF 5-13
Lewis Research Center	1,255,000	CF 5-15
Marshall Space Flight Center	930,000	CF 5-17
Michoud Assembly Facility	465,000	CF 5-18
National Space Technology Laboratories	105,000	CF 5-18
Wallops Flight Center	830,000	CF 5-19
Various Locations	2,250,000	CF 5-20
Miscellaneous Projects Less than $100,000 Each	1,540,000	CF 5-22
Total, FY 1976	$16,000,000	

Transition Period
July 1, 1976 - September 30, 1976

Ames Research Center	600,000	CF 5-26
Goddard Space Flight Center	660,000	CF 5-26
Jet Propulsion Laboratory	800,000	CF 5-27
Johnson Space Center	300,000	CF 5-28
Kennedy Space Center	430,000	CF 5-29
Langley Research Center	770,000	CF 5-29
Lewis Research Center	600,000	CF 5-31
Marshall Space Flight Center	470,000	CF 5-31
Michoud Assembly Facility	225,000	CF 5-32
National Space Technology Laboratories	210,000	CF 5-32
Wallops Flight Center	200,000	CF 5-33
Various Locations	2,535,000	CF 5-34
Miscellaneous Projects Less than $100,000 Each	950,000	CF 5-39
Total, Transition Period	$8,750,000	

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE	Rehabilitation and Modification of Facilities Not in Excess of $500,000 Per Project	
LOCATION	Various Locations	
		FY 1976 CoF Estimate $16,000,000
FY 1974 $14,785,000		FY 1975 $14,900,000

COGNIZANT INSTALLATION: Various Locations

LOCATION OF PROJECT: Various Locations

COGNIZANT PROGRAM OFFICE: Office of the NASA Comptroller

SUMMARY PURPOSE AND SCOPE:

This program is intended 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 priority rehabilitation and modification facility needs for FY 1976 which can be foreseen at the time of the submission of these estimates, and which are estimated to cost not in excess of $500,000 per project. 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 these physical plants. While, in the past, this particular program has been specifically directed toward the general nonprogrammatic segments of NASA facilities, this is the fourth year in which additional attention has been given to facility modification requirements generated by specific programs or projects.

PROJECT JUSTIFICATION:

At its initial cost, the existing NASA physical plant totals about $5.9 billion (June 30, 1974). A continuing program of rehabilitation and modification of these facilities is required to:

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

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

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

d. Provide a better and safer environment for all personnel.

e. Prepare for more efficient energy utilization by updating and improving utility systems.

This project includes only facility rehabilitation and modification work having an estimated cost not in excess of $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 and repair activities, or by related routine facility work efforts which are provided for in other than CoF estimates. Rehabilitation and modification work estimated to cost more than $500,000 is reflected as a separate major CoF line item project. Not included in this project are the minor construction of facilities projects (new and addition type) required in FY 1976. These latter requirements for FY 1976 are provided for under a separate project entitled "Minor Construction" which are included in these estimates.

PROJECT DESCRIPTION:

Items of rehabilitation and modification proposed to be accomplished within this program for FY 1976 are outlined under "PROJECT COST ESTIMATE" and total $16,000,000. Of this total $14,460,000 is represented by discrete work packages at designated NASA installations. The remaining $1,540,000 relates to those smaller rehabilitation and modification projects estimated to cost less than $100,000, the nature and purpose of which are the same as for that work specifically delineated but which, because of their individual smaller size, are not listed by item. At this time these items are considered to be of the highest priority. They have been carefully selected from lists totaling about $45 million. The $16,000,000 listing represents a most modest increment in relation to the existing total "backlog" of this type of work, for which provisions must be made over the next several years.

The remainder of the rehabilitation and modification work should be undertaken as a phased program over the next several years to place these installations on a more economical and efficient operating base. 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 also realistic to assume that a change in some of the items to be accomplished within the allocated resources may be required. For the purpose of justifying

this estimated facilities rehabilitation and modification requirement, a tentative listing of projects is set forth under "PROJECT COST ESTIMATE". This work will be accomplished on a priority basis. The total of $14,460,000 of discrete projects relates to the following broad categories of facilities:

a.	Utility Systems	$2,575,000
b.	Fire Detection/Protection Systems	745,000
c.	General Purpose Buildings	3,080,000
d.	Technical Buildings/Structures	7,550,000
e.	Pavements and Drainage	100,000
f.	Building Exteriors and Roofs	410,000

In addition there is the "Lump Sum" estimate of $1,540,000 for smaller project work, thus making a total of $16,000,000. The FY 1976 requests for facility rehabilitation and modification work, therefore, are directed toward the most urgent current needs for work of this type in the continuation of this essential program at NASA installations.

A. Ames Research Center — $1,565,000

1. Rehabilitation and Modification of Unitary Wind Tunnel Subsystem, Building N-227 — 385,000

This project provides for rehabilitation and upgrading of the automatic model support system and associated position control systems in the 8 X 7 Foot (2.4 x 2.1m) Wind Tunnel main drive compressor, replacement of the rotor blade shrouds in the 11-by 11-Foot (3.3 X 3.3m) Wind Tunnel main drive compressor, and modification of the cooling tower to prevent steam/water vapor drift. These facilities are all part of the Unitary Wind Tunnel Complex, a 19-year old facility costing about $33 million. It normally operates 24 hours a day in support of DoD, commercial transport, and NASA research programs, including space shuttle. The model support system rehabilitation will provide increased capacity, reliability and safety, and increased drive rate capability for angles of yaw and attack. This work has become necessary because gradual wear and deterioration of existing components have increased maintenance requirements and tunnel shutdown while reducing allowable test load capacity. The work will restore full load capability and significantly reduce the average tunnel operational hours required to reach test objectives, with substantial man-hour and electrical energy savings. Existing rotor blade shrouds have over 10,000 hours of operation; undiscovered failure could lead to blade loss during operation with probable extensive damage to the facility. The cooling tower rehabilitation will replace present vapor drift eliminators

with new improved units which will eliminate corrosion and vapor damage to nearby metal buildings and vehicles, as well as save up to 50,000 gallons (189.3 KL) of water in each eight hours of operation.

2. Rehabilitations and Modifications for Fire Protection $225,000

This project provides for the installation of fire detection equipment in twenty two buildings. These modifications will also include the coversion of the existing 7 X 10-foot (2.1m X 3.0m) No. 1 Wind Tunnel drive motor fire protection system from manual to automatic activiation with the installation of temperature detector automatic discharge valves and controls and equipment shut down interlocks. Also included is the rehabilitation of six other existing Wind Tunnel drive fire protection systems, including overhaul or replacement of valves, compressors, detectors, and relays as required. The 7 X 10-Foot Wind Tunnel No. 1 drive fire protection system is inadequate and it is unlikely that the existing manual system could be activated in time to limit damage in case of fire. The six other Wind Tunnel drive protection systems must be tested, repaired or modified to significantly improve reliability.

3. Rehabilitation and Modification of Flight Project Facility, Building N-244 105,000

This project consists of modification of approximately 1,700 square feet (153 sq.m) of interior space of Building N-244. The work consists of adding partitions, doors, a ceiling, flooring and the necessary heating, air conditioning and electrical to an existing mezzanine to provide a shop/laboratory and a small equipment/tool storage area. A 4 X 6 foot (1.2 X 1.8m) 1,500 pound (680 kg) equipment lift is provided to transport the project equipment to the mezzanine. A moveable roof and a heavy steel blast door are being added to the existing exterior hydrogen test area. This is required to provide the space and environment necessary to do the assembly and testing of the control and experimental instrumentation and recovery package for spacecraft payload integration work. In future years the mezzanine may be further extended to provide additional laboratory space.

4. Acoustic Modification to 7-by 10-Foot Wind Tunnel #1, Building N-215 400,000

This modification will provide 15,000 ft^2 (1,389 m^2) of acoustically absorbent walls and baffles in one of the cross legs, the diffuser, and the test section of the 7-by 10-Foot (2.1 X 3.0m) Wind Tunnel #1. The test section walls will be removable so that the facility can be operated with acoustically treated walls, hard walls, or an open section. The diffuser inlet will be modified for operating in the open mode. This project also includes a closed circuit TV system, an air supply noise attenuator, and

miscellaneous relocation of existing mechanical and electrical items. The facility will be used by the Ames staff and Ames-Stanford Joint Institute for Aeroacoustics for studies of noise generating mechanisms in small-scale fans, full-scale airframe components and moderate-scale V/STOL propulsion systems. Basic problems to be studied include the effects of forward speed on noise generated by turbulence, and the study of noise generating mechanisms typical of the more complex V/STOL aircraft. This research will materially contribute to the timely attainment of objectives and targets in aircraft noise abatement by making it possible to predict aircraft noise, and to design aircraft having noise output within limits that are safe for, and acceptable to the public. The proposed modification will be permanent and economically usable for the life of the wind tunnel. There are no other future related modifications anticipated for this facility.

5. Rehabilitation and Modification of First Floor Central Labs of Flight Simulation Laboratory, Building N-210 $450,000

This project provides for the modification of approximately 11,000 square feet (990 sq. m) of space in the high bay of Building N-210 into four (4) large simulation laboratories. The work involves the addition of partitions, doors, ceilings, computer access floor, painting, new heating and air conditioning systems, providing adequate rest room facilities, lighting and electrical power systems as well as rehabilitation of the building's chilled water system. This project will provide the space necessary to house special computer and related hardware for simulation support of the Center's new flight projects, such as V/STOL, Tilt-rotor, Augmentor-wing aircraft, etc. This first floor modification will be structurally designed to accommodate a future second floor.

B. Goddard Space Flight Center $1,085,000

1. Modification of Fire Protection Systems 420,000

This project provides for the installation of automatic sprinkler systems in the following 15 laboratory and test buildings to protect life, safety of personnel, high value equipment, and spacecraft components:

a. Magnetic Test Facility, Buildings 302, 303, 304, 305 - These buildings are used for spacecraft testing and frequently housed flight hardware.

b. Main Gate House, Building 9 - This is a security office and has below-grade occupancy creating difficulty in fire fighting.

c. Mechanical Test Facility and Quality Assurance Laboratory, Building 22 - This facility has a complete system of radiation-affected areas which are also below-grade for occupancy.

d. Magnetic Quiet Test Facility, Buildings 306, 307 - These buildings are unique test facilities and frequently house flight hardware.

e. Development Operations, Building 16A - This building houses a high volume of paper operations consisting of employee records, shipping and receiving of documents. Revised life safety criteria for this type structure and occupancy indicate sprinkler protection is required.

f. Central Heating and Refrigeration Plant, Building 24 - This building houses the center's control power plant and a backup diesel facility which is a critical facility during manned and unmanned missions.

g. Chemical Propulsion Facility, Buildings 402, 407, and 414 - This facility has unique high value, one-of-a-kind equipment involved in development and testing of flight hardware.

h. Space Science Laboratory, Building 6 - This building houses the center's reliability and quality assurance facility including unique one-of-a-kind high value test and diagnostic hardware.

i. Multi-Purpose Building 17 - This building houses network support data and communications equipment.

Prior year funding at Goddard for these general types of fire protection and safety items totals $2,986,000. Future funding of this type work is now estimated at approximately $3,000,000 and this would be progressively accomplished on a priority basis over several years.

2. Modification of Data Interpretation Laboratory, Building 23 $175,000

This project provides for the modification of approximately 6,000 square feet (552 m^2) on the ground floor of Building 23 for the installation of the new input processor, storage and management information system. Modification work will include all electrical, mechanical and environmental interfaces. This telemetry on-line processing system (TELOPS) is needed to (a) support experiments from operationally complex spacecraft in near real time, (b) improve facility efficiency and decrease operational costs by eliminating tape handling problems and reduce the time delay between data acquisition and data availability to experiments, (c) implement an efficient interface with the STDN network and eventually with the Tracking and Data Relay Satellite Systems (TDRSS), and (d) provide sufficient capability to handle the data volume expected in the future.

3. Modification of Heating, Ventilating and Air Conditioning Systems in the Network Test and Training Facility, Building 25 $490,000

This project provides for the conversion of the Network Test and Training Facility, Building 25, environmental control system from packaged direct expansion systems serving separate zones to a central chilled water system. This modification work is necessary since the existing direct expansion air conditioning package units have deteriorated to the point where they are now unreliable and require continual maintenance. The proposed conversion to a central chilled water system will not only improve the overall reliability of the plant but will effect considerable operating economies in reduced maintenance costs and energy conservation.

C. Jet Propulsion Laboratory $1,345,000

1. Modification to Environmental Laboratory, Building 144 490,000

This project provides for the modification of Room 100 in Building 144, to convert it to a class 10,000 clean room standard in accordance with flight project environmental needs. The work includes the application of clean, firm, smooth synthetic panels to all walls and ceilings, construction of a large airlock adjacent to the large access doors to Room 100, removal of the existing air handling system, installation of larger air handlers on the roof in conjunction with a filter bank and revised intake/exhaust duct work installation. Sealing, cleaning, and painting of the area is required. Change rooms for test personnel are included to make the complex functionally complete. This modification work is necessary since Room 100 of Building 144 is presently lined with open, fibrous, board-type sound absorbing panels to deaden the noise from a large electrodynamic shaker. The panels cannot be cleaned because of their cellular construction and continue to absorb quantities of dirt whenever the main access doors are open. Shaker operation causes extensive dusting of the panels in violation of flight project cleanliness criteria. Limited control has been obtained through the use of "clean" tents, but the scope of future missions makes further use of tents impractical. A permanent solution is desired to control contamination in the dynamics laboratory. Conversion of the air conditioning system to filtered, diffused, vertical down flow system will complete the clean up.

2. Rehabilitation of Structural Test Laboratory, Building 18 295,000

This project provides for the replacement of nine individual air conditioning units, a boiler and space heaters in Building 18 with a central circulating water system. The new air conditioning system

will handle both heating and cooling requirements. It will include necessary ducting, diffusers, filters, controls and balance appropriate to the complete heating, ventilating and air conditioning system. Interior lighting and electrical circuits will be improved and limited interior cleanup, compatible with the modification is provided, including rest room upgrading. The construction of this building dates back to 1951 with improvements in 1958 and 1963. Most replacement parts for the nine separate obsolete air conditioning units, plus space heaters which condition the interior, are no longer available. Breakdown rate is high and maintenance of 20 to 25-year old surplus equipment is no longer economical. Review of heating, ventilating and air conditioning maintenance costs show we are spending three times the replacement cost every four years for many of the air conditioning units in Building 18. Electrical panels are overloaded, and all older lights are without ballasts, leading to excessive burn out.

3. Rehabilitation of Electrical Safety Connections $185,000

This project provides for the replacement of electrical power receptacles in all JPL facilities at Pasadena to effect compliance with safety requirements using National Electrical Manufacturers Association (NEMA) standard devices which will permit interconnection of new equipment, which is manufactured in accordance with the new NEMA standards, with existing system. This project is required to enable installation of new spacecraft supporting equipment and also provide for personal safety.

4. Rehabilitation and Modification of Space Flight Operations Buildings 230/264 375,000

This project provides for the following modifications within the Buildings 230/264 Control Complex to meet operational requirements for the Mariner Jupiter Saturn (MJS) mission.

a. Mission Support Area: This work includes partition changes, electrical modifications, equipment rearrangement, installation, checkout/integration in Buildings 230/264. The Mariner Jupiter Saturn (MJS) project requirements specify the need for a completely equipped and checked out Mission Support Area (MSA) by January 1, 1977. Even if there is no extended mission on Viking, the Viking project cannot release any Building 230 space to MJS earlier than November 30, 1976, which leaves only one month to accomplish the necessary modification work. Therefore, it is planned to develop a separate MSA for MJS 77.

b. Telemetry Mini Computer Area: This work includes modifications to the existing telemetry system. Viking constraints on the present system dictate the need for development of a new real time telemetry system for MJS to support the initial training and flight operations.

c. Safety Tasks: This work includes rehabilitation of the boiler and cable way systems in accord with recommendations resulting from recent safety inspections. A boiler stack is deteriorating to the point of being in danger of exuding carbon monoxide into the building and therefore must be repaired in the near future. All new cable ways through the floors are built to the new fire regulations but existing cabling requires correction by installation of approved fire stops.

D. Johnson Space Center $1,400,000

1. Modifications to 11-Foot (3.4m) Chamber, Building 7 160,000

This project provides for removing the existing Lunar Module (LM) cabin section and the installation of a flange to allow acceptance of the Space Shuttle Environmental Control and Life Support System (ECLSS) "boiler plate" (orbiter crew cabin) at one end of the existing 11-foot chamber. The work includes installing a new flange and providing all necessary utilities and fire suppression and safety equipment. The instrumentation, data acquisition, operational support equipment, and fully trained operating crews for conducting tests in this facility are already available. This project is essential to assure that the space shuttle ECLSS hardware is evaluated under realistic test environments and that hardware operational procedures can be verified under actual use conditions.

2. Rehabilitation of Chamber A Test Article Support Data Circuitry, Building 32 110,000

This project provides for replacing deteriorated electricial circuitry, including cables and terminal connectors, in Vacuum Chamber "A" of the Space Environmental Simulation Laboratory, Building 32. The work includes replacing data cables that are between the rotating lunar plane in the chamber and the terminal cabinet beneath the chamber, cleaning terminal connectors, and replacing the connectors on the lunar plane. The work will restore the support circuitry to its original full measurement condition to provide the data needed for evaluating space shuttle development. The existing data cables were installed in 1965, and have been used extensively to support all major Chamber "A" tests. For the past several years, increasing numbers of circuits have failed. This situation must be corrected since all circuits are required for the scheduled space shuttle vehicle tests.

3. Rehabilitation of Central Heating and Cooling Plant and Distribution Systems 210,000

This project provides for rehabilitating a portion of the steam and chilled water generating and distribution systems in the Central Heating and Cooling Plant, Building 24, and in the utility tunnel. The work includes the rehabilitation of the steam boilers, instrumentation, and

auxiliary equipment; the replacement or rebuilding of approximately 80 condensate and steam control valves; the replacement of steam and condensate expansion joints with expansion loops where possible; the rehabilitation of the chiller system, instrumentation, and auxiliary equipment; the repair and/or replacement of approximately 40 chilled water valves; and the rehabilitation of the cooling tower structure and systems.

This is part three of a five-year program of rehabilitation of the Central Heating and Cooling Plant and distribution systems. The systems have been in continuous operation since 1963. A recent survey disclosed that 75 percent of the valves in the chilled water system failed to close completely. There have been several system failures in the steam system. Boiler rehabilitation to the tubes and firebox is necessary at this time to prevent further deterioration, which would necessitate complete replacement. A major failure of this heating and cooling system could possibly result in a delay in mission-essential testing.

4. Modifications for Life Sciences Facility, Building 37 $420,000

This project provides for the phase II modifications of the Lunar Receiving Laboratory (LRL), Building 37, to permit its effective use as a life sciences facility. Presently, one-half of the usable space in the LRL is occupied by life sciences activities. The reconfiguration of the LRL to a complete life sciences facility will provide the necessary capability to further develop biomedical research and to support the life sciences payloads for the shuttle orbital flight and other programs. The medical and biomedical operations are presently scattered in several locations at JSC and Ellington, AFB. The FY 1975 phase I modification work consisted of converting the existing biological barrier air conditioning systems to conventional systems typical of other laboratories at JSC, modifying the air conditioning system in the administrative area, and providing required emergency access-ways through existing biological barrier areas. These phase II modifications will convert the former lunar sample laboratories into biomedical research laboratories, including cardiovascular, environmental physiology, neuroscience, and vestibular laboratories. The work includes removing existing built-in laboratory equipment, relocating partitions, and modifying air conditioning and utilities. This proposed project, when complete, will provide space for operations coordination, payload configuration, and integration and simulation for payload development and actual flight. The future phase III modifications will maximize the beneficial utilization of the LRL for life sciences payload and other activities.

5. Replacement of Primary Electrical Feeders $240,000

This project provides for replacing the deteriorated 15 KV underground power cable for electrical circuit 1-11 and the electrical cable in the Center Support Area. The work includes replacing the existing 15-KV underground cable from "Oil Switch 300" to the switchgear in each of the buildings in the Thermochemical Test Area, and from "Oil Switch 400" to the switchgear in each of the buildings in the Center Support Area. This is phase II of a five-year program to replace these deteriorating cables, thus removing the potential of power failures which could adversely affect tests or other activities supporting the space shuttle and earth resources programs.

6. Modifications for Central Film and Tape Storage Area, Building 228 160,000

This project provides for modifying existing Building 228 for use as a central photographic film and computer tape storage area. The work includes upgrading existing fire detection, alarm, and suppression systems to meet all established fire protection standards and codes; modifying the air conditioning system, installing a new cold storage vault for tape and film; and installing movable and stationary storage units. The project is required: to eliminate the present fire hazard involved in housing computer tapes near computers; to alleviate congested storage conditions; and to afford maximum storage protection.

7. Rehabilitation of Photographic Hardware Development Laboratory, Building 15 100,000

This project provides for various office and laboratory area modifications to accommodate the consolidation of the functional elements of a photographic systems development laboratory. The modifications include partition relocations and associated electrical, telephone outlet, and air conditioning modifications. A recent reorganization of two directorates consolidated, within a single engineering and development organizational segment, a combined photographic systems development laboratory which performs the tasks of system development and optical system test, calibration, and repair in support of spacecraft and Earth Resources programs. The laboratories and other functional areas to be consolidated include a clean room facility, a bonded storage area, a darkroom, a photographic and crew operational hardware verification test area, a photographic systems laboratory, a design laboratory, and a small decal laboratory.

E. Kennedy Space Center $1,620,000

1. Modification of Chilled Water System, Operations and Checkout Building, Building M7-355 240,000

This project provides for modifying the existing chilled water system in Building M7-355 to allow the total chilled water requirement

to be satisfied by the east equipment room only. Work includes installing approximately 1,600 feet (488 m) of 16-inch (41 cm) insulated, welded pipe between the east and west equipment rooms. It also provides for installing three 1,065-gal/min (4,031-liter/min) pumps, and making the necessary electrical and building modifications. This project will reduce operations and maintenance costs, conserve electricity and release chiller equipment for other requirements.

2. Modification of Air Conditioning System, Utility Annex Building, Building K6-947, Launch Complex 39 $395,000

This project provides for moving one 970-ton chiller and associated switches from Building M7-355 to Building K6-947 at Launch Complex 39. Work will include making electrical modifications and condenser and chilled water connections, and providing remote operation controls and readout instrumentation. Necessary pumps will also be installed. The modifications will result in a significant electrical energy savings by using the 970-ton chiller in lieu of operating a second 2,500-horsepower unit to satisfy peak load requirements as is presently done.

3. Rehabilitation of High Temperature Hot Water System, KSC Industrial Area 490,000

This project provides for rehabilitating 4,700 feet (1,433 m) of underground hot water supply and return lines by installing the lines above ground and providing new insulation and protective jacketing. It also provides for rehabilitating associated valves and sleeves. Rehabilitation of this system is necessary to reduce major heat losses. Significant energy savings (fuel oil) per year are anticipated upon completion of this project.

4. Rehabilitation of Elevators on Mobile Service Towers, LC 36 "A" and "B", Eastern Test Range 330,000

This project provides for major rehabilitation of one elevator on each of the two mobile service towers on Launch Complex 36 to provide reliable elevator service for personnel during assembly, checkout, and launch of the Atlas-Centaur missions scheduled for launch from LC-36 through 1979. The existing elevators, which have been in service over 10 years, have deteriorated from heavy use and exposure to salt air.

5. Rehabilitation of Utilities in the Communication Building, Building M6-339 and KSC Headquarters Building, Building M6-399 165,000

This project provides for the rehabilitation of the air conditioning system in the Communications Building, Building M6-339 by replacing the

present air distribution system with a supply-air duct system and rebalancing the system. Damaged acoustical ceiling panels throughout the building will be replaced. The original air conditioning system was designed for a large open office area, which has since been partitioned. The present system has an insufficient air discharge area resulting in wide temperature variations, and insufficient air circulation. The project also provides for the rehabilitation of the hot water system in the KSC Headquarters Building, Building M6-399 film processing room. The work includes replacing the existing inadequate electric water heaters with two large hot water exchangers and associated equipment. Approximately 2,000 feet (609.6m) of insulated supply and return piping to the film processing room will be installed.

F. Langley Research Center $1,610,000

1. Rehabilitation of High Pressure Air Facility, Building 1247E 370,000

This project provides for rehabilitation and modification to the 5,000 psi (34,475,000 n/m^2) and 6,000 psi (41,370,000 n/m^2) central compressor station. Included in the modifications is the construction of a sound-resistant control room which will incorporate a console with indicators for monitoring pressures and temperatures of the compressed air, cooling water, lube oil and bearings of the five (5) large compressors by the use of remote sensing devices. This control room will provide a low noise level environment for facility operators during the major portion of their duty hours, thereby ensuring compliance with Occupational Safety and Health Act (OSHA) Standards with respect to high noise levels. Rehabilitation of the building interior includes minor repairs to the walls, floor and ceiling, improvement of the building ventilation system, some new light fixtures, and improved building power supplies. The exterior work includes minor repairs to the walls and windows, exterior pedestrian doors, exterior service doors and the roof. Facility 1247E was originally constructed in 1952 and repairs to flooring and ceiling are required in various areas. The walls and windows have been damaged by equipment vibration. New light fixtures are needed to meet current standards. Several recent studies have indicated that the operators are subjected to noise levels in excess of the limits allowed by current federal regulations. The compressors are so large that it is impractical to isolate them and it is more economical to shield the operators by building a sound-resistant control room. The main part of the building has an average noise level of 89 db with some areas up to 108 db.

2. Rehabilitation of the Unitary Plan Wind Tunnel, Building 1251 490,000

This project provides for the rehabilitation and replacement of critical research equipment in the Unitary Plan Wind Tunnel, Building 1251.

A remote monitoring system for the main drive and make up air systems will be installed to eliminate the need for personnel operating in a machinery generated noise environment in excess of OSHA Standards, thereby resolving a serious safety problem. Worn out equipment such as the cooling water pumps, the 3,500 horsepower motor gearbox coupling, the 63,000 horsepower main drive motor fans and rings, the hydraulic pumps, the air dryer system valves and the stagnation control vacuum valves will be replaced. Various facility components of this unique 19-year old facility have deteriorated extensively thereby not only causing, for the present, numerous unscheduled repairs, but also becoming the cause for an extended termination of operations in the near future unless complete rehabilitation of the affected parts is accomplished. Recently the primary mission of this facility has been to assist with the development testing of the critical boost and reentry phases of the space shuttle. Research and Development programs of NASA, DoD, and industry in the development of high speed aircraft and missiles require continuous support from this facility. Future funding requirements are about $3.8 million.

3. Rehabilitation of Electrical Power Distribution System, 22KV $450,000

This project provides for the replacement of major elements of the Center's electrical power distribution system at the 22,000 volt level. Included are 2 three-phase 7,500 KVA transformers and 2,500 feet (762 meters) of power feeders. Associated with the above work are minor modifications to system relay devices and miscellaneous duct and sub-station hardware to integrate the new transformers and feeders.

This upgrading of the system components will ensure continued uninterrupted service to 12 research and institutional facilities located in the East and West Areas and to the U.S. Air Force facilities served from this distribution system. The power transformers which were originally installed in the East Area in 1935 were relocated in the 1940's during the initial West Area expansion. Also the cables which were originally installed in the East Area in 1937 were moved to serve areas in the expanding West Area. Transformer obsolescence and inability of manufacturers to furnish spare parts makes maintenance and repair of this equipment most difficult. The cable insulation age and sheath deterioration have been a cumulative factor in further decreasing dependability of the systems.

4. Rehabilitation of Freon Reclamation System - Transonic Dynamics Tunnel, Building 648 200,000

This project provides for the replacement of the refrigeration state in the Freon-12 Reclamation System for the Transonic Dynamics Tunnel. Other equipment replacement required to restore the 20-year old, 35-ton, 3-stage unit to its originally designed capacity includes heat

exchangers, condensers, valves and interconnecting piping. Since the system operates below its design performance, an annual Freon-12 loss of $42,000 is experienced; hence, the project will effect an energy savings in Freon gas which will amortize the project cost in approximately five years. The Transonic Dynamic Tunnel is a unique national facility designed specifically for study of aeroelastic problems covering flutter, buffeting, ground wind loads and gust loads. It is used for support of such national programs as Space Shuttle and Viking with appropriate in-house studies, and to perform flutter clearance studies on the B-1 and YF-16 aircraft.

5. Rehabilitation of Hangar Addition, Building 1244D $100,000

This rehabilitation project will upgrade the reconstructed hangar addition, Building 1244D. This work will include additional electrical power, lighting utilities, and installation of fire sprinkler systems to provide storage and work space in support of the aeronautics research program. The existing hangar addition is a prefabricated structure which has been moved twice and reerected. The structure was approximately 16 years old when it was brought to Langley from Travis Air Force Base. The work is needed as soon as possible to provide more advantageous use of the available space. Some additional modifications will be required to this hangar in future year's programs.

G. Lewis Research Center $1,255,000

1. Rehabilitation of Exhaust System Safety Devices for Propulsion Systems Laboratory (PSL) Equipment, Building No. 64 390,000

This project will provide for the rehabilitation by replacement of seven 54-inch to 84-inch (136cm to 211cm) hydraulically operated butterfly valves in the exhauster system with check valves equipped to operate by air. The seven check valves will provide overpressure protection by operating at approximately 1 to 2 p.s.i. (0.7-1.4n/cm2) thereby preventing overpressure at the inlets of the 2nd, 3rd, or 4th stage exhausters. The new check valves will control the air flow through the system to relieve an overpressure hazard. The check valve operator will contain a shear pin to provide additional safety provisions. A recent hazard analysis of the PSL exhaust system at Building 64 has indicated the need for this positive means of overpressure protection.

2. Rehabilitation of Refrigeration Building No. 9 240,000

This project provides for the rehabilitation of the Refrigeration Building No. 9. The rehabilitation of the exterior will include repairs to the roof, flashings, parapets, tuck point and waterproofing the masonry, and the replacement of the existing windows. The interior rehabilitation includes the strengthening of the existing wood trusses

with metal tie rods, and painting of the interior surfaces. The Refrigeration Building No. 9 was constructed to minimum standards with World War II materials. Ordinary wear and tear over the years has resulted in degradation of the quality of the interior and exterior surfaces to the point where complete rehabilitation is needed to improve the building and resist further deterioration.

3. Rehabilitation of Petroleum-Chemical Air Heater No. 2, PSL Equipment Building No. 64 $270,000

This project provides for the rehabilitation of the 17-foot (5.2m) diameter 45-foot (13.7m) long gas fired petroleum-chemical Air Heater No. 2 in the PSL Equipment Building No. 64. The interior tube framing system and tubes will be rehabilitated by replacement. This heater is required to be rehabilitated to provide the required quantity and temperature of heated combustion air for testing larger jet engines with high subsonic air flow. The present two petroleum-chemical heaters are inadequate to supply the demand. Rehabilitation of this heater will result in increased operational efficiency.

4. Rehabilitate Combustion Air Intercoolers in Engine Research Building No. 5 185,000

This project will provide for the replacement of the 14 existing combustion air intercoolers located in the Engine Research Building (ERB) No. 5 with new intercoolers and associated piping. These 14 remaining ERB combustion air compressors intercoolers must be replaced so that an acceptable compressed air quality for research programs can be maintained. In 1970 an initial 11 intercoolers were replaced. These remaining coolers are now approximately 30 years old and leak cooling tower water into the air system. This leakage acts as a damaging contaminant producing loss of research data and sometimes damage to instrumentation and other equipment. Center energy consumption will be reduced with the increase in efficiency of the proposed new coolers and piping as less power is required to operate the compressors and water pumps.

5. Rehabilitate Library Service Building No. 60 170,000

This project provides for the rehabilitation of approximately 58,000 square feet (5,390 m^2) of the Library Service Building, No. 60. The rehabilitation of the exterior includes repair of the roof, flashing and parapets, tuck pointing, cleaning, water proofing masonry, and caulking all stone work joints. New aluminum windows will be installed on three floors. This building was constructed in 1951 and has been in continuous use. The rehabilitation of the exterior will bring this building up to current standards.

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H. Marshall Space Flight Center $930,000

1. Modifications for Software Test and Integration Laboratory (STIL), Building 4708 100,000

This project provides for the necessary modifications in Building 4708 to accommodate the Spacelab Software Test and Integration Laboratory. The modifications cover a floor area of approximately 8,500 square feet (782 m^2) of computer laboratory and office space. Proposed modifications include installing partitions; installing heating and air conditioning and electrical power systems. The STIL, which will consist of a large computer (IBM 370 class) and a spacelab data management computer system, will be used to verify spacelab software provided by the European Space Research Organization (ESRO) and to develop, produce, and verify software for the operational phase of this program. It will further be used to maintain and update spacelab software and to integrate the collective experiments applications software for spacelab mission.

2. Modification of Space Sciences Laboratory, Building 4481 480,000

This project constitutes phase five in the improvements program for Building 4481. It provides for modifying approximately 9,000 square feet (828 m^2) of floor space and some exterior work. The interior work involves replacing partitions, doors, frames, and ceilings; and the heating, cooling, ventilating, lighting, electrical, plumbing, and safety systems. The exterior work involves adding windows and modifying the entrance. The purpose of this project is to provide adequate housing for scientific personnel and to eliminate the crowded conditions, inadequate power, poor humidity and dust control, and low water and air pressure which have hampered research.

3. Rehabilitation of Air Conditioning System, Data Systems and Test Building, Building 4708 350,000

This project provides for rehabilitating air conditioning systems serving approximately 40,000 square feet (3,680 m^2) of floor space on the south side of Building 4708. Eight individual direct expansion-type air conditioning systems will be replaced by a centrifugal water chiller system with a 600-ton capacity. Systems to be modified will incorporate provisions for energy conservation. A recent study of energy utilization of Building 4708 indicated that this project would significantly reduce annual electrical consumption and annual industrial water consumption. This project is the first of three phases involving the rehabilitation of all of the air conditioning in Building 4708. This project will alleviate maintenance problems created by the varying size and type of existing systems, and will reduce consumption of electrical power approximately 500,000 KWH and 30 million gallons of water (113,600 KL) annually.

I. Michoud Assembly Facility $465,000

1. Modification of Utilities Monitoring Systems, Manufacturing Building 103 and Engineering Buildings 101 and 102 315,000

This project provides for modifying the existing plant utilities monitoring system by adding controls for the 51 fan houses and two equipment rooms atop Buildings 101, 102, and 103. This addition will decrease response time for starting and stopping a 30-horsepower blower and a 20-horsepower chilled water pump in each of the 51 fan hours. In addition, it will provide for closer maintenance of plant environment and significantly reduce consumption of electric energy.

2. Rehabilitation of Manufacturing Building, Building 103 $150,000

This project provides for rehabilitation of three large access doors on the west end of the Manufacturing Building 103. Each of these doors is 120 feet wide by 40 feet high and weigh about 75 tons. The doors rise upward and fold for a clear opening and are powered by heavy motors for complete mechanization. The doors are 30 years old and require major refurbishment to preclude interruption or shutdown of the external tank production flow once manufacturing begins. The rehabilitation work will include replacing some of the tracks, gaskets, cables and bearings; refurbishing the electrical system, including the motors, limit switches, relays, and contactors; and replacing all necessary parts to insure that the doors are watertight.

J. National Space Technology Laboratories $105,000

1. Replacement of 150-Ton Absorption Chiller Unit, Material Receiving and Storage Facility, Building 2204 105,000

This project provides for replacing the existing 150-ton absorption chiller unit, which supplies the temperature and humidity environment for critical storage areas, and making necessary repairs to the high temperature hot water circulating pump. Replacement parts are no longer available for the absorption unit, and it has become impractical and uneconomical to continue making replacement parts in-house.

K. Wallops Flight Center $830,000

1. Rehabilitation of Electrical Facilities 245,000

This project provides for the rehabilitation of the overhead distribution system in the rocket storage area, replacing wooden platform substations with structural steel and new transformer banks at E-134, F-20 and F-21 and replacing existing wooden poles with concrete standards at launch pads 0, 2, 3, 4 and 5. The present distribution system is approximately 30 years old and in a state of serious deterioration. The system should be rebuilt to alleviate major outages and excessive maintenance.

2. Rehabilitation of Aircraft Maintenance Hangar, Building D-1 435,000

This project provides for the rehabilitation of the building exterior to include removal and replacement of 17,500 square feet (1,626 square meters) of built-up roofing, replacement of all north wing windows, replacement of 18 exterior doors and 12 doors between the hangar bay and wings, replacement of the roll-up door, weatherstripping the sliding hangar doors, patching the stucco, and painting the entire exterior. The interior rehabilitation shall include removal of 19 existing window units from the north wing second floor offices and installation of a central air conditioning system, renovation of the first floor heating system, painting the first floor shops, replacing the light fixtures in the first floor shops, replacing the air compressors, replacing the domestic water system, and renovation of all rest room facilities. This rehabilitation is required to minimize further deterioration of this building and to correct deficiencies in the Heating Ventilation and Air Conditioning (HVAC), electrical and plumbing systems.

3. Rehabilitation of Automotive Repair and Utilities Maintenance Building F-20, and Electric and Carpenter Shop Building F-21 150,000

This project provides for the rehabilitation of buildings as follows:

a. Building F-20: This work includes rehabilitating the air conditioning unit for the office area, and installing grease trap and related piping in the building drainage system, rehabilitating the building heating system, upgrading the rest room ventilating system, and replacing the fixtures. Providing supplemental lighting and power and upgrading the truck exhaust system. Rehabilitating service doors and resealing the roof joints to prevent leakage.

b. Building F-21: This work includes providing a new air conditioning unit for the office area, rehabilitating the building heating system, upgrading the rest room ventilation system and replacing fixtures. Providing supplemental lighting and power. Rehabilitating four service doors and resealing joints to prevent leakage.

The work to be done in the above buildings is urgently required to prevent further deterioration and to provide a suitable working environment.

L. Various Locations $2,250,000

1. Rehabilitation of Primary Transfer Switches, Downey, California 100,000

This project provides for upgrading one 15kV drawout switch unit and for providing 32 existing 15-kV switch units with new arc chutes. It also provides for adding discharge spring latches and for the modification of 16 transfer switch enclosures by weatherproofing, installing filters, and installing heaters and controls. These repairs and modifications are necessary to prevent future failures which could cause power interruptions and have an adverse impact on the shuttle program.

2. Rehabilitation and Modification of NASA Industrial Plant, Santa Susana, California 450,000

This project provides for replacing the existing deteriorated underground water piping serving the "Alfa" test stands with approximately 1,800 feet (548.6 m) of 24-inch (61-cm) carbon steel pipe and related valving above ground. This water system is used primarily for fire protection and flame-deflector cooling for the "Alfa" test stands, which are being used to test the smaller rocket engines. These engines cannot be reliably and economically tested with the current breakdown experienced with the water supply system. This project also includes rehabilitating the air conditioning systems, power lines and electrical distribution systems, storm drainage system, and buildings/structures, the majority of which were constructed 30 years ago.

3. Tracking and Data Acquisition Stations 1,700,000

a. Modification of Sixty-Four Meter Antenna, Goldstone, California (400,000)

This project will provide for the rehabilitation and modification of the high pressure hydraulic pumping system for the azimuth hydrostatic bearing assembly at Goldstone. The modified pumping system demonstrated on the antennas at Spain and Australia

increased the thickness of the oil film in the hydrostatic bearing by increasing the high pressure pump flow and permitted the use of higher viscosity oil. Included is an emergency shutdown system with interlocks to prevent bearing damage. The existing system has been in operation since December 1964.

b. Rehabilitation and Modification of Goldstone, California, Electronic Grounding and Testing Systems ($200,000)

This project will provide for the modification and upgrade of the grounding system to reduce or eliminate ground loop circulating currents which interfere with the operation of the electronic equipment. In addition, the load distribution system and transformer bank will be modified and incremental reactive loads will be added to permit performance testing without interference to station operations and mission support.

c. Rehabilitation and Modification of the Electrical System (Power Distribution and Ground Fault Protection)

This project will provide modification and replacement of existing switchgear, increase transformer capacity and underground distribution cable capacity, rehabilitate the ground fault protection and modify the engine-generator control switchgear. In particular, emphasis will be placed on replacing circuit breakers of insufficient interrupting capacity, adding ground fault protection equipment and increasing cable capacity to minimize electrical fires which would shutdown a facility for as much as two months.

Goldstone, California	(DSN)	(495,000)
Canberra, Australia	(STDN)	(160,000)

d. Rehabilitation and Modification of Air Conditioning Systems

This project will modify and refurbish the air conditioning systems in existing operation building which furnish cooling for mission critical electronic equipment. Since the installation of the original equipment, new electronic systems have been added without corresponding increase in the cooling system. In addition, most new electronic systems introduced as replacements of old systems have much greater heat loads. This project will replace worn out equipment such as condensers, fans and motors many of which are 15 years old. Ducting and controls will also be modified or replaced and zones will be re-routed to accomplish optimum heat balance to protect electronic equipment from over heating and to establish a controlled environment for stable electronic operation.

Canberra, Australia	(STDN)	(220,000)
Madrid, Spain	(DSN)	(225,000)

MISCELLANEOUS PROJECTS LESS THAN $100,000 EACH	$1,540,000
TOTAL	$16,000,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

It is estimated that between $15 and $20 million per year will be required for the continuation of this facility rehabilitation and modification program.

CONSTRUCTION OF FACILITIES

July 1, 1976 - September 30, 1976

ESTIMATES

PROJECT TITLE	Rehabilitation and Modification of Facilities Not in Excess of $500,000 Per Project	
LOCATION	Various Locations	
July 1, 1976 - September 30, 1976	CoF Estimate $8,750,000	
FY 1975 $14,900,000	FY 1976 $16,000,000	

COGNIZANT INSTALLATION: Various Locations

LOCATION OF PROJECT: Various Locations

COGNIZANT PROGRAM OFFICE: Office of the NASA Comptroller

SUMMARY PURPOSE AND SCOPE:

This program is intended 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 priority July 1, 1976 - September 30, 1976 rehabilitation and modification facility needs which can be foreseen at the time of the submission of these estimates, and which are estimated to cost not in excess of $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 these physical plants.

PROJECT JUSTIFICATION:

At its initial cost, the existing NASA physical plant totals about $5.9 billion (June 30, 1974). A continuing program of rehabilitation and modification of these facilities is required to:

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

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

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

d. Provide a better and safer environment for all personnel.

e. Prepare for more efficient energy utilization by updating and improving utility systems.

This project includes only facility rehabilitation and modification work having an estimated cost not in excess of $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 and repair activities, or by related routine facility work efforts which are provided for in other than CoF estimates. Rehabilitation and modification work estimated to cost more than $500,000 is reflected as major CoF line item projects. Not included in this project are the minor construction of facilities projects (new and addition type) required at this time. These latter requirements, for this period, are provided for under a separate project entitled "Minor Construction" which is included in the estimate.

PROJECT DESCRIPTION:

Items of rehabilitation and modification proposed to be accomplished within this program for July 1, 1976 - September 30, 1976 are outlined under "PROJECT COST ESTIMATE" and total $8,750,000. Of this total, $6,000,000 represents discrete work packages all of which reflect requirements at designated NASA field installations which were not included in prior year budget estimates. An additional amount of $1,800,000 is included for the accomplishment of projects which had previously been scheduled in prior year budget estimates but which could not then be undertaken due to the need to revise the listing of work to be accomplished within the allocated resources for a given fiscal year. These revisions are in keeping with the basic intent of this program and have allowed for the accommodation of several urgent but unforeseen institutional projects and many pressing unforeseen program support type facility needs which could not fully qualify for accomplishment under Section 1(g) as "unforeseen programmatic needs". The project also provides $950,000 for those smaller rehabilitation and modification work packages estimated to cost less than $100,000, the nature and purpose of which are the same as for that work specifically delineated but which, because of their individual smaller size, are not listed by item.

They have been carefully selected from lists which originally totalled some $29 million. The $8,750,000 request for this interim period represents

a modest increment in relation to the existing total "backlog" of this type of work, for which provisions must be made over the next several years. This remainder of the rehabilitation and modification work should be undertaken as a phased program over the next several years to place these installations on a more economical and efficient operating base. 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 this quarter some rearrangement of priorities may be necessary and it is also realistic to assume that a change in some of the items to be accomplished within the allocated resources may be required. For the purpose of justifying this estimated facilities rehabilitation and modification requirement, a tentative listing of projects is set forth under "PROJECT COST ESTIMATE". This work will be accomplished on a priority basis. The total of $6,000,000 of discrete projects relates to the following broad categories of facilities:

a.	Utility Systems	$1,155,000
b.	General Purpose Buildings	1,585,000
c.	Technical Building/Structures	2,395,000
d.	Pavements and Drainage	250,000
e.	Building Exteriors and Roofs	615,000

The request for July 1, 1976 to September 30, 1976 for facility rehabilitation and modification work, therefore, is directed toward the most urgent current needs for work of this type in the continuation of this essential program at the NASA Installations.

PROJECT COST ESTIMATE:

A. Ames Research Center $600,000

1. Rehabilitation and Modification of Second Floor of Technical Services Building, N-220 185,000

This project provides for the modification of approximately 10,000 sq. ft. (900 sq. m) of the second floor space of the machine shop facility so that it can be occupied by the instrument maintenance and modification group of the Model and Instrument Machining Branch. The modifications will involve the installation of new light fixtures, redistribution of utilities, floor covering, and air conditioning of some areas to provide a semi-clean-room environment for this group of precision instrument makers. The machine shop building was originally constructed in 1960 and does not have the capability for high precision machinery or instrument repair work.

2. Rehabilitation and Modification of Technical Conference Building, N-201 415,000

This project provides for the rehabilitation of a 30-year old auditorium to incorporate current safety requirements and provisions for the handicapped. This will include adequate access, emergency exits and rest rooms for handicapped personnel who require wheel chairs. The technical briefing and conference area will be modified by installing a stepped floor and fixed seating for approximately 370 people. The lobby, rest rooms, mechanical and electrical equipment will be modified. The rehabilitation work will include acoustical treatment of the auditorium walls, ceiling and floor, and the replacement of the existing windows with brick panels. The existing auditorium was completed in 1944 and requires rehabilitation. There is no existing ramp access for wheel chairs and the emergency exits are inadequate. The present folding chairs are inadequate and could impair escape paths in the event of fire or other emergencies. Rehabilitation is long overdue and the proposed modifications are required to provide an acceptable meeting place for technical conferences.

B. Goddard Space Flight Center 660,000

1. Rehabilitation of Utility Systems 360,000

This project provides for: (1) rehabilitation of steam and condensate lines and associated insulated conduit south of roads 4 and 8, (2) replacing of damaged sections with new casing and providing cathodic protection, (3) rehabilitation of chilled water piping in the same area as well as building connections and internal piping, and (4) sectionalizing

valves and connections as required. The work will also include other utility modifications within various buildings as required. Examination of portions of these services indicated that subsequent construction had damaged protective coverings allowing steel conduit to corrode. New valving and connections are required to allow necessary sectionalization of external and internal utility distribution systems for maintenance and operational control.

2. Modification of Power Distribution System for the Goddard Optical Research Facility. (Various Buildings and including the Antenna Test Range) $300,000

This project provides for the extension of an existing 13 Kilovolt electric feeder at the main Center to the remotely located Goddard Optical Research Facility (GORF) and the Antenna Test Range. This project includes installation of approximately 12,000 feet (3,600 meters) of electric cable, twenty transformers, and an electrical distribution system at the GORF. This modification work is necessary since the electrical supply to GORF is becoming critical due to the increased number of programs requiring satellite tracking and laser ranging equipment. The programs requiring this equipment are those such as: San Andreas Fault Experiment, EOPAD and GEOS-C. The power to GORF is currently supplied from the Agriculture Research Center's (ARC) 4,160 Volt Distribution System. This power supply has not been reliable in the past because power for GORF has been cut off during electrical emergencies at ARC.

C. Jet Propulsion Laboratory 800,000

1. Rehabilitation of Heating, Ventilating, and Air Conditioning Systems in the Laboratory, Building 161 330,000

This project provides for the rehabilitation of major mechanical components of the heating, ventilating and air conditioning system of Building 161, including overhaul of two centrifugal chillers and installation of a third; replacement of two hot water and two chilled water boilers; replacement of the temperature control system, ductwork extensions/modifications, and diffuser relocations. Reinsulation of work areas, replacement of pneumatic actuator seals and boots, architectural repairs, painting, and complete air balance is included. Clean room and computer installations in Building 161 will be provided with improved redundancy. All existing heating, ventilating and air conditioning equipment in Building 161 was originally installed in 1956 and has been operating continually. Chillers need general overhaul, and redundancy is required for the clean room and computer areas. The main hot and chilled water coils have numerous tubes plugged because of leaks. The cast iron sectional boiler has had three expensive breakdowns and must be replaced by a single fire tube type unit. The control system will be expanded and obsolete equipment replaced.

2. Rehabilitation of Central Recording Center/ Data Acquisition Facility, Building 22, ETS $470,000

This project provides for the modification of Building 22 at the Edwards Test Station and rehabilitation of the overall Central Recording Center System. The work includes rehabilitation of air conditioning system, modification to the interior configuration of the facility, and its systems and interconnecting utilities to the test areas. This project is required to maintain a reliable test center for the ETS in support of the Mars, Jupiter, Saturn (MJS) Program. Present components of the Central System are approximately 12 years old. The building air conditioning is also old and beyond economical maintenance.

D. Johnson Space Center 300,000

1. Rehabilitation of Heating and Cooling Systems, Various Buildings 195,000

This project provides for replacing deteriorated heating and cooling valves, flexible hoses, and several heating and cooling coils. It is required to maintain overall reliability of the heating and cooling systems and to permit more efficient operation of the utility distribution systems within the buildings that were built in the 1964 to 1965 time frame. The valves, expansion joints, pressure-reducing stations, and hoses are approaching the end of a useful life based on like equipment failure and normal life expectancy. This specific effort is part of a continuing program to rehabilitate the most urgent and pressing portions of these heating and cooling systems.

This is part of a phased program to rehabilitate the heating and cooling systems and utility distribution systems. There have been several failures in the steam systems valves and expansion joints. Rehabilitation of the various components is necessary at this time to prevent further deterioration, which could necessitate complete replacement. A major failure within these components could create a definite hazard to operations and could possibly even result in a delay in mission-essential testing.

2. Rehabilitation of Chilled Water Valves, Utility Tunnel 105,000

This project will provide for the rehabilitation or replacement of some 40 worn and/or inoperative valves in the chilled water distribution system in the utility tunnel. These valves are approximately 10 years old and are in need of refurbishment or replacement. At present, inoperative valves involve a shutdown of a building or zones on a more excessive basis then would ordinarily be necessary to

repair inoperative elements. Such shutdowns could cause unnecessary delays in testing due to the lack of a chilled water supply. This is phase four of a 5-year program to replace or rehabilitate the chilled water valves.

E. Kennedy Space Center $430,000

1. Rehabilitation of Roof, Vehicle Assembly Building "Low Bay", Launch Complex 39 290,000

This project provides for replacing 5,000 square feet (460m^2) of water-damaged roof and deteriorated flashing, installing a roof vent to dry out trapped moisture, and 15 roof drains to eliminate water ponding on the roof of the Vehicle Assembly Building (VAB) low bay. This project provides the minimum amount of work to prevent further roof deterioration, in the future, however, it will be necessary to hot-mop and gravel the entire roof area of the VAB low bay.

2. Modification of Vehicle Assembly Building "Low Bay" for Shops 140,000

This project provides for modifying the existing shop and test areas in the Vehicle Assembly Building (VAB) low bay to provide permanent facilities for the electronic/electric, fabrication, pneumatic/hydraulic, and wire rope shops. It will centralize widely scattered facilities and provide for more efficient operation. Work includes removing existing partitions; installing waste and exhaust, hot and cold water, and compressed air systems; improving ventilation; and adding power outlets and lighting.

F. Langley Research Center 770,000

1. Rehabilitation of Hypersonic Propulsion and High Intensity Noise Facility, Building 1221 280,000

This project will rehabilitate 58,000 sq. ft. (5,400 m^2) of office, shop and laboratory spaces on the first and second floors of Building 1221. Noise research valving and control rooms will be modified to effect a savings in research time and money. Automatic valve controls and control room modifications will permit two aircraft noise facilities (Building 1221 and Building 1218) to conduct research simultaneously rather than the present arrangement which permits only one facility to operate with the other waiting. The research conducted here complements the research at the other facilities; it does not duplicate the research effort. Since both facilities are now operated separately, this will result in a savings in both time and research effort. The work will include repair of the exterior masonry walls, replacement of wooden windows, roof repair, improvement of rest rooms,

HVAC system modernization, fire protection system installation, and refurbishment of doors and interior finishes. This facility was constructed in 1946. The extensive research performed in the building and the general deterioration that has occurred now necessitates a general rehabilitation. The walls, roof, and windows have exhibited deterioration. Automatic control of air valves and control room improvements are needed. Building 1221 is used exclusively for structural-acoustical (sonic fatigue) research and the flow field-near field jet noise research in the static condition.

2. Rehabilitation of Technical Conference Facility, Building 1222 $240,000

This project consists of the rehabilitation of Langley's Technical Conference Facility which is required to adequately serve the Center's main conference needs. This includes modifying the existing presentation facilities and relocating the projection room to more effectively utilize the conference area. Also included in this rehabilitation are provisions for adequate fire protection devices, repairs to interior and exterior walls, replacement of deteriorated windows and doors, upgrading rest room facilities, and improvements to the existing air conditioning and utility system. The present facility was constructed in 1946 as a combination recreation/conference area, and is completely unsuited for the conference activities which is now serves. For example, there are approximately eight meetings per month, each with an average attendance of 200 people. Attendance often exceeds 400. Expansion of the projection room is required to adequately accommodate the equipment necessary for a technical presentation. A 90-degree rotation of the speaker's area and the projection is necessary to effectively utilize existing space. The existing building systems and finishes are substandard and deteriorated to the point of requiring excessive maintenance.

3. Rehabilitation and Modification of West Area Main Road System 250,000

In conjunction with the new development and continued growth in the West Area of LaRC, the increased vehicular flow through the Center requires that the traffic patterns be developed along certain main streets. This project will provide for a continuation of Walcott Road to Ames Road and the rehabilitation of a portion of Ames and Durand Roads, the intersection of Ames Road and Durand Road, and traffic control improvement throughout the area. The work will include some demolition, paving, drainage, and road repair or resurfacing. The traffic composition in the area of the main gate is primarily a result of several small streets all intersecting in a small area. No main thoroughfare exists which can channel the traffic to the heart of the Center. Also, the ever increasing

traffic flow of trucks to the warehouse area, cars to the East Area, and visitors to the Visitor Center necessitates a main thoroughfare to these areas. This project will provide the necessary continuity of the entrance road system and will materially aid the flow of traffic into the Center.

G. Lewis Research Center — $600,000

1. Rehabilitation of the Instrument Research Laboratory, Building No. 77 — 490,000

This project provides for the rehabilitation of approximately 37,400 sq. ft. (3,470 m^2) of the Instrument Research Laboratory, Building No. 77. The exterior rehabilitation includes tuck pointing, cleaning and waterproofing the masonry work, caulking all stone joints and the installation of new aluminum windows. The interior rehabilitation will include some new flooring, ceiling, and lighting. The electrical system will be upgraded where required. The heating, ventilating, and air conditioning equipment will be replaced and the rest rooms renovated. This building was constructed over twenty years ago and has received only routine maintenance. The extensive rehabilitation of the interior and exterior features of the structure are required to bring it up to current standards.

2. Rehabilitate Air Dryer for the 8 x 6 Supersonic Wind Tunnel, Building 57 — 110,000

This project will provide for the rehabilitation by replacement of the elements in the Air Dryer for the 8 x 6 Supersonic Wind Tunnel. The deterioration of these elements after 24 years of continuous use has resulted in poor performance of the air dryer and has now reached a point where positive corrective action must be undertaken. Rehabilitation of these working parts of the air dryer will increase its moisture absorption capability and reduce the amount of natural gas and electric power required for this operation. This work will further reduce the amount of maintenance needed on this system.

H. Marshall Space Flight Center — 470,000

1. Rehabilitation of Guidance and Control Building, Building 4487 — 470,000

This project consists of general rehabilitation of the western portion of the "A-wing" and the entire "AB-wing" in Building 4487. Work includes removal of various obsolete and

overloaded air conditioning units, air handlers, and chillers; installation of an adequate centralized air conditioning system; and connection of the air conditioning system to an existing central chiller. Power distribution and lighting systems will be replaced and damaged architectural surfaces, window screens, and doors will be repaired or replaced. The exterior will be repainted. This rehabilitation will result in energy conservation and reduce maintenance costs. It will also facilitate the consolidation of various electronic and control activities from other buildings into Building 4487. This project comprises the second phase of the five-year plan begun in FY 1975 for the general rehabilitation and upgrading of Building 4487 to meet operational requirements imposed by current R&D usage.

I. Michoud Assembly Facility	$225,000
1. Rehabilitation of Roofs, Engineering Buildings 101 and 102	225,000

This project provides for removing and replacing the entire 41,854 sq. ft. (3,851 m^2) built-up roof on Building 101 and the entire 57,275 sq. ft (5,269 m^2) built-up roof on Building 102. These roofs were built in 1943 and rehabilitated in late 1961. Despite patches and repairs, the roofs on these buildings still have numerous leaks, soft spots where insulation has been saturated, and blisters from trapped moisture. To correct these problems and to preserve the wooden building roof structures, these roofs must be replaced now.

J. National Space Technology Laboratories	210,000
1. Modifications to Maintenance Buildings, Buildings 2201 and 2205	210,000

This project provides for modifying the Maintenance Buildings 2201 and 2205 to comply with safety standards. Modifications to Building 2201 include installing a dust collector system in the carpenter shop; installing a vehicle exhaust system; vaporproofing the electrical conduit system in the automotive area to prevent explosions; providing a ventilated, enclosed area for the battery shop and storage; and providing an enclosed paint spray booth. Building 2205 modifications include providing a fume exhaust system in the cleaning tank area, rehabilitating the chiller absorption unit and pumps, replacing mercury lamp ballasts, and repainting exposed structural steel in the cleaning tank area.

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K. Wallops Flight Center $200,000

1. Rehabilitation of Two Buildings; Assembly Shop, Building W-15, and Gymnasium and Post Office, Building D-10 100,000

This project provides for the rehabilitation of the following two buildings:

a. Building W-15: This work includes floor repair and installation of vinyl asbestos tile flooring in the stock room, installing of an exhaust system in welding area, air conditioning in shop area, replacing incandescent lighting with fluorescent lighting, install eyewash fountain in the battery preparation area, weather stripping all exterior doors, replacing steam boilers with new unit, sealing around metal siding and behind interior and exterior of building, construction of a sidewalk behind the storage building and replacement of underground communications service cable.

b. Building D-10: This work includes replacing door sills and doors, patching floors, rehabilitating rest rooms, ceiling/wall areas, heating, ventilating and air conditioning systems, and lighting system. Calking and sealing all building windows and painting interior office areas.

The work to be done in the above buildings is urgently required to prevent further deterioration and to provide a suitable working environment.

2. Modification of Water Distribution System 100,000

This project provides for modification of the existing water system by constructing some 2,800 linear feet (853 meters) of 10-inch water line including related fittings and valves. This line will be connected to an existing 8-inch (20.32cm) water line approximately 350 feet (106.75 meters) southwest of the Bulk Materials Storage Building N-116, then in a southwesterly direction crossing the paved apron east of the Range Control and Evaluation Facility, Building N-159, continuing southwest outside the edge of a wooded area past Building N-161 to a point approximately 150 feet (45.75 meters) east of the Telemetry Control Building, N-162, then running northwest along the north side of N-162 and connecting to an existing ten inch line at Building N-162. Two more connections will be made along the proposed line to connect an existing stubbed out line northeast of Building N-159 and an existing line northeast of Building N-161. This modification to the water system is needed to connect the existing dead end water line back into the water system by means of looping. This loop will give the two

following improvements: (1) circulation through the lines needed to maintain adequate pressure during fire use, and (2) a higher quality to the water used in human consumption. The size of the proposed line will be adequate to accommodate possible future expansion to the service area.

L. Various Locations $2,535,000

1. Rehabilitate Roof, Space Systems Development Laboratory, Building 288, Downey, California 100,000

This project provides for removing the entire roof of Building 288 and replacing it with a new built-up roof. All roof penetrations will be provided with new flashings, and vents will be installed to prevent the formation of blisters. The present roof was installed when the building was constructed in 1964 and has deteriorated to the point that only complete replacement can restore the integrity of the roof and prevent damage to the building and its contents.

2. Rehabilitation and Modification of Various Buildings, White Sands Test Facility 240,000

This project provides for refurbishing and improving eight buildings in the "100 and 200 areas" representing approximately 137,000 square feet (12,732 m^2) of floor area. The modifications include replacing corroded water lines, installing fire protection and safety appurtenances, replacing inefficient air conditioning equipment, and installing new floor tile and ceiling panels. The work also includes rehabilitating an air distribution system, weather stripping various exterior doors, replacing an interior door, painting part of the interior, installing an overhead vehicle exhaust system in one building, constructing a blast wall in one building, and installing a sawdust collection system. The rehabilitation and modifications are necessary to reduce maintenance costs by conserving energy, and to comply with current standards.

3. Tracking and Data Acquisition Stations 395,000

a. Rehabilitation and Modification of Electrical System (cabling and ground fault protection), Goldstone, California (DSN) (290,000)

This project will provide modification and replacement of the existing 5,000-volt and 600-volt cabling and ground fault protection for the 480-volt systems. In particular, it will provide protection from catastrophic arcing grounds in the 480-volt system; replace the existing nonshielded cable with shielded cable and place the 2,400- and 600-volt cables in separate raceways to conform to changes to the State of California basic electrical regulations.

b. Modification of Sixty-Four Meter Equipment Room, DSS-14 ($105,000)

This project will provide for a modification to the back-up structure of the prime reflector to install electrical equipment at a minimum distance from the tricone. Overcrowded electronics in the tricone will be relocated thereby increasing the width of the access walkways within the tricone to conform to the State of California basic electrical regulations.

4. To provide for the accomplishment of project work which had previously been scheduled but which could not then be undertaken due to the need to revise the listing of work in favor of more pressing institutional and program support work to be accomplished within the allocated resources for a given fiscal year. 1,800,000

a. Modification to Arc Heater and Test Bay of the Mach 50 Helium Tunnel Building N-238, Ames Research Center (340,000)

An existing electric arc air heater will be modified and reinstalled in the test bay of Building N-238. New water manifolds, four inch gas line, electric controls, switch gear, and cables will be provided by this project.

This modification work will provide a capability to perform tests to determine the effects of massive boundary layer transition and turbulent heating rates at high stagnation pressures. The information obtained from these tests will be used in the design of thermal protection systems (TPS) for ballistic missiles and for planetary probes. The unique capability of this arc will be the proper scaling of model and gap size in relation to boundary layer thickness. A large arc heater such as the one proposed will permit precise determination of heat shield performance under turbulent boundary layers. This will result in a significant increase in the payload of entry vehicles. The power supply (60 megawatts) provided for the Interaction Heating Shuttle Test Facility under a FY 1972 CoF project will also be used to power this arc heater. The resultant combustor will greatly enhance the capabilities indicated.

Although this modification work will provide a completely operational facility in itself, it may be necessary to undertake additional modification work at a later time in this facility to achieve greater capabilities. This proposed new requirement is being fully evaluated and would cost approximately $450,000. This proposed future work will be a separate and distinct project from that described above and, if later approved, will be funded as a separate project.

b. Rehabilitation and Modification of the Heating, Ventilating and Air Conditioning System in Nine Laboratory Buildings, Goddard Space Flight Center (175,000)

This project provides for the rehabilitation and upgrading of the heating, ventilating and air conditioning system in Buildings 1, 4, 11, 14, 18, 19, 20, 21 and 25. It includes: upgrading the air conditioning on the south side of Building 1 to relieve solar heat gain and to provide zone and cycle control, upgrading the air conditioning system of the laboratory in Building 4; providing a ventilation system and insulated wall in the steam station, Building 11; installing a ten ton air conditioning unit for the first floor of Building 14; rehabilitating the entire system in Buildings 18, 19 and 20; upgrading the system on the south side of Building 21; and increasing the air quantities and provide additional humidification in the computer areas of Building 25. These modifications are necessary to meet the changed occupant requirements of the buildings as well as the rehabilitation of deteriorated equipment involved.

c. Modifications to Mission Support Area, Space Flight Operations Facility, Building 230, Jet Propulsion Laboratory (300,000)

This project will modify the computer area of the Space Flight Operations Facility (SFOF), rehabilitate the cabling and ground system, and separate the mission control and computing center communications functions from those of the Deep Space Network. This project provides for extensive modifications to the SFOF to satisfy project requirements. It is also necessary to upgrade the ground system to reduce noise levels, and improve equipment operations and communications between SFOF and the Systems Development Laboratory, and to rearrange the communication equipment. Work of this nature is a continuing requirement in light of mission operations utilization of this facility.

d. Rehabilitation of Anechoic Chamber Doors, Building 14, Johnson Space Center (75,000)

This project provides for the repair of Anechoic Chamber doors to Building 14. The doors were installed in 1964 and at present require installation of new "fingerstock" (an interlocking radio frequency shield) on the large chamber door and cleaning the contact surface of the minor fingerstock, installation of new weatherseals and refurbishment of the interlock switches and air cylinders. A study was made to determine the amount of damage

and deterioration of the doors, and it concluded that the continued rate of deterioration, if not corrected, may seriously impact the shuttle and other testing to be performed in the chamber. Penetration of moisture and dirt through improperly closed and weather-sealed doors will cause deterioration of the radio frequency (RF) absorber material, which would be extremely costly to repair. This project is required in order to maintain integrity in the results of electromagnetic interference (EMI) tests.

e. Rehabilitation of Aircraft Parking Apron, Langley Research Center ($250,000)

This project provides for the rehabilitation of the existing aircraft parking apron with construction of a 3,800 square yards (3,177.7 m^2) concrete extension. This extension will be located on the south side of Building 1244, near the end of the main taxiway going to the Air Force main runway. The new apron extension will improve flight operations at Langley by providing a better flow of traffic from the taxiway and improve operations in parking and maneuvering aircraft and equipment. For some time, operations have been impeded by restricted ramp space. Traffic includes such large aircraft as the C-310, C-54, G-159 and CH-54 (Flying Crane Helicopter) in addition to numerous smaller jet, reciprocating engine, and rotary wing aircraft. Other large transient aircraft (C-141) often utilize the NASA ramp. Twenty aircraft are now assigned to this Center including the Boeing 737. Inefficiency in ground handling operations involves not just loss of time, but also unnecessary manpower. This project will also involve removal of the existing fueling system which will be replaced by truck fueling. The replacement of the fueling system is necessary since the existing one is obsolete and does not have sufficient pressure or volume to accommodate present and future aircraft requirements.

f. Rehabilitate Electrical Power Distribution System, Lewis Research Center (200,000)

This project provides for the rehabilitation of several components of the electrical power distribution system. The undersized 2,400 volt tie cable between transformers "B2" and "G4" is inadequate to handle essential loads in the event "B2" is required to be removed from service. Transformer "B2" provides electrical power for critical loads throughout the Center. This project also

provides for the replacement of the high voltage 34.5 KV "potheads" at Substations "A" and "B". These original dry-type high voltage potheads were installed 30 years ago, some have failed and all need replacement. The adjacent potheads when dismantled have indicated evidence of imminent failure. This project also includes the replacement of the control cables from the Electrical Distribution Center to Substation "B", the Sewage Pumping Station No. 1, Building No. 26, to the switching apparatus at Substation "C", and from Manhole 38 to Manhole 7. All of these cables indicate considerable sign of deterioration also, resulting in a condition of imminent failure. Additional rehabilitation of the Center's electrical power distribution system will be required in future years.

g. Rehabilitation of Guidance and Control, Building 4487 ("A" Wing East), Marshall Space Flight Center ($460,000)

This project provides for rehabilitation of 45,000 square feet, first and second floor, "A" Wing East, Building 4487. The work includes removal of various obsolete and overloaded air conditioning units, air handlers, chillers, and the installation of a centralized air conditioning system connected to an existing new central chiller. Power systems will be replaced to provide required breakers and controls for special loads such as computers. Lighting systems will be modified to meet required illumination levels. In addition, repair or replacement and painting of partitions, doors, windows, and ceilings will also be required. This building was built in 1956 as a Guidance and Control Laboratory for the Army, using austere standards of construction, and has since become inadequate to meet demands and loads of current aerospace research. Wear and tear of the building and its poor utility systems have increased maintenance and has been the cause of having to make piecemeal additions to the systems to meet even the minimal operational requirements of the research activities in the building. Future funding to rehabilitate other wings of the building will be required in the future.

MISCELLANEOUS PROJECTS LESS THAN $100,000 EACH	$950,000
Total	$8,750,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

It is estimated that between $15 and $20 million 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 1976 ESTIMATES

Minor Construction

Summary of Project Amounts by Location FY 1976	Amount	Page No.
Ames Research Center	$535,000	CF 6-2
Flight Research Center	205,000	CF 6-3
Goddard Space Flight Center	235,000	CF 6-4
Jet Propulsion Laboratory	520,000	CF 6-4
Johnson Space Center	50,000	CF 6-5
Langley Research Center	675,000	CF 6-6
Lewis Research Center	185,000	CF 6-7
Wallops Flight Center	145,000	CF 6-8
Various Locations	1,700,000	CF 6-9
Miscellaneous Projects Less than $50,000 Each	750,000	CF 6-10
Total, FY 1976	$5,000,000	

Transition Period
July 1, 1976 - September 30, 1976

Ames Research Center	155,000	CF 6-13
Goddard Space Flight Center	595,000	CF 6-14
Jet Propulsion Laboratory	480,000	CF 6-15
Johnson Space Center	160,000	CF 6-16
Langley Research Center	280,000	CF 6-16
Tracking and Data Stations	330,000	CF 6-17
Various Locations	500,000	CF 6-18
Miscellaneous Projects Less than $50,000 Each	450,000	CF 6-19
Total, Transition Period	$2,950,000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE	Minor Construction of New Facilities and Additions to Existing Facilities not in Excess of $250,000 Per Project	
LOCATION	Various Locations	
		FY 1976 CoF ESTIMATE $5,000,000
FY 1974 $4,600,000		FY 1975 $4,500,000

COGNIZANT INSTALLATION: Various Locations

LOCATION OF PROJECT: Various Locations

COGNIZANT PROGRAM OFFICE: Office of the NASA Comptroller

SUMMARY PURPOSE AND SCOPE:

To provide for minor facility construction at NASA field installations and at Government-owned industrial plants engaged in NASA activities. This provides for minor facility projects involving the construction of new facilities or additions to existing facilities, each project of which is estimated to be not in excess of $250,000. Such minor construction is necessary in FY 1976 to further 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 adaptions required 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 work which must be accomplished in FY 1976 to meet general NASA installation requirements or technical facility needs.

This work is not solely or primarily required to support specific research or development programs. However, included are those items which are required in FY 1976 to meet the particular needs of one or more specific research or development programs and which can be adequately identified at

the time of submission of this budget estimate. Items of work proposed to be accomplished within this program for FY 1976 have been carefully selected from a list totaling about $9 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:

Tentative subprojects of work to be considered for accomplishment under this estimate are outlined under "PROJECT COST ESTIMATE" and total $5,000,000. Of the $5,000,000 total, $4,250,000 represents specific discrete items of work identified in this documentation and the balance, $750,000, is indicated as a "lump sum" amount to provide for facilities work of these types (new construction and additions) at the various field installations and estimated to cost not in excess of $50,000 for each such project. This amount in turn is based on a presentation of specific project tasks of the new construction type which must be accomplished in this time frame.

PROJECT COST ESTIMATE:

A. Ames Research Center	$535,000
1. Construction of Flood Control Basin	240,000

This project provides for the construction of a drainage basin of approximately 2 acres (8094 m^2) located within the north boundary of Ames Research Center, approximately 1/2 mile (800m) south of north boundary of the Center. Pumps and a discharge line as well as the necessary electrical utilities are included. This land is below the level of San Francisco Bay due to subsidence; thus, rain water run-off presently stands on Center property until it becomes stagnant, and becomes a breeding ground for mosquitos. The V/STOL static test stand and magnetic test facilities are located adjacent to this flooded area. The project is urgently needed for both health and environmental reasons.

2. Construction of Control Room for Static Test Facility, N-249 170,000

This project provides for the construction of an underground control room, fuel supply, and electrical service for the new static test facility. The work consists of a 30-foot by 40-foot (9m by 12m) concrete control room for personnel protection and security of important instrumentation. Electrical service consisting of 480 and 280/120 volts and relocation of existing floodlights for night operation will also be provided. Because the site is remote from other facilities, fire alarm, telephone service, and sanitary facilities are required for the operating personnel.

The existing test control and instrument rooms are portable trailers which all provide little protection for operating personnel or research equipment for hazards inherent in developmental research with rotor type aircraft. The trailers, regardless of protection that could be constructed, also present a reflective surface that compromises acoustical measurements associated with this testing. Current emphasis on V/STOL research and especially in the development of more efficient and quiet aircraft, in addition to the hazardous elements of the present arrangement, make it necessary that the proposed improvements be made. The data acquisition system for this static test facility will require some modifications in the future.

3. Addition Within the Flight and Guidance Simulation Laboratory, Building N-243 $125,000

This project will provide an interior addition to Building N-243. There will be four laboratories on the first floor, and an equal area for offices above the laboratories for a total gross area of 5,600 sq. ft. (504 m^2). The laboratory space will provide control and maintenance areas for the visual scene generator and set-up areas for simulation experiments. The building was originally built as a simulation laboratory with office space for approximately 40 people, but it presently is required to house over 100. Simulator control rooms are being occupied as office space by personnel using the Flight Simulator for Advanced Aircraft (FSAA) in support of FAA Certification programs; conference rooms, utility rooms, and laboratory spaces occupied by visiting experimenters using the FSAA in support of Advanced Medium STOL Transport (AMST); Tilt Rotor; Quiet Short Haul Research Aircraft (QSRA); Rotor Systems Research Aircraft (RSRA); and Space Shuttle Orbiter experiments, and by support service personnel for various simulators located in this building.

This project will convert presently uncommitted floor space to relieve this severe congestion which at this time severely hampers full and efficient utilization of the Center's simulation facilities.

B. Flight Research Center $205,000

1. Construction of a Storage Warehouse 205,000

This project provides for the construction of a pre-engineered metal building 80 feet (24.4m) by 120 feet (36.6m) by 24 feet (7.3m) eave height. The structure will provide warehouse space of a gross area of 9,600 square feet (892 m^2). The structure will be provided with minimum utilities consistent with warehouse occupancy. These minimum utilities will include fire protection, lights, 120/208 volt power, natural gas heating, and evaporative cooling.

This project will provide space to meet the increasing requirements for parts storage. As newer aircraft are added to the inventory of the Flight Research Center, particularly those one-of-a-kind aircraft such as the

X-24B, F-111 TACT, Remotely Piloted Research Vehicles and Highly Maneuvering Aircraft Technology (HiMAT), greater storage space is required which does not exist at the present time.

C. Goddard Space Flight Center $235,000

1. Construction of Frequency Standard and Test Building 235,000

This project provides for the construction of a frequency standard and test facility with an area of approximately 1,200 square feet (111 m^2). The exterior walls will be aluminum with cement block liners located on a heavy concrete slab base. The facility will have two screen rooms, a laboratory, and office space with heating and air conditioning. The project also includes 1,000 feet (305m) of fencing with an entrance gate and parking area which is to be located near the gate. The facility will be located 500 feet (150m) from any roads and in a tree area for the radio frequency (RF) shielding. To satisfy the Agency's requirements for precise range data to satellites and Network Very Long Baseline Interferometry (NVLBI) in the 1976-1977 period, timing and frequency control techniques are being developed. To test and maintain these standards, a facility is required that is vibration isolated, thermally controlled and radio frequency quiet. The facility will be used as a basic calibration standard as well as a laboratory in which research and development programs will be conducted.

D. Jet Propulsion Laboratory $520,000

1. Construction of Addition to Building, TM-17, Table Mountain (TM) 235,000

This project proposes the construction of a 3,500-square foot (326 m^2) addition to the existing headquarters building (TM-17) at the Table Mountain facility. Approximately 2,000 sq. ft. (186 m^2) will be added to the south which will provide additional offices, technical equipment storage, facility operational supply storage, and a mechanical room for heating, ventilating, and air conditioning equipment. Approximately 1,500 sq. ft. (140 m^2) will be added to the north for a sleeping area. Construction will be of masonry and heavy duty fireproof roofing shingles to match the existing building. The new facility storage space is the only area on the entire remote site where standard operating supplies, including emergency food supplies, can be kept. The existing headquarters building contains only one office, four bedrooms, and no storage facilities. All scientific and technical personnel are housed in substandard cottages which are over 45 years old and which are extremely expensive to maintain and heat. They are also located sufficiently distant from the headquarters building to make bad weather travel hazardous and inconvenient. Completion of this addition will permit demolition of the last three remaining buildings constructed by Smithsonian personnel (TM-8, TM-10, TM-11).

2. Construction of Control Room, Antenna Laboratory $55,000

This project provides for the construction of a 600-square foot (55.2 m^2) control room for Building 212, west range. Construction will consist of concrete footings and floor slab, masonry block walls, built-up roofing, lighting, air conditioning, five (5) sprinklers, and an evacuation alarm system. The new systems will be extensions of the existing systems in Building 212. The present area used for this control function is approximately 144 square feet (13.25 m^2) located in the north west corner of Building 212. During tests, the access used by personnel is through a window onto a wooden platform and then down some stairs. Due to the ever changing state of the art and the utilization of new equipment in a small area, it has been necessary to stack electronic equipment on top of each other in order to conduct tests. The amount of equipment in this small area has precluded the possibility of having a work bench or desk in the area. Construction of this control room will provide an adequate room for equipment and suitable working area for personnel.

3. Construction of Technical Service Facility at Edward Test Station (ETS) 230,000

This project will provide for the construction of a 2,700-square foot (245 m^2) concrete masonry unit structure. The structure will be air conditioned as required and include High Efficiency Particulate Air Filter (HEPA) for the "clean" area. Standard partitions, drop ceilings, floor tile, and rest rooms will also be included. This building will provide a major increment of a central facility designed to consolidate the major, nonhazardous technical support activities at ETS. These functions include instrumentation repair and calibration, chemical laboratory, transducer calibration and repair and a small clean assembly capability. This facility will be designed to consolidate scattered operations in a single up-to-date laboratory type building. Instrumentation work is currently in 10' x 45' (3.1m x 13.9m) and 8' x 35' (2.4m x 10.7m) standard trailers; the clean laboratory is in a 15-year old deteriorated trailer; the chemical laboratory is in a 29-year old "temporary" stud and stucco, much modified building. Maintenance costs are excessive, some project environmental requirements cannot be met, operation and administration costs are excessive. Hazardous chemicals have to be shipped off ETS for necessary analytical work for lack of capability. This project would accelerate demolition of older buildings and trailers that are no longer economical to maintain and is the key element of work to initiate implementation of the ETS Master Plan.

E. Johnson Space Center $50,000

1. Addition to Pyrotechnics Test Facility, Building 352 50,000

This project will provide additional space in the Pyrotechnics Test Facility, Building 352, to permit total qualification of initiators and flight-type hardware for the space shuttle program because existing space

is insufficient to house all the test equipment required for shuttle qualification testing at any one time. The work includes enclosing the concrete apron area on the east side of the building to make it an integral part of the existing high bay area. The access drive and walkways will be extended to the new door on the east side. The vibrator system cooling tower, exterior lighting, and fire alarm systems will be relocated. The new area will be provided with interior lighting, electrical circuits, and heating and air conditioning ducts.

F. Langley Research Center $675,000

1. Addition to Environmental and Space Science Laboratory, Building 1250 245,000

Office space is required for Environmental and Space Science Division personnel adjacent to the laboratory space they are presently utilizing in Building 1250. This project will provide a 5,000-sq. ft. (465 m^2) gross floor area office addition on the west end of the building. The addition will be constructed with a reinforced concrete foundation and floor slabs, a structural steel frame, and brick veneer cavity walls with insulated metal panel window units. All necessary heating, ventilating, air conditioning, lighting, and electrical power distribution will also be provided. Seventeen people will be moving into the new addition from trailers, with six of these also vacating laboratory space in Building 1293B. Twenty-five people will be moving from laboratory space in Building 1250 to the new addition. Because of its unique chemistry and biology laboratory accommodations, Building 1250 provides the logical facility for the consolidation of the environmental quality research and the high bay area provides excellent space for advanced technology laboratory development activity. At the present time there are 105 people occupying the building. Since the building was designed with office space for only 60 people, many of the occupants are using laboratory areas for offices, and there is severe crowding in the existing office space (less than 90 sq. ft./individual). The Langley environmental quality program has reached the point where the laboratory area used as office space is badly needed for research. This laboratory space is expensive and it is cost effective to construct the proposed office addition to Building 1250 to capitalize on existing laboratory areas and to alleviate overcrowding.

2. Construction of Administrative Management Building 240,000

Space is required on the West Area for records and personnel from the Personnel Division which are now located in the East Area. This project consists of a new masonry structure of approximately 5,000 square feet, (465 m^2) gross area. It will be located on the southwest corner of the intersection of Ames Road and Moffett Road and will house approximately 40 people. The building will initially be provided with corridors, rest rooms, and mechanical equipment room, with the remaining areas left open to provide maximum flexibility. Eighty-five percent of the Center's workforce is located in the West Area while the bulk of personnel division staff is in

the East Area. The distance of four miles, each way, to conduct personal transactions is both costly and inefficient while at the same time inhibiting the total involvement of the personnel staff in providing consultation and advice, due to their physical location. Another costly trade off pivots around the integration of the resources management systems involving payroll, business data systems division, and the personnel records unit. Centralization of personnel members will greatly reduce the built-in "time lag" for the numerous daily interfaces now encountered under the present East Area-West Area splintering.

3. Addition for Training Facility, Building 1194 $190,000

This project provides for an addition to the existing Library, B-1194, to be used for training in the West Area at LaRC. The addition will have approximately 4,000 sq. ft. (372 m^2) of classroom and administrative space, including necessary rest rooms and hallways. The Center's broad gauged training programs critically need additional space. These programs include apprentice training, equal employment training, secretarial, and upward mobility programs; and renewed emphasis upon short courses and specialized seminars to be offered locally. The present use of trailers as an interim measure is only a temporary solution because the space utilized is inadequate, has limited life and higher maintenance costs. Training is receiving increasing attention and this addition is vitally needed to meet identified needs. Phasing out classroom space in the East Area will curtail the need for several hundred trips per week with the attendant lost time involved.

G. Lewis Research Center $185,000

1. Shop Addition to 8 x 6 - Foot Supersonic Wind Tunnel, Building No. 55 80,000

This project will provide for a new shop building 63' x 30' x 22' high (19.2m x 9.1m x 6.7m) to be constructed adjacent to Building 55, 8 x 6 Supersonic Wind Tunnel (SWT) and Building 56, the Structural Dynamics Laboratory. The walls of the adjacent buildings will be used for two sides and the other sides will be constructed of concrete block. The roof will be steel joist, metal deck and built-up roofing. Electrical service, lighting, heating and other services will be provided. The shop will have a monorail and hoist with large roll-up door. The floor will be a concrete slab on grade.

Over the years the Spacecraft Preparation Area and Environmental Test Area has slowly expanded to a point where the 8 x 6 SWT support group no longer has a suitable work area in which to perform their duties.

The proposed new addition of 1890 sq. ft. (175.6m^2) will provide enough additional space to permit rearrangement of present facilities in a manner that will provide suitable area for the 8 x 6 SWT service support group.

2. Addition to Engine Research Building (ERB) No. 5 (Office Section) $105,000

This project will provide a needed second floor safety exit for the personnel in the ERB office section. Presently the personnel have access to only one exit which does not meet the safety standards. The addition will be a matching brick structure, two floors in height, with built-up roof and relocated matching aluminum sash. It will include heating, air conditioning and electrical work. The new stairway will have metal fire doors top and bottom. Design of the structure and site changes will blend with present surroundings and be esthetically pleasing.

At the present time, two means of egress from the second floor office section of ERB No. 5 which meet code and safety requirements do not exist. The proposed addition would incorporate an acceptable second means of egress. In addition, a much safer and accessible entrance and exit would be provided on the first floor for stretcher patients of the Medical Service Unit.

H. Wallops Flight Center $145,000

1. Construction of Addition to Airfield Radar Control Building, A-41 145,000

This project provides for an 1,800-square foot (167 m^2) addition to the West side of existing Building A-41. This will include rest room facilities, storage area, office and shop areas. This addition is to be constructed of masonry walls over concrete foundation and reinforced concrete floor slab. The roof structure shall be shed type and attached to the existing roof framing on Building A-41. The new area shall have a suspended acoustical ceiling, electrical power, lighting, heating, ventilation and air conditioning. A septic tank and drain field system, new well system and extended bituminous parking area will also be provided. Since the installation of the basic radar system equipment, other associated equipment has been added. All of this equipment has been concentrated in order to minimize impacting the office and shop areas. This has created operational problems, especially with the number of people in this one large room. It is now planned to add eight more racks of project support equipment which will require using the present office and shop areas. This will make necessary the additions provided by this project.

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I. Various Locations $1,700,000

1. Construction of Support Facilities for Mobile Lasers (LAGEOS) at Various Locations 1,310,000

This project will provide for the construction of support facilities for the periodic locations of seven mobile, precise laser tracking stations to support the Laser Geodynamic Satellite (LAGEOS). This project is designed to define the global tectonic plates, plate motion (earthquakes), plate stress and information about fault structures. The construction will consist of site clearing, grading, road construction, erection of temporary shelters, trailer hardstands, boresight towers, wind holddowns, groundings and sanitary facilities. Higher costs are estimated at the remote sites due to their distances from supporting centers and area locations. All costs have been tailored to the proposed sites.

The estimated cost to construct these facilities at these locations ranges from $100,000 to $235,000.

Each of the seven sites will be managed as a separate project because of the different locations envolved. This is the second increment of these LAGEOS projects. The first encrement was funded in FY 1975 at $980,000. The subsequent third increment will be approximately $750,000.

2. Installation of Commercial Power Service to Rosman (STDN) Station 240,000

This project provides for the installation of a commercial power service to the Rosman STDN station. The system will provide overhead cable service to within 2,000 feet (610m) of the site, direct burial cable installation from this point to the power plant and suitable outdoor switchgear and transformers to apply the service to the site load via the existing distribution system. This project will increase the reliability of station power by providing two independent sources and also will reduce operating costs.

3. Construction and Additions to Facilities at Industrial Plants 150,000

This project provides for the minor facility construction needs as required at the Government-owned industrial plants engaged in NASA activities. This work which is not directly program related involves the necessary erection of buildings and structures, installation of equipment, assembly of a new facility, a replacement facility, or the addition to an existing facility associated with the NASA industrial plants. This project is to provide for the priority work of this nature which will arise but cannot be specifically identified at this time. The work to be included in this project must be accomplished during this time in order to meet general NASA requirements at these industrial plants.

MISCELLANEOUS PROJECTS LESS THAN $50,000 EACH	$750,000
TOTAL	$5,000,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

It is estimated that between $4 and $6 million per year will be required for the continuation of this essential minor construction work at NASA field installations and Government-owned industrial plants engaged in NASA activities.

CONSTRUCTION OF FACILITIES

July 1, 1976 - September 30, 1976 Estimates

PROJECT TITLE	Minor Construction of New Facilities and Additions to Existing Facilities Not in Excess of $250,000 Per Project		
LOCATION	Various Locations		
July 1, 1976 - September 30, 1976		CoF ESTIMATE $2,950,000	
FY 1975 $4,500,000		FY 1976 $5,000,000	

COGNIZANT INSTALLATION: Various Locations

LOCATION OF PROJECT: Various Locations

COGNIZANT PROGRAM OFFICE: Office of the NASA Comptroller

SUMMARY PURPOSE AND SCOPE:

To provide for minor facility construction at NASA field installations and at Government-owned industrial plants engaged in NASA activities. This provides for minor projects involving the construction of new facilities or additions to existing facilities, each project of which is estimated to be not in excess of $250,000. Such minor construction is necessary during the period July 1, 1976 to September 30, 1976 to further 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 adaptions required 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 work which must be provided for during the period July 1, 1976 - September 30, 1976 to meet general NASA installation requirements or technical facility needs.

This work is not solely or primarily required to support specific research or development programs. However, included are those items which are required to meet the particular needs of one or more specific research or

development programs and which can be adequately identified at the time of submission of this budget estimate. Items of work proposed to be accomplished within this program during the quarter year 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 this quarter 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:

Tentative subprojects of work to be considered for accomplishment under this estimate are outlined under "PROJECT COST ESTIMATE" and total $2,950,000. Of this total, $2,000,000 represents discrete work packages all of which reflect requirements at designated NASA field installations which were not included in prior year budget estimates. An additional amount of $500,000 is included for the accomplishment of projects which had previously been scheduled in prior year budget estimate but which could not then be undertaken due to the need to revise the listing of work to be accomplished within the allocated resources for a given fiscal year. These revisions are in keeping with the basic intent of this program and allow for the accommodation of urgent but unforeseen facility project work which could not fully qualify for accomplishment under Section 1(g) as unforeseen programmatic needs. Also included is $450,000 as a "lump sum" amount to provide for facilities work of these types (new construction and additions) estimated to cost not in excess of $50,000 for each project.

PROJECT COST ESTIMATE:

A. Ames Research Center $155,000

1. Addition to the Space Suit Physiology Laboratory, Building N-239A 75,000

This project provides for the addition of a mezzanine deck of approximately 1,500 sq. ft. (139 m^2) over existing environmental chambers which will adjoin the present mezzanine office area of the life sciences high bay, Building N-239A. By extending the new passageway via a catwalk with a railing, a second exit stair will be provided for both the new laboratory spaces and the existing offices. A new heating-cooling system will be provided. Existing water and fire protection sprinkler system will be extended to the new facility. These new laboratories will primarily be utilized to support a vastly expanded program of space suit investigations into the mechanisms of metabolic and thermal control, and fluid balance and electrolyte shifts within the body as influenced by the existing space suits and their life support systems. Secondarily, these new laboratory spaces will accommodate the laboratories located in Building 239 which will be lost as a result of an urgent requirement to expand the Human Research Facility which again, is in direct support of the space shuttle program.

2. Addition to Shop Area of the Arc Jet Laboratory, Building N-238 80,000

This project provides an "L"-shaped addition of approximately 1,800 sq. ft. (167 m^2). Approximately one-third of this space is devoted to laboratory space for instrumentation and calibration and the remainder for model preparation. These activities are presently located in Building N-238 which is too small for these functions. In addition, the personnel working in this area experience work interruptions because the area must be cleared during Arc Jet operation. The Interaction Heating Shuttle Panel Test Facility is currently operational with the test time of the arc increased from a minute to 30 minutes or more. Safety and efficiency considerations require that a safe work area, separated from the arc jet operation, be provided. The facility supports space shuttle and high reynolds number military research, and includes the giant planet pilot program.

B. Goddard Space Flight Center $595,000

1. Addition to the Environmental Testing Facility, Building 10 245,000

This project provides for the construction of a 7500-sq. ft. (697 m^2) addition to the Environmental Testing Facility, Building 10 for about fifty Systems Reliability Directorate personnel. This addition, which provides 4000 sq. ft. (372 m^2) of office space and 3500 sq. ft. (325 m^2) of laboratory space, will support the planned relocation of these personnel which in turn permits the consolidation of the now fragmented Quality Assurance Division and the parent Directorate into two facilities. Such relocation will permit a more effective use of the available space, eliminate current difficulties resulting from communications and coordination problems between organizational elements, and will provide for a more effective and functionally efficient operation. Included in this addition will be partitioning, lighting, heating, ventilating and air conditioning, rest room facilities and utilities to meet the requirements of the functions being consolidated in Building 10. The space being vacated will be utilized by personnel in the Projects Directorate who are presently housed in leased space.

This project is the second phase of a GSFC long term program undertaken in fiscal year 1975 to significantly improve the utilization of available space at the Center. The first phase involved the modification of three separate facilities totaling approximately 65,000 net sq. ft. (6039 m^2) of office, laboratory and storage space at a cost of $890,000. It is anticipated that additional resources may be required in subsequent years for further improvement in space utilization necessary to properly accommodate the Center's changes in workload and manpower requirements.

2. Construction of Display Area Adjacent to Space Projects Building 1 105,000

This project provides for the construction of a 3,600-sq. ft. (334 m^2) partially enclosed area adjacent to Building 1 for the display of space oriented exhibits. The large number of visitors justifies the need for a display area where visitors can view flight hardware and spacecraft exhibits. The need for this facility will become more pressing due to the expected increase in visitors during the 1976-1977 time frame.

3. Construction of Addition to Instrument Construction and Installation Laboratory, Building 5 245,000

This project provides for the construction of a 6,000-sq. ft. (558 m^2) mezzanine addition over the south wing of the Instrument Construction and Installation Laboratory, Building 5. A structural steel and concrete mezzanine is planned with partitions and finishes suitable for the laboratory and office occupancy. The mezzanine will enable the relocation of various elements of the Sounding Rocket Division of the Engineering Directorate into a centralized location. This project will provide for more efficient operation of the sounding rocket program which encompasses activities from project initiation through launch in support of scientific and applications research.

C. Jet Propulsion Laboratory $480,000

1. Construction of Addition to Lumber Storage Building, Building 234 105,000

This project will provide for approximately 1,200 square feet (110 m^2) of additional area at the east of Building 234 plus rearrangements to a 250-square foot (23 m^2) existing locker room in Building 234. The project will substantially improve working conditions for many of the craftsman at JPL by providing a badly needed rest room and clean up facility, isolated work areas for foremen, a lock and key shop and replacement of old locker equipment with modern, adequate change facilities. Construction will be single story, slab floor and concrete block walls to match the existing building. A metal pan and lightweight concrete roof will carry a hot mopped moisture barrier. Rest rooms, shower and change areas will be standard industrial construction and afford reasonable privacy for the men. This work is required because there are no rest room facilities on the first floor of the Carpenter Shop, Building 201, or in the Storage Building 234. Some 20 to 30 craftsmen work out of these areas and are forced to use very minimum change facilities and have no "wash up" capability available to them. Nearby office facilities are occasionally used, resulting in excessive dirt and maintenance costs. The lock and key shop needs to be relocated for supervision and efficiency in operation. The men need a "headquarters area" with sufficient rest room facilities, larger lockers that are adequate for a man's effects, and a place with reasonable privacy to clean up at the end of the day.

2. Construction of Cast and Cure Building No. 1 for Solid Processing Line, Edwards Test Station (ETS) 165,000

This project provides for the construction of a 500-square foot (46.5 m^2) standard metal structure. The building will be constructed over a concrete floor slab and will contain a centrally located underground curing oven. The mechanical equipment will occupy an area of 160 square feet (14.9 m^2), and the solid fuels casting and curing operations will be located in an area of 340 square feet (31.6 m^2). The underground curing oven is temperature controlled between 50°F (10°c) and 200°F (94°c) using hot or chilled circulating water and fans. A monorail crane provides for handling of the motor cases and their insertion into the below floor oven. The facility will be ventilated only. The project includes extension of the required access roads, underground extension of the ETS supporting utilities, and relocation of perimeter fencing as required by appropriate safety manuals. Present composite base solid propellants cannot supply the specific impulse requirements for future planetary missions of the series but the new double base systems theoretically are able to accomplish this.

The new propellant systems are hazardous to process and the size requirements for retro motors increase with spacecraft weight and trajectory velocity. Development work is necessary to prove the practical feasibility, of the theoretical projection, in full scale motors. This facility will permit the test program to be implemented in direct support of long-range requirements.

3. Construction of Two Oxidizer Operations Buildings, Edwards Test Station (ETS) $210,000

This project provides for the construction of the following two small buildings: (1) 330-square foot (30.7 m^2) building for oxidizer grinding, and (2) 720-square foot (67.0 m^2) building for blending/drying operations. An access road, utilities and fencing will also be provided. The buildings will be constructed of concrete block and each will have a "blow out" wall. Both buildings will be insulated and temperature stabilized using hot water heating and direct expansion cooling equipment. Necessary safety items, sprinklers, cleaners and exhaust systems are part of this project. These two small grinding and blending/drying facilities are being planned as the "batch production" sites for double base propellants at the Edwards Test Station. These propellants are coming under intensive R&D development as being required for retro motors on the long-range requirements. Facilities need to be made available to safely handle the quantities of fuel involved in the anticipated processing operations. Siting of these facilities will be in accord with safety criteria requirements as shown on the ETS master plan.

D. Johnson Space Center 160,000

1. Construct Storm Drains, 400 Area 160,000

This project provides for improving the storm water drainage system in the center support area of JSC. The work includes installing a subsurface storm sewer pipe system, regrading existing swales, constructing new swales, installing area inlets, and paving an outfall structure at the discharge point of this system into ditch 26. The storm sewer system is required to alleviate ponding and vegetation growth which is hampering ground maintenance in this area and which is contributing to excessive mosquito breeding.

E. Langley Research Center 280,000

1. Addition to the Plant Safety Building, Building 1248 200,000

The health facility to be constructed under this project will provide space for administrative activity, treatment of minor illnesses and injury, performance of job-related and preventive physical

examinations, and emergency services. The construction will be of concrete masonry units and brick - a 4,000-square foot (372 m^2) addition to Building 1248. The addition is proposed to provide for centralized emergency and occupational health activities. The various facets of health services at Langley are currently dispersed at locations that make coordination and communication difficult and sometimes delayed. The facility will enable upgrading medical functions to present-day needs and recognized standards. Coordinated rapid response to emergencies will be achieved through the improvement of centralization of emergency teams. Ambulance drivers, nurses, and fire-fighting personnel will all be dispatched to an emergency scene from a single location, and health personnel may be trained with immediate availability to their duty station.

2. Addition to 8-Foot High Temperatures Structures Tunnel (HTST), Building 1265 $80,000

The work consists of a single story addition to the southwest corner of the office portion of Building 1265, to add approximately 1,600 square feet (148 m^2) of space to the building. The addition will match the existing building in design and construction. The existing office space in B-1265 was designed to serve the minimum needs of personnel conducting aeronautical research in the 8-Foot HTST. Recently, with the addition of the thermal protection system test facility to the 8-Foot HTST complex, and the full dedication of both these facilities to shuttle development, on a multiple shift basis, it has become necessary to increase the staff for the operation of these facilities beyond the capabilities of the available office space in B-1265. At present, some of the professional staff are housed in substandard office space provided by two trailers adjacent to the building.

F. Tracking and Data Acquisition Stations 330,000

1. Construction of Ground Improvement Structures at Madrid Complex 330,000

This project provides for the installation of approximately 9,800 feet (3,000 meters) chain link fencing approximately 7 feet high (2.1 m) around the perimeters of the three stations at the Madrid complex. Perimeter lighting on 20-foot (6 m) poles which are 80 feet (25 m) apart will be installed. The stations, at the present time, have perimeter wire strand fence to keep cattle out. However, chain link fence is required to prevent inadvertent or deliberate intrusion by people.

a. DSN Madrid (2 stations) (200,000)

b. STDN Madrid (1 station) (130,000)

G. Various Locations $500,000

To provide for the accomplishment of project work which had prevously been scheduled but which could not then be undertaken due to the need to revise the listing of work to be accomplished within the allocated resources for a given fiscal year.

1. Addition to Materials Science Laboratory, Building N-240, Ames Research Center (245,000)

The project is a single story building addition to the High Bay of the Material Science Laboratory, Building N-240. The addition will provide approximately 6,000 square feet of office, graphics and computer related equipment areas for research scientists and support personnel of the Ames Computational Fluid Dynamics Branch. The project includes building site work and extension of utility lines into the addition, as well as complete mechanical and electrical.

Approximately 33 research scientists are now associated with the Ames Computational Fluid Dynamics Branch, studying various aerodynamic problems of National interest; these studies are largely based upon numerical simulation and visual display of flow fields about appropriate objects. At present, this group and the graphic equipment required for visual simulation and analysis work, is housed in the Central Computer Facility which is already overcrowded. By the end of FY 1975 about 50 people will be attached to this group and, similarly, the necessary graphic and related equipment will about double. It is also anticipated that Central Computer Facility hardware will expand by that time. The proposed addition, supplemented by the existing office and laboratory spaces on the second floor of Building N-240, is necessary to relieve this congestion. Further, designing the project to accommodate the essential graphic and related equipment, will result in improved equipment and personnel effectiveness in analyzing data from the Central Computer, ILLIAC IV, and other computers which provide the calculations comprising an integral part of this group's research efforts.

2. Addition to Blockhouse, Launch Complex 36, Kennedy Space Center (225,000)

This project provides a 5,100 square foot (474 square meters) addition to the blockhouse annex of the Atlas Centaur Vehicle Launch Complex 36, Eastern Test Range. This addition will permit consolidation of engineering personnel in the blockhouse annex and enable the release of 14 trailers presently utilized by the personnel at the blockhouse.

C. Various Locations $500,000

To provide for the accomplishment of project work which had previously been scheduled but which could not then be undertaken due to the need to revise the listing of work to be accomplished within the allocated resources for a given fiscal year.

1. Addition to Materials Science Laboratory, Building N-240, Ames Research Center (240,000)

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This project provides a 5,100 square foot (474 square meters) addition to the blockhouse annex of the Atlas Centaur Vehicle Launch Complex 36, Eastern Test Range. This addition will permit consolidation of engineering personnel in the blockhouse annex and enable the release of 14 trailers presently utilized by the personnel at the blockhouse.

3. Addition of the Helium Distribution System Helium Gas Holder, Building 121, Lewis Research Center ($35,000)

This project will provide for the construction of 1,500 linear feet of underground 4-inch line for transporting helium gas (resulting from boil-off of liquid helium used in Engine Research Building (ERB) research facilities) directly to helium purification, storage, and reliquification equipment located adjacent to helium gas storage container holders, Buildings 121 and 122.

The existing helium gas holder, Building 120, adjacent to the Engine Research Building 5, has deteriorated and is in need of replacement unless other helium recovery measures are instituted. The proposed line will not only replace the holder, Building 120, but will also eliminate the costly and time consuming present procedure of collecting the helium in the holder, pumping it into a tube trailer, and then transporting it to Buildings 121 and 122 for temporary storage. Further, the present method of handling the helium results in contamination which would be eliminated by use of the direct pipeline proposed.

MISCELLANEOUS PROJECTS LESS THAN $50,000 EACH	450,000
TOTAL	$2,950,000

FUTURE CoF ESTIMATE FUNDING REQUIRED TO COMPLETE THIS PROJECT:

It is estimated that between $4 million and $6 million per year will be required for the continuation of this essential minor construction work at NASA field installations and Government-owned industrial plants engaged in NASA activities.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

SUMMARY

Facility Planning and Design
FY 1976

	Amount	Page No.
Regular Requirements:	$5,375,000	
Master planning	225,000	CF 7-2
Engineering support	875,000	CF 7-3
Preliminary engineering reports and related engineering studies	1,125,000	CF 7-5
Final design	3,150,000	CF 7-5
Other Requirements:	3,900,000	
Shuttle facility planning and design	3,440,000	CF 7-6
Spacelab/payloads planning and design	460,000	CF 7-7
Total FY 1976	$9,275,000	

Transition Period
July 1, 1976 - September 30, 1976

Regular Requirements:	1,950,000	
Master planning	125,000	CF 7-9
Engineering support	655,000	CF 7-9
Preliminary engineering reports and related engineering studies	570,000	CF 7-11
Final design	600,000	CF 7-11
Other Requirements:	850,000	
Shuttle facility planning and design	850,000	CF 7-12
Total, Transition Period	$2,800,000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1976 ESTIMATES

PROJECT TITLE Facility Planning and Design FY 1976 CoF ESTIMATES $9,275,000	
FY 1974 $13,600,000	FY 1975 $10,900,000

The funds requested in this estimate are required to provide for the following advance planning and design activities related to facilties activities and projects:

a. The accomplishment of necessary development and master planning for field installations and, where not otherwise provided for, the updating of record drawings and the provision of engineering services.

b. The preparation of preliminary engineering reports, cost estimates, and design and construction schedules.

c. The preparation of final construction contract plans, specifications, and associated cost estimates and schedules that are required to implement construction projects.

d. The accomplishment of facilities siting and other investigations, as well as the accomplishment of special facilities studies and reports.

The $9,275,000 requested for facility planning and design for FY 1976 is composed of two major segments:

a. Regular requirements - $5,375,000

b. Other requirements - $3,900,000

Regular requirements encompass the basic purposes outlined above. The "other requirements", while also in support of these purposes, cover those special needs which are related to large, complex projects or specific programs which are considered to represent high potential future construction requirements and for which early definition is essential.

These large projects require significantly more planning and longer lead time than is normally involved. This planning must be completed prior to inclusion of the project in a budget request, consequently, most of these projects represent a continuing effort from previous years rather than new work. For this reason, the budgetary needs for this segment of facility planning and design reflect a significant reduction over funds required in the previous year.

1. REGULAR REQUIREMENTS

A. Master Planning $225,000

This segment of the requirement includes the necessary provisions to update and further develop existing Master Plans for the field installations including facility studies and site investigations. Documentation will define facility parameters within which subsequent engineering efforts will be based for future development. This also provides for documentation on existing plans where actions or deviations from previous plans have not been recorded for the various field installations.

Master Plans at the various field installations are generally updated at cyclic three-year intervals. Approximately one-third of the field installations are involved in any one fiscal year, keeping the level of effort relatively constant. These plans provide for the orderly consideration of the allocation, proper arrangement and efficient correlation of land areas and structures to serve the purpose of the various installations. Representative master planning activity candidates for FY 1976 are:

(1) Flight Research Center

The updating of the existing Master Plan to reflect current space shuttle modifications and also the latest changes in land uses.

(2) Johnson Space Center

The initiation of shuttle-related changes in programmatic assignments for the Center following the Apollo Soyuz mission and the updating of the existing plan to reflect these changes.

(3) Ames Research Center

An update for the existing plan to incorporate possible "land trade" activities between the Center and Pacific Gas and Electric Company

in connection with anticipated modifications to the 40' x 80' wind tunnel. It will include pertinent planning used in E.O. 11724 land utilization survey and will also incorporate current changes in the existing five-year plans and programmatic assignments.

(4) White Sands Test Facility

Studies are required to provide an updated inventory to reflect space shuttle modifications and incorporate the current facility plans into the standard approved format.

B. Engineering Support $875,000

Provisions for facility studies and specific engineering support have taken on an added importance in recent years, and must continue to be given high priority throughout FY 1976. These efforts are of upmost importance due to the more unpredictable cost situation which currently exists and recent cost trends in construction materials, fuels, and operation and maintenance cost for the physical plant. This also includes provisions for establishing and maintaining a current engineering data base and updated construction specifications for utilization by the various field installations. The following items are included in the FY 1976 requirements:

(1) Value Engineering, Cost Validation and Analysis

This will provide for the procurement of engineering services to improve, whenever possible, cost effectiveness of facility projects by subjecting project design criteria, specifications and working drawings for specific material components and systems to a detailed independent review by engineering specialists in the particular area of involvement. It will also provide services necessary to more accurately predict facility costs which will aid in resource planning for the various field installations.

(2) Building Research and Advisory Board Support

This covers annual support to the Federal Construction Council (FCC) operations and provides for special studies that this Council will perform throughout FY 1976 to help advance the science and technology of Federal Government building and construction. The FCC is a committee of the Building Research Advisory Board (BRAB), National Academy of Sciences.

(3) Utilities Services/Rates Analysis

This provides for the continued services of utility rate analysis support, to include counseling, surveillance, and agency-wide recommendations with regard to utility rates, contract negotiations and systems operations. This has become of increasing importance in light of the rapid increases in utility costs and supply problems.

(4) Design Specifications Update and Support

This provides continued engineering services for updating and operating the agency-wide construction specification system which combines a catalog of preapproved standard construction specifications on magnetic tape and a computer software program for selective retrieval and taped printouts of bid specifications.

(5) Minor Facility Project Update and Support

This will provide engineering services for the agency wide facilities information system for all facility projects from inception through design and construction. This system has the capability of providing all pertinent information on projects including priority assignments, technical information, cost estimates, schedules, etc., and providing a continuous "overview" to assisting management in making timely project and program decisions. This system also provides as a by-product, a solid accessible method for storage of historical data on facility projects.

(6) Engineering Handbook Update

The Facilities Engineering Handbook is a document prepared by Headquarters, to guide the field installations on a standardized approach to facilities engineering, These handbooks are used as policy and criteria for all in-house engineering as well as work done by Architectural-Engineering firms. Since new criteria is constantly being developed and/or corrected, the handbook must be modified accordingly.

(7) Facility Operation and Maintenance Analysis

This provides for engineering support in implementing, at field installations, recommendations of previous effort concerning manpower utilization, work control systems, preventive maintenance, and financial management and reporting. This also provides for limited operation and maintenance management surveys to be conducted on a priority basis, at selected NASA field installations.

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(8) Energy Reduction Analysis and Support

This provides for the continuation of engineering services to establish both immediate and long range energy conservation criteria for the operational management and design of commercial-type buildings, coincident with validation of an energy computer modeling program. This project will provide instrumentation and computer modeling at selected Centers and expand the types of structures being tested. This is a continuation of an existing program of developing substantive energy conservation design criteria and operational procedures for existing standard-type buildings.

C. Preliminary Engineering Reports and Related Engineering Studies $1,125,000

(1) Preliminary Engineering Reports (725,000)

Preparation of preliminary engineering reports (PER's), investigations, and project studies related to proposed facility projects to be included in the FY 1978 Construction of Facilities program are provided for by this estimate. 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. This request will provide for PER work associated with proposed subsequent non-space shuttle construction involving and estimated cost of $25 million to $30 million of construction for which updated PER's will be needed and with new projects estimated to cost $20 million to $25 million for which complete new PER's will be required.

(2) Related Engineering Studies (400,000)

Investigations and project studies related to proposed facility projects to be included in the subsequent Construction of Facilities programs are provided for by this estimate. Such studies have taken on an increased importance in recent years and involve chemical waste disposal, utility control systems improvements, and miscellaneous energy and like studies. These studies are required to allow for the timely development of projects to meet the stated functional needs and to provide basic data, cost estimates, and schedules for related future budgetary proposals.

D. Final Design $3,150,000

The amount requested will provide for the preparation of designs,

plans, drawings and specifications necessary for the accomplishment of non-space shuttle facility projects, primarily those which are planned for inclusion in the FY 1977 Construction of Facilities program. This request will provide for final design work associated with such proposed subsequent construction of this nature estimated to cost $35 to $40 million. It will also provide for residual requirements of this nature which have accumulated from prior years final design activities.

Subtotal, Regular Requirements $5,375,000

2. OTHER REQUIREMENTS

These other facilities planning and design requirements are generated by potential future projects, large in size and of a complex nature. Those in this particular request are primarily associated with future space programs which require a long planning cycle. Early and progressive design work is essential to ensure 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 facility projects. For this reason, these requirements must be provided for over and above the regular and the more recurrent facility planning and design needs covered above.

A. Shuttle Facility Planning and Design $3,440,000

(1) Shuttle Facilities Studies and Preliminary Design (440,000)

This portion of the total space shuttle facility requirement is associated with the preparation of preliminary engineering reports (PER's), the conduct of facilities investigations and the studies for facilities projects to be included in the FY 1978 Construction of Facilities program. This preliminary work is associated with future construction for that year now estimated to cost in the range of $50 to $55 million and is to be carried out in relation to space shuttle related projects such as:

(a) Launch and Landing Facilities

Additional studies will be conducted and PER's will be implemented towards modifying existing facilities, to satisfy refurbishment and logistics facility requirements at the launch and landing complex. Further studies will be needed to better define the facility needs as they relate to higher launch rates and to implement value engineering in the high value projects.

(b) Solid Rocket Booster Facilities

Studies and PER's will be continued toward modifying existing facilities or providing added capabilities for the solid rocket booster production as they relate to satisfying increased production requirements.

The cost of these related studies/engineering reports is estimated at $100,000 and the estimated cost of preparing preliminary engineering reports (PER's) is $340,000.

(2) Shuttle Facilities Final Design ($3,000,000)

This portion of the total facility planning and design requirement for space shuttle facilities is associated with the preparation of final design, drawings and specifications required for the proposed subsequent construction of space shuttle facilities, now estimated to cost $65 million to $70 million, and which may be included in a FY 1977 Construction of Facilities request. This design effort is mainly related to the second phase of the launch and landing facilities at Kennedy Space Center required to support the higher launch rate. It is directed toward preparation of final design drawings and specifications for the additional launch facilities needed to support the initial launch capability and higher flight rate particularly the second pad, mobile launch platform and vehicle assembly building required to support recovery operations at Kennedy Space Center. Also included is design for certain ground test facilities and manufacturing and final assembly facilities at MAF required for the greater production rates.

B. Spacelab Payloads Planning and Design $460,000

This planning requirement is related to the study, preliminary engineering and final design of initial facilities necessary to support the spacelab and payloads programs. These programs are essential to provide the capability for conducting science, application and technology missions. In addition, increased facilities are anticipated to be needed for launch, operation and experiment installations and integration activities. These facilities are now estimated to cost $5 million to $7 million and it appears will be needed in the FY 1977 construction of facilities time frame. The cost of these studies and preliminary engineering effort is estimated at $100,000 and the final design is estimated at $360,000.

Subtotal, Other Requirements	$3,900,000
Total FY 1976 Request	$9,275,000

CONSTRUCTION OF FACILITIES

July 1, 1976 - September 30, 1976 Estimates

PROJECT TITLE Facility Planning and Design	
July 1, 1976 - September 30, 1976 CoF Estimates $2,800,000	
FY 1975 $10,900,000	FY 1976 $9,275,000

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

a. The accomplishment of necessary development and master planning for field installations and, where not otherwise provided for, the updating of record drawings and the provision of engineering services.

b. The preparation of preliminary engineering reports, cost estimates, and design and construction schedules.

c. The preparation of final construction contract plans, specifications, and associated cost estimates and schedules that are required to implement construction projects.

d. The accomplishment of facilities siting and other investigations, as well as the accomplishment of special facilities studies and reports.

This $2,800,000 request for facility planning and design for July 1, 1976 - September 30, 1976 is composed of two major segments:

a. Regular requirements $1,950,000

b. Other requirements $850,000

Regular requirements encompass the basic purpose outlined above. The "other requirements", while also in support of these purposes, cover those special needs which are related to large, complex projects or specific programs which are considered to represent high potential future construction requirements and for which early definition is essential. These larger projects require significantly more planning and longer lead time than is normally involved. This planning must be completed prior to inclusion of the project in a budget request, consequently, most of these projects represent a continuing effort from previous years rather than new work.

1. REGULAR REQUIREMENTS

A. Master Planning $125,000

This segment of the requirement includes the necessary provisions to update and further develop existing Master Plans for the field installations including facility studies and site investigations. Documentation will define facility parameters within which subsequent engineering efforts will be based for future development. This also provides for documentation on existing plans where actions or deviations from previous plans have not been recorded for the various field installations.

Master Plans at the various field installations are generally updated at cyclic three-year intervals. Approximately one-third of the field installations are involved in any one fiscal year, keeping the level of effort relatively constant. These plans provide for the orderly consideration of the allocation, proper arrangement and efficient correlation of land areas and structures to serve the purpose of the various installations.

(1) Kennedy Space Center

A major master planning and associated facility utilization study will be needed to fully explore and document the various aspects of land/facility use changes and building space consolidations necessary for KSC to most effectively accommodate the refined definition of the impacts and programmatic/functional requirements of the space shuttle.

(2) Downey NASA Industrial Plant

A major update of the existing Master Plan which will incorporate the various modifications and changes in facility and land utilization to provide for space shuttle orbiter production, to develop a statistical/narrative inventory of existing manufactoring capabilities, and to refine planning which will accommodate probable future shuttle-related manufacturing needs.

B. Engineering Support 655,000

Provisions for facility studies and specific engineering support have taken on an added importance in recent years and with current budget limitations must continue to be given high priority. These efforts are of upmost importance due to the unpredictable cost situation which currently exists and recent cost trends in construction materials, fuels and operation and maintenance cost for the physical plant. This also includes provisions for establishing and maintaining a current engineering data base and updated performance specifications for utilization by the various field installations. The following items are included in these requirements:

(1) Value Engineering, Cost Validation and Analysis

This will provide for the procurement of engineering services to improve, whenever possible, cost effectiveness of facility projects by subjecting project design criteria, specifications and working drawings for specific material components and systems to a detailed independent review by engineering specialists in the particular area of involvement. It will also provide services necessary to more accurately predict facility costs which will aid in resource planning for the various field installations. This procurement will be required during the transition period although the related work will not actually be executed until the following fiscal year. Therefore, resources will be needed in this time frame to award contracts for the related work.

(2) Building Research and Advisory Board Support

This covers annual support by NASA as a participating agency to the Federal Construction Council (FCC) operation and provides for special studies that this Council will perform throughout Fiscal Year 1977 to help advance the science and technology of Federal Government building and construction. The FCC is a committee of the Building Research Advisory Board (BRAB), of the National Academy of Sciences.

(3) Design Specifications Update and Support

This provides continued engineering services for updating and operating the agency-wide construction specification system which combines a catalog of preapproved standard construction specifications on magnetic tape and a computer software program for selective retrieval and taped print-outs of bid specifications. Although much of the work will be executed during the following fiscal year, resources will be required in this time frame to allow for procurement of contract services to accomplish the work.

(4) Minor Facility Project Update and Support

This will provide continued engineering services for inputing current information on minor facilities projects into an ongoing computerized agency-wide information system and for operating this system for all field installations throughout a major portion of the following fiscal year.

(5) Energy Reduction Analysis

This will provide engineering services to develop utility control techniques applicable to all field installations and will serve as an agency-wide guide when future utility conservation measures are enacted.

(6) Cooling Tower/Boiler Treatment Study

This provides for engineering support necessary to examine treatments for cooling towers and boilers at the various installations throughout the agency in order to reduce/eliminate current problems associated with these systems. This has become increasingly important in light of major problems recently experienced by several major field centers.

C. Preliminary Engineering Reports and Related Engineering Studies $570,000

(1) Preliminary Engineering Reports

Initiation of preliminary engineering reports (PER's), investigations, and project studies related to proposed facility projects to be included in subsequent Construction of Facilities programs are provided for by this estimate. 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 basic data, cost estimates and schedules related to any such future budgetary proposals. This request will provide for initiation of PER work associated with proposed subsequent non-space shuttle construction. The remaining funds required for completion of this cycle of PER effort will be included in the FY 1977 estimates.

(2) Related Engineering Studies

Investigations and project studies related to proposed facility projects to be included in the subsequent Construction of Facilities programs are provided for by this estimate. Such studies have taken on an increased importance in recent years and involve chemical waste disposal, utility control systems improvements and various energy and like studies. These studies are required to allow for the timely development of projects to meet the stated functional needs and to provide basic data, cost estimates, and schedules for related future budgetary proposals.

D. Final Design 600,000

The amount requested will provide for the initiation of designs, plans, drawings and specifications necessary for the accomplishment of non-space shuttle facility projects planned for inclusion in the FY 1978 Construction of Facilities program. This request will provide for initiation of final design work associated with proposed subsequent construction of this nature. The additional funds required to complete design of the FY 1978 non-shuttle program will be included in the FY 1977 Budget.

Subtotal, Regular Requirements $1,950,000

2. 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 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 planning effort and associated preliminary engineering reports greater than general type facility projects. For this reason, these requirements must be provided for over and above the regular and the more recurrent facility planning and design needs covered above.

A. Shuttle Facility Planning and Design $850,000

(1) Shuttle Facilities Studies and Preliminary Design (200,000)

This portion of the total space shuttle facility requirement is associated with the preparation of preliminary engineering reports (PER's), the conduct of facilities investigations and the studies for facilities projects to be included in the FY 1979 Construction of Facilities program. This preliminary work is associated with future construction for that year, now estimated to cost in the range of $45 million to $50 million and is to be carried out in relation to space shuttle related projects such as:

(a) Solid Rocket Booster Facilities

Studies and PER's will be continued toward modifying existing facilities or providing capabilities for the solid rocket booster production as they relate to satisfying increased production requirements.

Funds for completion of this study and preliminary design effort will be included in the FY 1977 budget.

(b) Launch and Landing Facilities

Additional studies will be conducted and PER's will be accomplished towards modifying existing facilities to better satisfy support facility requirements at the launch and landing site. Although no specific facilities have yet been validated for this time frame, it is felt that certain potential modifications have sufficient merit to warrant further studies to determine more cost effective methods of satisfying higher launch rates during the operational phase.

(2) Shuttle Facilities Final Design ($650,000)

This portion of the total facility planning and design requirement for space shuttle facilities is associated with the initiation of final design, drawings and specifications required for the proposed subsequent construction of space shuttle facilities, now estimated to cost $50 million to $55 million, and which may be included in a FY 1978 Construction of Facilities request. This design effort is mainly related to second phase of launch and landing facilities at Kennedy Space Center required to support the higher launch rate.

Funds for completion of this design effort will be included in the FY 1977 Budget.

Subtotal, Other Requirements	$850,000
Total for July 1, 1976 - September 30, 1976 Period	$2,800,000

U.S. GOVERNMENT PRINTING OFFICE : 1975 O - 566-538