National Aeronautics and
Space Administration

Budget Estimates

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FISCAL YEAR 1983

Volume II

Construction of Facilities

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

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SUMMARY
INFORMATION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

GENERAL STATEMENT

The Construction of Facilities (CoF) appropriation provides for contractual services for repair, rehabilitation and modification of existing facilities; the construction of new facilities; the acquisition of related facility equipment; the design of facilities projects and advance planning related to future facilities needs.

The funds requested for 1983 provide for: the continuation of prior year's endeavors in meeting the facilities requirements for the Space Shuttle; Space Shuttle Payload support operations; modification of aeronautical research and development facilities; repair, rehabilitation, and modification of other facilities to maintain, upgrade and improve the usefulness of the NASA physical plant; minor construction of new facilities; and facility planning and design activities.

The projects and amounts in the budget estimate reflect Space Shuttle and Space Shuttle Payload requirements that are time sensitive to meet specific milestones. Other program requirements for 1983 include the construction of a data analysis facility at the Ames' Dryden Flight Research Facility; rehabilitation and modification of utility systems at the Goddard Space Flight Center and rehabilitation of the Airfield at Goddard's Wallops Flight Center; modifications to the transonic dynamics tunnel and modifications to the 4- by 7-meter low speed tunnel at the Langley Research Center; and, modifications of the 450 PSI air system and modification of rocket engine test facility for altitude testing at the Lewis Research Center.

The FY 1983 program continues to meet the objectives of preserving and enhancing the capabilities and usefulness of existing facilities and to ensure safe economical and efficient use of the NASA physical plant. This request continues the necessary rehabilitation and modification program as in prior years and continues a repair program. The purpose of the repair program is to restore facilities to a condition substantially equivalent to their originally designed capability. The minor construction program continues to provide a means to accomplish smaller facility projects which accommodate changes in technical and institutional requirements. This program also includes projects which continue NASA efforts to reduce the consumption of energy.

Funds requested for facility planning and design cover advance planning and design requirements for potential future projects, master planning, facilities studies, engineering reports and studies and the preparation of facility project design drawings and bid specifications.

The request for FY 1983 is $100,000,000, an increase of $1,300,000 above the adjusted appropriation for FY 1982. Outlays are estimated to be $121,800,000 in FY 1983, a decrease of $13,100,000 from the estimate for FY 1982.

NATIONAL, AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION LANGUAGE

CONSTRUCTION OF FACILITIES

For construction, repair, 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, [$99,800,000] *$100,000,000,* to remain available until September 30, [1984] ***1985 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 repair, rehabilitation and modification of facilities, minor construction of new facilities and additions to existing facilities, and facility planning and design. ***(42 U.S.C. 2451, et. seq.; Department of Housing and Urban Development—Independent Agencies Appropriation Act, 198.2; additional authorizing legislation to be proposed.)***

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
Program and Financing (in thousands of dollars)

Identification code 80-0107-0-1-999	Budget plan (amounts for construction of facilities actions programed)			Costs and obligations		
	1981 actual	1982 est.	1983 est.	1981 actual	1982 est.	1983 est.
Program by activities:						
Direct program:						
1. Space transportation systems.....	10,100	20,050	21,405	27,281	21,400	22,900
2. Scientific investigations in space.....	1,617	---	1,740	4,751	2,400	1,200
3. Space and terrestrial applications.....	---	---	---	5	---	---
5. Aeronautical research and technology.....	44,041	22,650	20,115	63,031	47,200	34,300
7. Supporting activity.....	61,192	56,000	56,740	53,912	61,200	60,800
Total direct program.....	116,950	98,700	100,000	148,980	132,200	119,200
Reimbursable program:						
1. Space transportation systems.....	3,410	3,000	16,000	3,900	3,100	5,500
5. Aeronautical research and technology....	1,805	1,600	1,600	1,371	1,800	1,700
7. Supporting activity.....	785	400	400	934	1,400	800
Total reimbursable program.....	6,000	5,000	18,000	6,205	6,300	8,000
Total program costs, funded..	122,950	103,700	118,000	155,185	138,500	127,200
Change in selected resources (undelivered orders)	---	---	---	-35,201	12,300	4,800
10.00 Total.....	122,950	103,700	118,000	119,984	150,800	132,000

Identification code 80-0107-0-1-999	Budget plan (amounts for construction of facilities actions programed)			Costs and obligations		
	1981 actual	1982 est.	1983 est.	1981 actual	1982 est.	1983 est.
Financing:						
11.00 Offsetting collections from Federal funds.	-6,000	-5,000	-18,000	-5,835	-5,000	-18,000
Unobligated balance available, start of year: For completion of prior year budget plans:						
21.40 Direct	---	---	---	-110,466	-112,616	-69,616
21.40 Reimbursable	---	---	---	-7,493	-6,900	-4,000
22.40 Unobligated balance transferred from other accounts: Direct	-1,200	---	---	---	-1,200	---
Unobligated balance available, end of year: For completion of prior year budget plans:						
24.40 Direct	---	---	---	112,616	69,616	53,516
24.40 Reimbursable	---	---	---	6,900	4,000	6,100
25.00 Unobligated balance lapsing	---	---	---	44	---	---
39.00 Budget authority	115,750	98.700	100,000	115.750	98.700	100.000
Budget authority:						
40.00 Appropriation	115,000	99,800	100,000	115,000	99,800	100,000
40.00 Reduction pursuant to P.L. 97-101 See. 501 (41)	---	-4,000	---	---	-4,000	---
42.00 Transferred from other accounts	750	2,900	---	750	2,900	---
43.00 Appropriation (adjusted)	115,750	98.700	100.000	115.750	98.700	100.000
Relation of obligations to outlays:						
71.00 Obligations incurred, net				114,150	145,800	114,000
72.40 Obligated balance, start of year				138,469	105,628	116,528
74.40 Obligated balance, end of year				-105,628	-116,528	-108,728
77.00 Adjustments in expired accounts				-86	---	---
90.00 Outlays				146,905	134,900	121,800

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1983 ESTIMATES

SUMMARY OF THE BUDGET PLAN BY LOCATION

Location	FY 1981	FY 1982 (In Dollars)	FY 1983
Ames Research Center	13,930,000	18,500,000	---
Hugh L. Dryden Flight Research Facility	---	---	4,500,000
Goddard Space Flight Center	---	---	2,840,000
Jet Propulsion Laboratory	3,500,000	1,000,000	---
Lyndon B. Johnson Space Center	---	680,000	---
John F. Kennedy Space Center	760,000	1,720,000	---
Langley Research Center	20,756,000	2,950,000	16,200,000
Lewis Research Center	10,355,000	1,200,000	3,915,000
Michoud Assembly Facility	4,582,000	---	---
Wallops Flight Center	---	---	2,150,000
Various Locations	3,350,000	9,800,000	---
Space Shuttle Facilities	10,100,000	20,050,000	21,405,000
Space Shuttle Payload Facilities	1,617,000	---	1,740,000
Repair	15,000,000	12,800,000	15,000,000
Rehabilitation and Modification	19,000,000	17,700,000	20,000,000
Minor Construction	4,000,000	2,300,000	4,000,000
Facility Planning and Design	10,000,000	10,000,000	8,250,000
Total Plan	116,950,000	98,700,000	100,000,000

SUMMARY OF BUDGET PLAN BY COGNIZANT OFFICE

	FY 1981	FY 1982 (In Dollars)	FY 1983
Office of Space Transportation Systems.....	17,059,000	22,450,000	23,145,000
Office of Space Science and Applications	3,500,000	---	4,990,000
Office of Aeronautics and Space Technology..	45,041,000	22,650,000	24,615,000
Office of Space Tracking and Data Systems	3,350,000	10,800,000	---
Office of Management....	48,000,000	42,800,000	47,250,000
Total.....	116,950,000	98,700,000	100,000,000

SUMMARY OF BUDGET PLAN BY SUBFUNCTION

Code No.				
253	Space Flight	10,100,000	20,050,000	21,405,000
254	Space Science, Applications, and Technology	1,617,000	---	1,740,000
255	Supporting Space Activities.....	61,192,000	56,000,000	56,740,000
(250)	Subtotal, General Science, Space, and Technology..	72,909,000	76,050,000	79,885,000
402	Air Transportation	44,041,000	22,650,000	20,115,000
	Total.....	116,950,000	98,700,000	100,000,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1983 ESTIMATES

SUMMARY OF THE BUDGET PLAN BY LOCATION

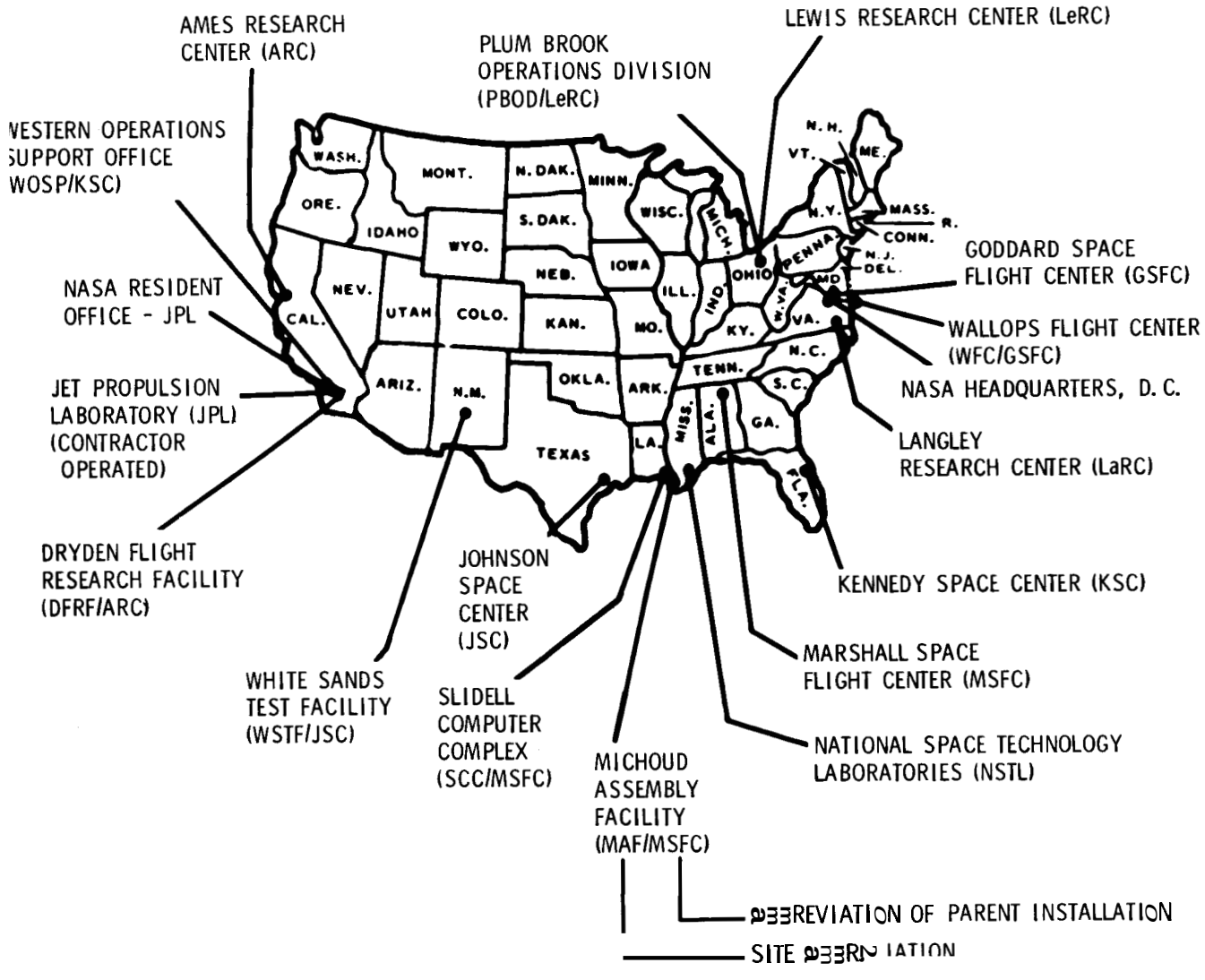
Cognizant Office	Budget Activity	Subfunction Code	Location and Project	FY 1981	FY 1982	FY 1983	Page No.
				(Thousands of Dollars)			
			Lyndon B. Johnson Space Center	---	680	---	
STS	7	255	Rehabilitation of Utility Control System, Various Buildings	---	680	---	
			John F. Kennedy Space Center	760	1,720	---	
STS	7	255	Construction of Waste Material Incinerator	---	895		
STS	7	255	Repair of Operations and Checkout Building Roof	---	825	---	
STS	7	255	Rehabilitation of High Temperature Hot Water System, Zone 2, Industrial Area	760	---	---	
			Michoud Asssembly Facility	4,582	---	---	
STS	7	255	Rehabilitation of Roof, Phase 11, Building 103	3,800	---	---	
STS	7	255	Rehabilitation of Chilled Water System	782	---	---	
			Space Shuttle Facilities at Various Locations as Follows:	10,100	20,050	21,405	
STS	1	253	Modifications to Solid Rocket Booster Refurbishment and Subassembly Facilities (KSC)	---	---	1,700	CF 1-4
STS	1	253	Modification of Manufacturing and Final Assembly Facilities for External Tanks (MAF)	5,400	2,785	17,845	CF 1-14
STS	1	253	Minor Shuttle-Unique Projects (Various Locations).	2,000	1,115	1,860	CF 1-28
STS	1	253	Construction of Solid Rocket Booster Processing and Segment Storage Facilities (KSC)	---	12,400	---	
STS	1	253	Modifications to Building 30 for Shuttle Operations (JSC)	---	650	---	

Cognizant Office	Budget Activity	Subfunction Code	Location and Project	FY 1981	FY 1982	FY 1983	Page No.
				(Thousands of Dollars)			
STS	1	253	Modifications to Firing Rooms (KSC)...	---	3,100	---	
STS	1	253	Modifications to Solid Rocket Motor Manufacturing and Assembly Facilities, Thiokol Plant, Wasatch, Utah.....	2,700	---	---	
			Space Shuttle Payload Facilities at Various Locations as Follows:	1,617	---	1,740	
STS	2	254	Rehabilitation and Modification for Payload Ground Support Operations (KSC)	1,617	---	1,740	CF 2-1
			Goddard Space Flight Center	---	---	2,840	
SSA	7	255	Rehabilitation and Modification of Utility Systems.....	---	---	2,840	CF 3-1
			Jet Propulsion Laboratory	3,500	1,000	---	
ST&DS	7	255	Modifications to Space Flight Operations Facility (230).	---	1,000	---	
SSA	7	255	Modifications to Various Buildings for Energy Conservation	1,500	---	---	
SSA	7	255	Modifications to Various Buildings for Seismic Protection	2,000	---	---	
			Wallops Flight Center	---	---	2,150	
SSA	7	255	Rehabilitation of Airfield	---	---	2,150	CF 4-1
			Ames Research Center	13,930	18,500	---	
AST	5	402	Modification of 12-Foot Pressure Wind Tunnel	---	18,500	---	
AST	5	402	Construction of Man-Vehicle Systems Research Facility..	8,230	---	---	
AST	5	402	Modification of Steam Ejector System and Thermal Protection Laboratory (N-234)	2,300	---	---	
AST	5	402	Modification of the Unitary Plan Wind Tunnel (N-227)....	3,400	---	---	
			Dryden Flight Research Facility	---	---	4,500	
AST	7	255	Construction of Data Analysis Facility	---	---	4,500	CF 5-1

Cognizant office	Budget Activity	Subfunction Code	Location and Project	FY 1981	FY 1982	FY 1983	Page No.
				(Thousands of Dollars)			
			Langley Research Center	20,756	2,950	16,200	
AST	5	402	Modifications to the 4- by 7-Meter Low Speed Tunnel (1212-C)	---	---	7,200	CF 6-1
AST	5	402	Modifications to Upgrade the Transonic Dynamics Tunnel (648)	---	---	9,000	CF 6-9
AST	5	402	Modifications for Enhanced 20-Inch Supersonic Wind Tunnel (1247D)	---	2,950	---	
AST	5	402	Modifications for Avionics Integration Research Laboratory (1220)	5,756	---	---	
AST	5	402	Modifications to Aircraft Landing Dynamics Facility (1257)	15,000	---	---	
			Lewis Research Center	10,355	1,200	3,915	
AST	5	402	Modification of Rocket Engine Test Facility for Altitude Testing	---	---	995	CF 7-1
AST	5	402	Modification to 450 PSI Air System in Engine Research Building	---	---	2,920	CF 7-9
AST	5	402	Modifications for High Pressure Turbine Corrosion and Thermal Fatigue Testing	---	1,200	---	
AST	7	255	Decommissioning of Plum Brook Station Reactor Facility, Phase II	1,000	---	---	
AST	5	402	Modifications to Central Air System, Various Buildings	7,655	---	---	
AST	5	402	Rehabilitation of Electrical Switchgear, Engine Research Building (5)	1,700	---	---	
			Various Locations	3,350	9,800	---	
ST&DS	7	255	Construction of Two 34-Meter Antennas	2,400	9,800	---	
ST&DS	7	255	Replacement of Azimuth Radial Bearing, DSS-14 Goldstone, Calif. (JPL)	950	---	---	
MGMT	7	255	Repair of Facilities at Various Locations, Not in Excess of $500,000 Per Project	15,000	12,800	15,000	CF 8-1
MGMT	7	255	Rehabilitation and Modification of Facilities at Various Locations, Not in Excess of $500,000 Per Project	19,000	17,700	20,000	CF 9-1

Cognizant Office	Budget Activity	Subfunction Code	Location and Project	FY 1981	FY 1982	FY 1983	Page No.
MGMT	7	255	Minor Construction of New Facilities and Additions to Existing Facilities at Various Locations, Not in Excess of $250,000 Per Project.....	4,000	2,300	4,000	CF 10-1
MGMT	7	255	Facility Planning and Design.....	10,000	10,000	8,250	CF 11-1
			TOTAL.....	116,950	98,700	100,000	

LOCATION OF MAJOR AND COMPONENT INSTALLATIONS



SUM 11

RECORDED VALUE OF CAPITAL TYPE PROPERTY
IN-HOUSE AND CONTRACTOR-HELD
AS OF SEPTEMBER 30. 1981
(DOLLARS IN THOUSANDS)

Reporting Installation	Land	Real Roperty: Buildings	Real Roperty: Other Structures and Facilities	Real Roperty: Leasehold Improvements	Real Roperty: Total	Equipment	Fixed Assets in Progress	Total
Ames Research Center.....	2,928	231,128	17.642	---	251,698	300,338	145.218	697,254
ARC-Moffett Field, CA.....	2,921	215,604	10,580	---	229,112	226,962	140,850	596.9 24
Dryden Flight Research Center.. .	---	15.524	7,062	---	22.586	62.514	4,368	89.468
DFRC-Edwards AFB, CA..	---	15,524	7.062	---	22.586	62,514	4.368	89.468
Various Locations (a).....	---	---	---	---	---	10,862	---	10.862
Goddard Space Flight Center.....	3,111	143.105	120.814	---	267,030	565.964	31.977	864,971
GSFC-Greenbelt, MD.....	1.360	91.855	18,868	---	118,083	213.686	19.383	351,152
Tracking Stations (Networks)....	332	16,628	47,717	---	64,677	219,242	4.413	288,332
Wallops Flight Center.....	1.419	28,577	54,228	---	84,224	53,240	8,181	145.645
WFC-Walops Island. VA.....	1.119	28.577	54,228	---	84,224	53.240	8,181	145,645
Varioua Locations (a).	---	45	I	---	46	79.196	---	79,842
Jet Propulsion Laboratory.....	1,188	94.968	68.076	1,745	165,977	257,709	29,929	453,615
JPL-Pasadena, CA.....	1,188	83,361	11,978	1,743	98.270	182,181	29,929	310,380
Deep Space Network.....	---	11.607	56.098	2	67.707	75,528	---	143.235
Johnson Space Canter.....	9.115	198,397	66,405	---	271,917	614.839	31.592	918,348
JSC-Houston, TX.....	5,545	161,980	37,936	---	205,461	374.928	27,154	607,543
White Sands Teat Facility								
WSTB-Las Cruces. NU.....	---	9,640	21.095	---	30.735	17.965	---	48,700
Varioua Locations (a).....	3,570	26.111	5,374	---	35.721	221.946	4.438	262.105
Kennedy Space Center.....	71.345	377,650	392.842	---	841,837	935.986	88,983	1,866,806
KSC-Cape Canaveral, FL.....	11,345	377,650	392,741	---	841.736	930.390	88.983	1,861.109
Western Teat Range Operations								
Mv. WTROD-Lompoc, CA..	---	---	---	---	---	4.273	---	4.273
Varioua Locations (a)..... ...	---	---	101	---	101	1,323	---	1,424
Langley Research Center..	162	135,762	289,169	---	425.093	189.088	27.697	641,878
LARC-Hampton, VA.....	162	135,762	288.955	---	424.879	169.570	27,697	622.146
Various Locations (a).....	---	---	214	---	214	19,518	---	19,732
Lewis Research Center.....	2.230	215,746	77,169	136	295.281	153.463	16.860	465,605
LERC-Cleveland, OH.....	316	139,396	58.078	136	197.926	115.291	16.860	330,077
Plumbrook Operations Division								
PBOD-Sandusky, OH.....	1,914	76.350	18.414	---	96.678	6.216	---	102,894
Various Locations (a).....	---	---	677	---	677	31,956	---	32.633
Marshall Space Flight Center.....	7.164	215.161	133,201	---	355.526	430.850	1.504	787,880
MSFC-Huntsville, AL.....	---	3.958	65.634	---	189.592	252.535	1.504	443,631
Michoud Assembly Facility								
NAP-New Orleans. LA..	1.095	82.029	55,391	---	144.515	29.173	---	174,288
Slidell Computer Complex								
SCC-Slidell, LA.....	69	5,035	2,111	---	7.215	8,724	---	15.939
Various Locations (a).....	---	4.139	10.065	---	14,204	139,818	---	154.022
National Space Technology Labs....	18,061	68.775	194,718	---	281.554	25,475	---	307,029
NSTL-NSTL Station, MS.....	18.061	68.775	194.718	---	281.554	25,415	---	306.9 69
Varioua Locations (a).	---	---	---	---	---	60	---	60
NASA Headquarters.....	---	---	---	4	4	22,358	6,640	29,002
Washington, DC.....	---	---	---	4	4	8,558	6,640	15,202
Varioua Locations (a).....	---	---	---	---	---	13,800	---	13,800
TOTAL..	115,304	1,680,692	1,358.036	1.885	3,155,917	3,496,070	380,400	7,032,387

PROJECT
JUSTIFICATIONS

SPACE SHUTTLE
FACILITIES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

SUMMARY

SPACE SHUTTLE FACILITIES

	Amount	Page No.
Office of Space Transportation Systems:		
Summary		CF 1-1
Launch and Landing Facilities	1,700,000	
Modifications to Solid Rocket Booster Refurbishment and Subassembly Facilities, Kennedy Space Center	1,700,000	CF 1-4
Manufacturing and Final Assembly Facilities	17,845,000	
Modifications of Manufacturing and Final Assembly Facilities for External Tanks, Michoud Assembly Facility	17,845,000	CF 1-14
Minor Facilities	1,860,000	
Minor Shuttle-Unique Projects, Various Locations	1.860.000	CF 1-28
Total	21,405,000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE:	Space Shuttle Facilities
INSTALLATION:	Various Locations
	FY 1983 CoF ESTIMATE: $21,405,000

LOCATION OF PROJECT: Locations are identified in the following documentation

COGNIZANT HEADQUARTERS OFFICE: Office of Space Transportation Systems

FY 1982 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding	6,724,000	29,732,392	36,456,392
Capitalized investment	N/A	311,894,785	311,894,785
Total	6,724,000	341,627,177	348,351,177

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to rehabilitate, modify, and add to existing Government-owned facilities, and to construct new facilities to meet unique requirements of the Space Shuttle Program. As in prior years, this Shuttle facilities package includes all major facility requirements unique to the Space Shuttle Program. In FY 1983, the proposed Shuttle facilities are primarily related to modifications to support external tank (ET) manufacturing and final assembly at Michoud Assembly Facility (MAF). Also included are modifications to the

Vehicle Assembly Building low bay at Kennedy Space Center (KSC), and minor Space Shuttle-unique rehabilitation and modification projects required to support the Space Shuttle program.

PROJECT JUSTIFICATION:

Prior year CoF budgets for the Space Shuttle Program authorized modifications and construction of facilities for technical development, Space Shuttle main engine tests, ground tests, manufacturing, and launch and landing. All of the facilities to support the Design Development, Test and Evaluation portion of the program are completed and operational. The major project in this funding request is for modifications to manufacturing facilities for ET's to meet production needs. Other projects included are: modifications to the Solid Rocket Booster (SRB) refurbishment and subassembly facilities at KSC to support increased flight rates, and site preparation and utilities for KSC housing facilities. Detailed justifications are included in the project documents that follow.

As in previous requests, the projects included have been carefully reviewed against operational projections and mission capabilities to insure that they are not prematurely requested.

PROJECT COST ESTIMATE:

Launch and Landing Facilities	1,700,000
Modifications to Solid Rocket Booster Refurbishment and Subassembly Facilities, Kennedy Space Center	1,700,000
Manufacturing and Final Assembly Facilities	17,845,000
Modifications of Manufacturing and Final Assembly Facilities for External Tanks, Michoud Assembly Facility	17,845,000
Minor Facilities	1,860,000
Minor Shuttle–Unique Projects, Various Locations	1,860,000
Total	21,405,000

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATIONS TO SRB REFURBISHMENT AND SUBASSEMBLY FACILITIES

LOCATION PLAN

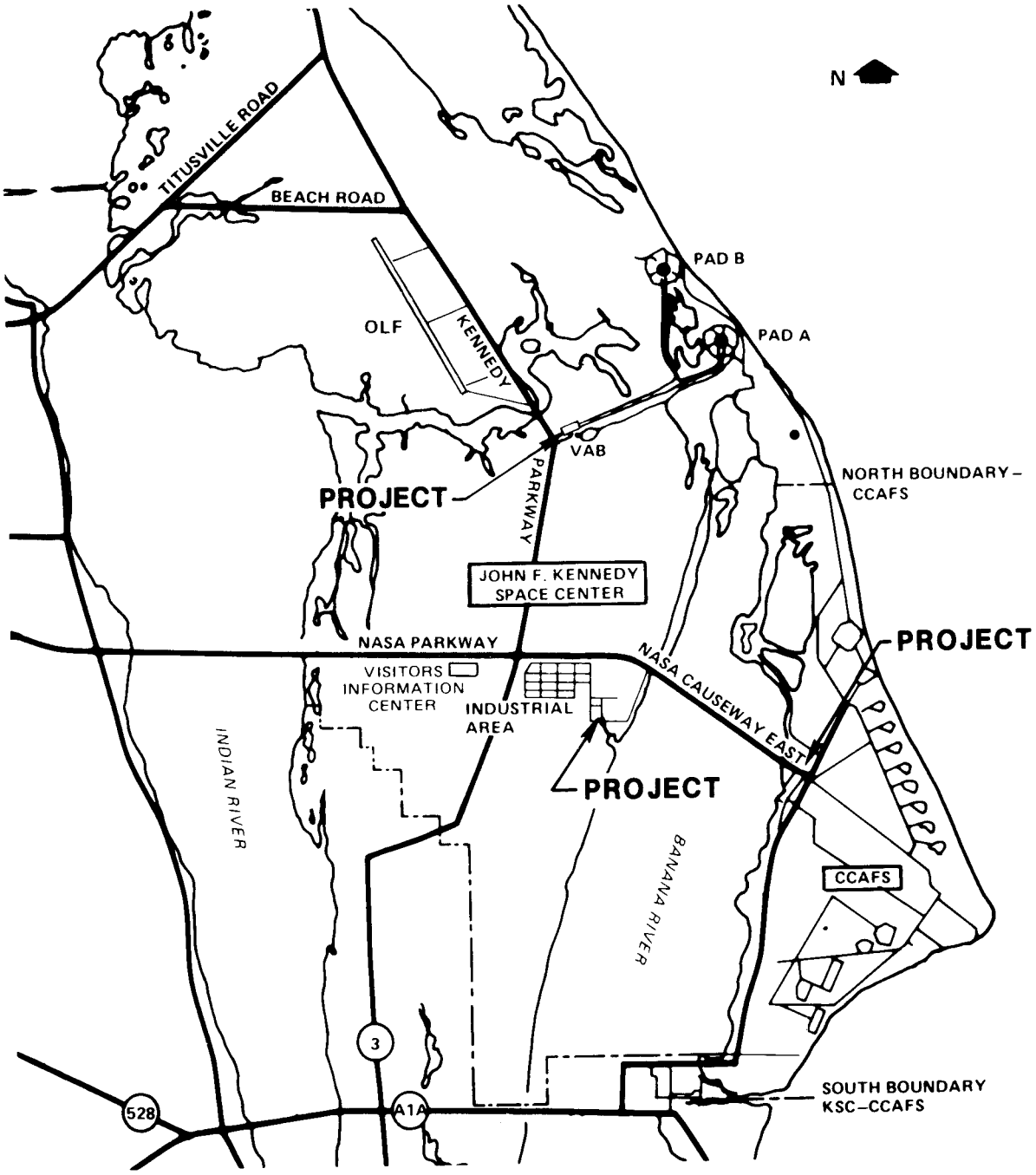


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE:	Modifications to Solid Rocket Booster Refurbishment and Subassembly Facilities
INSTALLATION:	John F. Kennedy Space Center
	FY 1983 CoF ESTIMATE: $1,700,000

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Transportation Systems

FY 1982 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding	136,000	667,392	803,392
Capitalized investment..	N/A	16713791785	167,379,785
Totai	136,000	168,047,177	168,183,177

SUMMARY PURPOSE AND SCOPE:

This project provides for modifications to facilities used in the refurbishment and subassembly of solid rocket booster (SRB) forward and aft skirts at the Kennedy Space Center (KSC) (Figure 1). These facilities include the Vehicle Assembly Building (VAB) low bay (Figure 2), the Hypergol Maintenance Facility (HMF) (Figure 3) and Hangar N (Figure 4), which sequentially process forward and aft skirts to ready them for subsequent flights.

Experience with STS-1 and related SRB processing studies indicate that both the HMF and the VAB low bay can support a flight rate of only eight per year due to facility limitations. Of primary concern is the painting and insulation area (P&I) located in the VAB low bay. Here, the curing cells block efficient access to the insulation spraying booths. Meeting the flight rates for FY 1984 and subsequent years is predicated upon the elimination of these difficulties.

The planned modifications include relocation of small shops from the VAB low bay and from the HMF to Hangar N, rearrangement of forward skirt nose cone and frustum work areas within the VAB low bay, and the installation of five new curing booths in the VAB low bay.

PROJECT JUSTIFICATION:

The Solid Rocket Booster (SRB) is one of two primary propulsion systems of the Space Shuttle. Each SRB used in the program is assembled from component parts checked out at KSC prior to launch. These component parts include solid rocket motor (SRM) segments, aft skirt assemblies, forward skirt assemblies, frustums and nose cones. The SRM segments are steel casings, filled with solid propellant, which are shipped individually via railway flat cars from the manufacturing plant in Utah to KSC. Four SRM segments are required for each SRB. The aft skirt is assembled utilizing specialized workstands in the VAB. The aft skirt contains the nozzle which can be swiveled hydraulically to control the direction of thrust. The mechanism which causes the nozzle to move is called the thrust vector control (TVC) system and must be tested prior to each launch. The forward skirt, frustum and nose cone are prepared for flight in the VAB low bay. These elements form the front end of each SRB, and contain the parachutes needed for recovery and the booster separation motors required to physically separate the SRB and Orbiter while in flight.

After an SRB is used on a mission, it is recovered at sea and returned to Hangar AF at KSC where the empty SRB is cleaned and disassembled. The SRM segment casings are returned to the manufacturer for reuse. All other components are refurbished at KSC.

Refurbishment activities begin at Hangar N where all components are inspected for damage and critical dimensions are validated. Aft skirt assemblies are next forwarded to the HMF where the TVC system is serviced, fueled and tested. The aft skirt from the HMF, as well as the forward skirt assemblies from Hangar N, then proceeds to the VAB low bay. The primary activities in the low bay are to spot paint and to re-insulate all flight hardware with ablative material. The insulation process is accomplished using specialized spray booths for application and curing cells for drying. The refurbished items are eventually reassembled to form the two SRB's.

The first modifications to the VAB low bay and to the HMF were programmed in the FY 1976 budget and were intended to provide the initial operational capability. It was recognized from the outset that additional modifications would be necessary once refurbishment procedures were refined and matured. Experience from processing STS-1 indicates that both the VAB low bay and the HMF SRB operations can support only eight flights per year. In the low bay, the present curing cells block efficient access to the spray booths, and additional curing cells are needed. To add new curing cells and to eliminate the congestion near the spray booths, a partial rearrangement of the low bay is required. Similarly, in the HMF, TVC processing would be greatly enhanced by the rearrangement of interior floor space, including the relocation of some shop areas to Hangar N.

IMPACT OF DELAY:

Delaying this project will have an adverse impact on the flight schedule for FY 1984 and subsequent years. Also, as the flight rate increases, it will become extremely difficult to schedule available times in which the modifications could be accomplished.

PROJECT DESCRIPTION:

The forward assembly buildup areas, presently located in the VAB low bay on the west side of the transfer aisle (Cells 3 and 4), will be moved to the east side (Cells 7 and 8) (Figure 5). Lighting, compressed air and crane rails will be provided in Cells 7 and 8. The transfer aisle floor between Cells 3 and 4 and Cells 7 and 8 will be sealed to allow for air pallet operations. In Cells 3 and 4, five new curing booths will be installed. New ramps will be constructed, and miscellaneous walls will be removed in the area between the existing ablator application booths and the new curing booths. A 1,500-square foot (135 square meter) storage facility for flammable materials used in the painting and insulation processes will be constructed outside of but adjacent to the low bay.

Hangar N will be modified to accommodate the relocation of small machine shops from the HMF and the VAB low bay. Modifications include an expansion of the electrical power system and the installation of additional gaseous nitrogen and helium piping.

PROJECT COST ESTIMATE:

This cost estimate is based on related engineering studies.

	Unit of Measure	Quantity	Unit cost	Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	1,700,000
VAB low bay	LS	---	---	1,430,000
Curing cells	EA	5	180,000	(900,000)
Mechanical/electrical, cells 7 and 8	LS	---	---	(400,000)
Architectural	LS	---	---	(130,000)
Storage building	LS	---	---	120,000
Hangar N mechanical/electrical	LS	---	---	150,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				1,700,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan, VAB
Figure 3 - Site Plan, Hypergol Maintenance Facility
Figure 4 - Site Plan, Hangar N
Figure 5 - Floor Plan, VAB Low Bay

OTHER EQUIPMENT SUMMARY:

Noncollateral equipment required includes portable access platforms, flight hardware support stands, transportation dollies and miscellaneous lifting/handling devices. These items will cost approximately $500,000 and will be provided with R&D resources.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future requirements are forecasted for the VAB low bay or for Hangar N. For higher flight rates, it is possible that the HMF will have to be expanded to test all TVC systems. This requirement has not yet been validated.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATIONS TO SRB REFURBISHMENT AND
SUBASSEMBLY FACILITIES

SITE PLAN

VAB

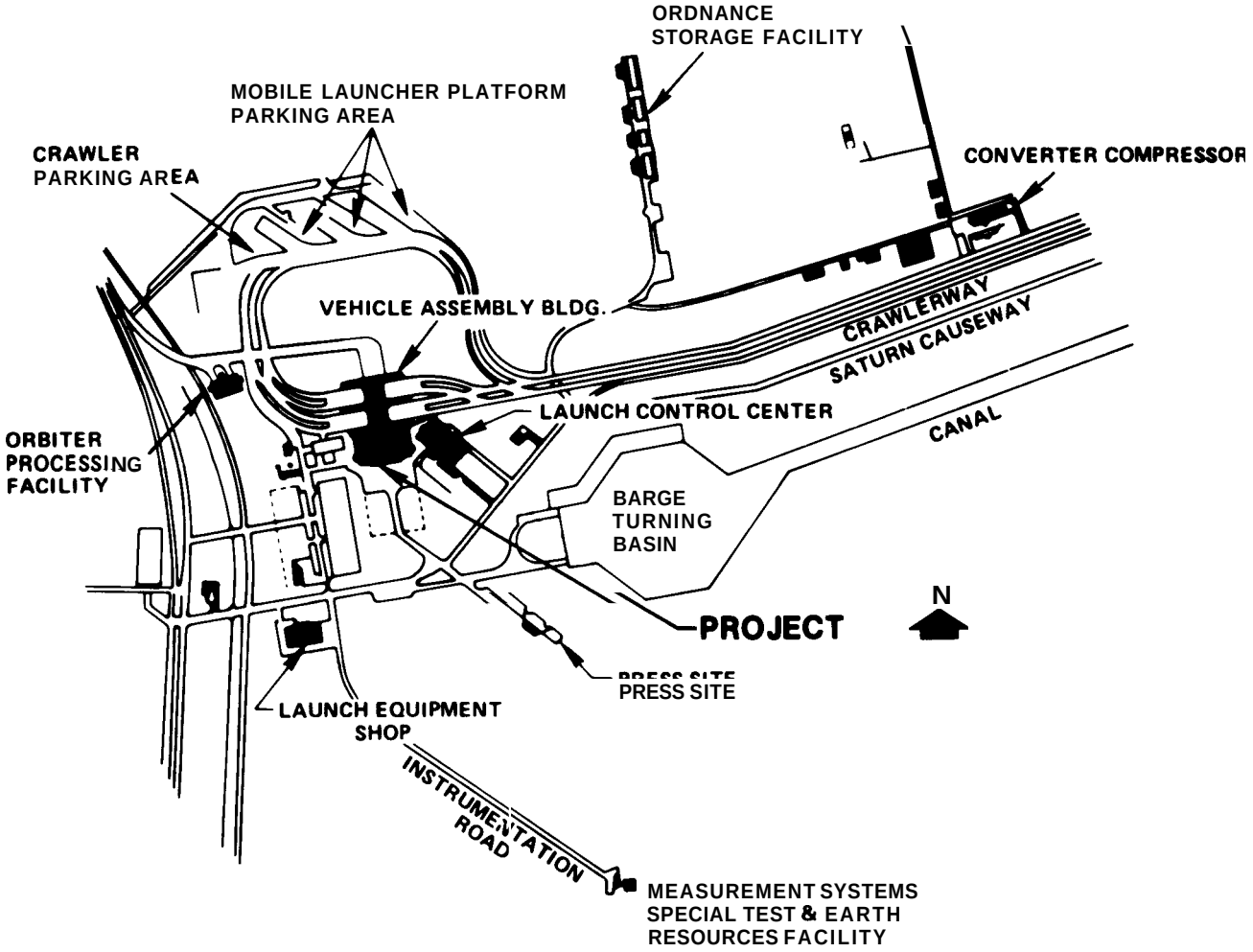
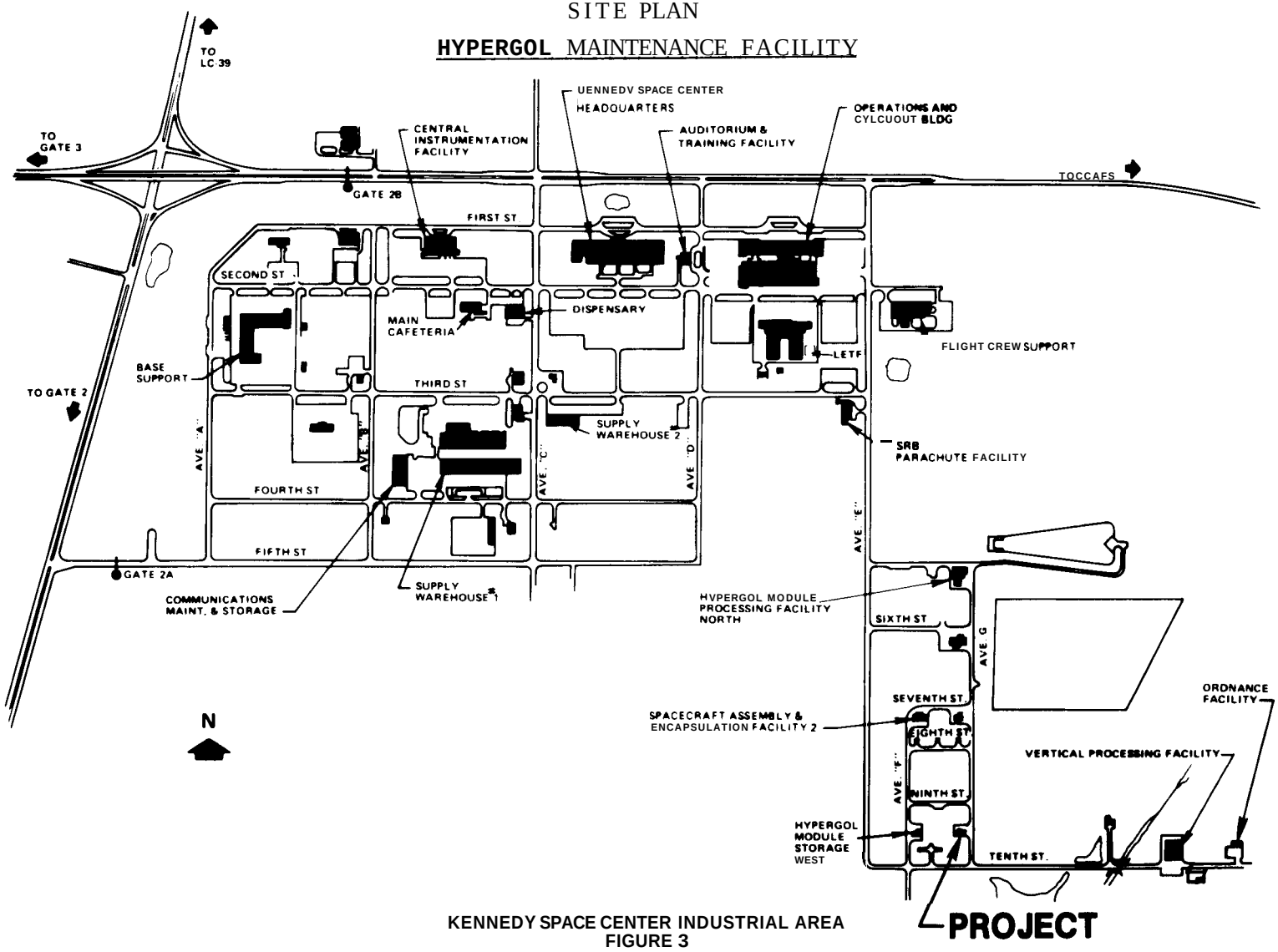


FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATIONS TO SRB REFURBISHMENT
AND SUBASSEMBLY FACILITIES

SITE PLAN

HYPERGOL MAINTENANCE FACILITY

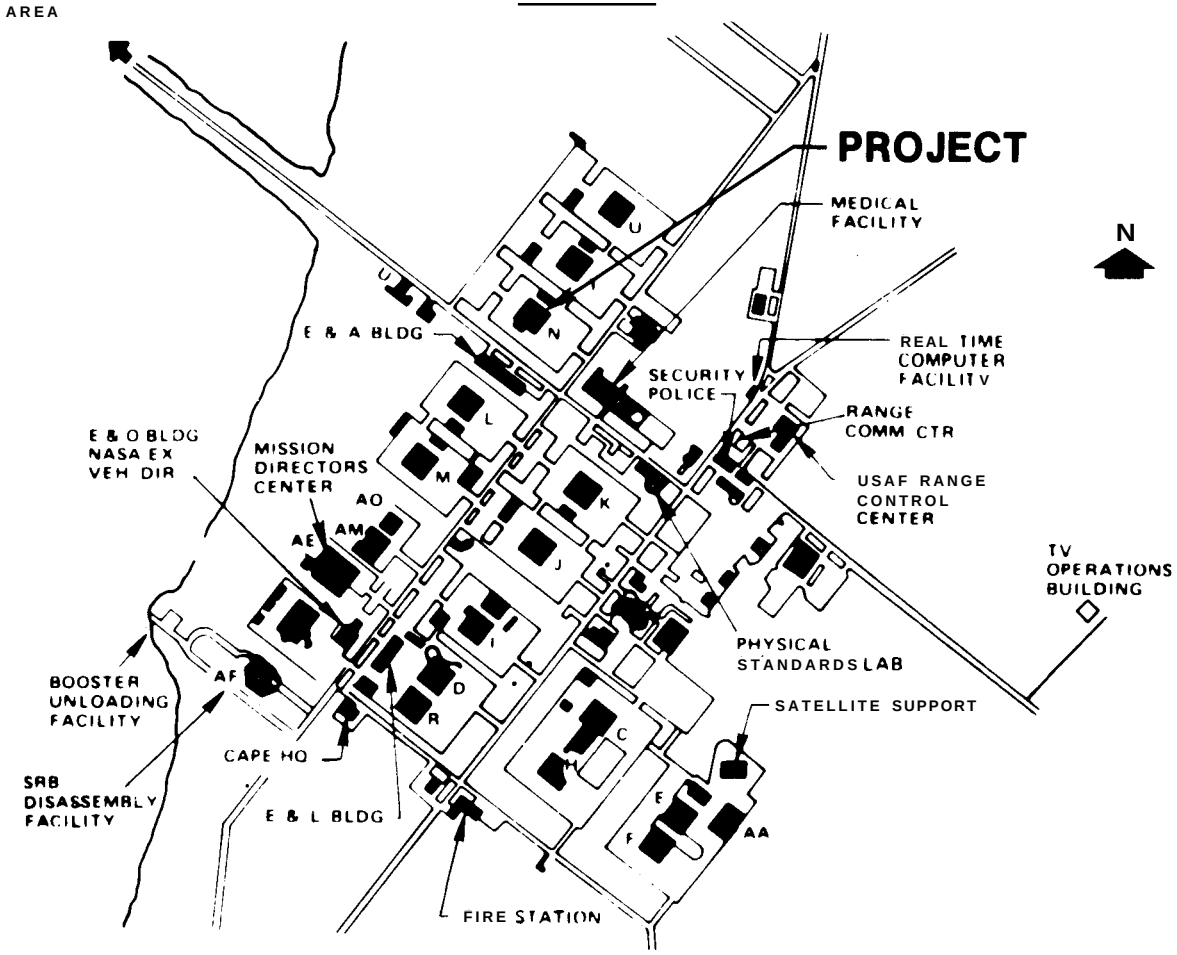


KENNEDY SPACE CENTER INDUSTRIAL AREA
FIGURE 3

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATIONS TO SRB REFURBISHMENT
AND SUBASSEMBLY FACILITIES

SITE PLAN

HANGER N



CAPE CANAVERAL AIR FORCE STATION INDUSTRIAL AREA
FIGURE 4

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATIONS TO SRB REFURBISHMENT AND SUBASSEMBLY FACILITIES

FLOOR PLAN

VAB LOW BAY

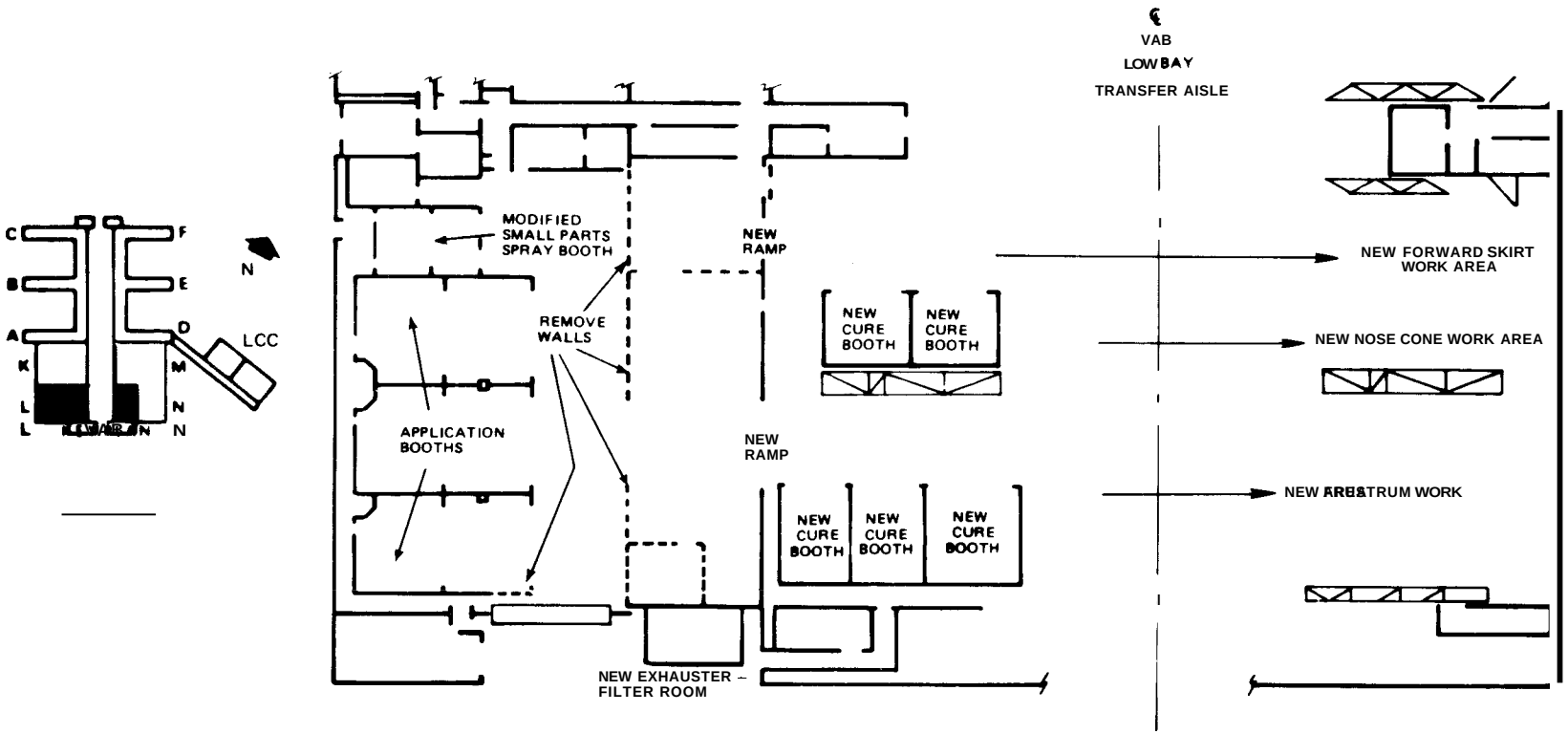


FIGURE 5

MICHOUD ASSEMBLY FACILITY
FISCAL YEAR 1983 ESTIMATES
MODIFICATION OF MANUFACTURING AND FINAL ASSEMBLY FACILITIES FOR EXTERNAL TANKS

LOCATION PLAN

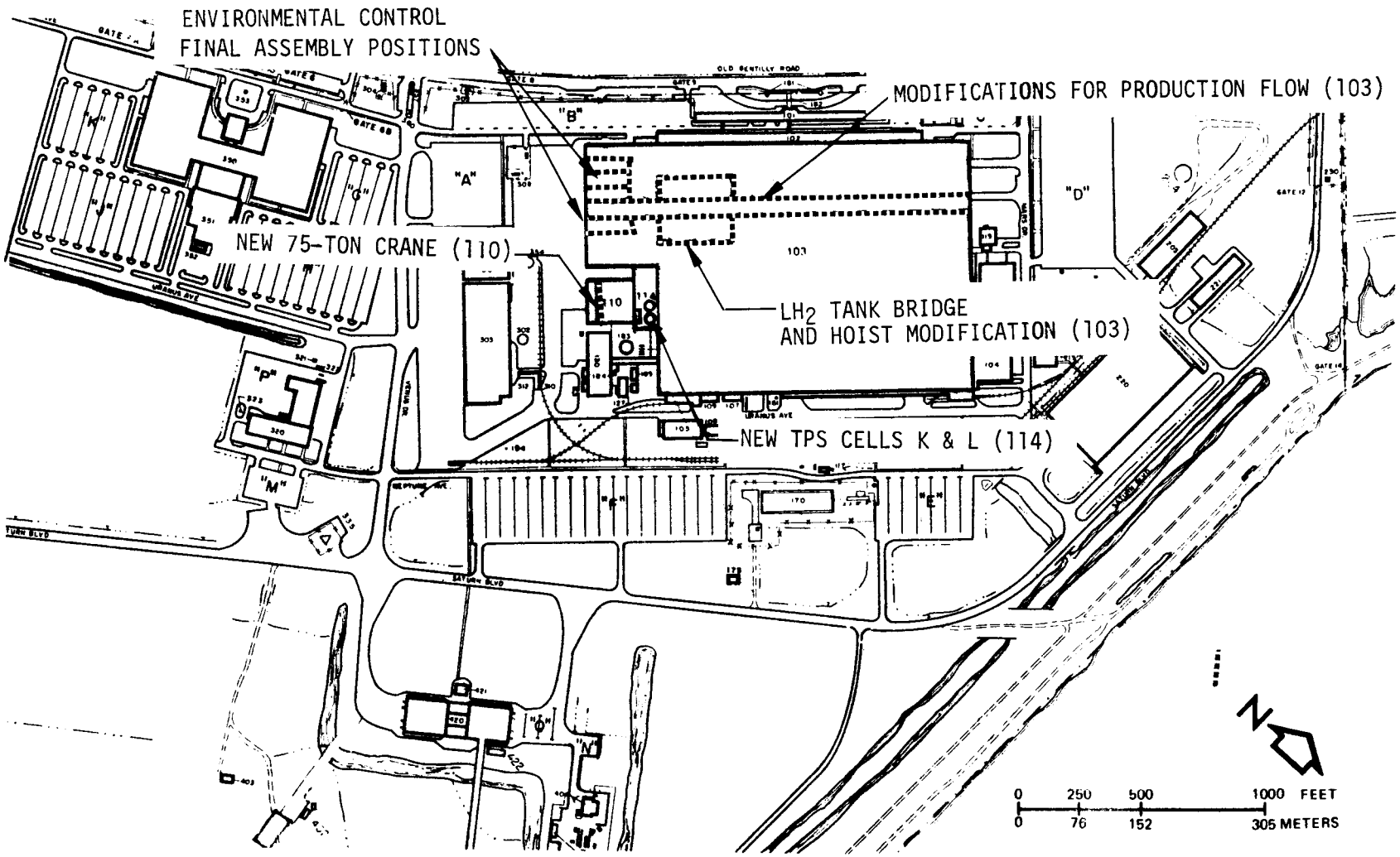


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE:	Modification of Manufacturing and Final Assembly Facilities for External Tanks
INSTALLATION:	Michoud Assembly Facility
FY 1983 CoF ESTIMATE:	$17,845,000

LOCATION OF PROJECT: New Orleans, Orleans Parish, Louisiana

COGNIZANT HEADQUARTERS OFFICE: Office of Space Transportation Systems

FY 1982 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding	6,420,000	29,065,000	35,485,000
Capitalized investment	N/A	144,515,000	144,515,000
Total	6,420,000	173,580,000	180,000,000

SUMMARY PURPOSE AND SCOPE:

This project continues work funded in Fiscal Year 1982 and prior years for modification of manufacturing and final assembly facilities at the Michoud Assembly Facility (MAF) for the Space Shuttle External Tank (ET) production. The ET is the component of the Space Shuttle that supplies propellants to the Orbiter's main engines. Each ET consists of three major components: a liquid oxygen (LO_2) tank, an intertank and a liquid hydrogen (LH_2) tank. The facility modifications at MAF are required to provide capability for fabrication and assembly, testing and cleaning, application of a thermal protection system (TPS) and major component assembly

of the ET. The tank is also equipped with plumbing and electrical systems, and then checked/accepted prior to shipment to the launch site for mating with the Orbiter and Solid Rocket Boosters.

Prior years resources provided phased modifications to the Main Manufacturing Building, Building 103; the Vertical Assembly Building (VAB), Building 110; and the Final Acceptance and Checkout Building, Building 420. Included were construction of a high bay facility, Building 114, to apply thermal protection system (TPS) coating to the LO_2 tank and the intertank; a facility for cleaning, priming and applying ablator to the LH_2 tank, Building 131; and a pneumatic proof test facility for the LH_2 tank, Building 451.

This project provides for the construction of two environmentally controlled spray cells (K&L) for TPS application on the LO_2 tank and intertank, installation of a 75-ton crane in the VAB, and general modifications in the Main Manufacturing Building 103 to improve production flow and productivity. The work in Building 103 includes providing a production aisle through the main manufacturing plant, upgrading an overhead crane system located in the LH_2 tank weld area and providing a controlled environment area in the ET final assembly area.

PROJECT JUSTIFICATION:

TPS Spray Cells K&L - A second LO_2 tank/intertank ablator spray cell (K) and a third foam spray cell (L) are necessary to support the FY 1984-85 ET production schedules. The two-year lead time for the construction and activation makes it necessary to start construction in early FY 1983. In FY 1978, a high bay addition to Building 114 provided two TPS foam spray cells (G&H) and one TPS ablator spray cell (J). These cells were designed for spraying TPS material on the LO_2 tank/intertank and projected to provide an ultimate production capability of 28 tanks per year. The time lines for these cells were established from preliminary engineering configurations without benefit of actual manufacturing experience. Subsequent engineering and manufacturing process evaluations indicate that the earlier estimates were too optimistic. Current estimates based on production and development experience gained in applying TPS materials indicate that production capacity will be limited to approximately 15 tanks per year in the ablator spray area by late FY 1984, and to 20 tanks per year in the foam spray area by mid-FY 1985. Additional work and test procedures not envisioned in the original estimates are the primary factors contributing to the reduction in projected rates.

The current projected capacity of the existing TPS spray cells will not support the required production rate in the late FY 1984 and mid FY 1985 time frame and must be augmented with Cells K&L.

Additional 75-Ton Crane - The existing 75-ton crane in the VAB will not support the early FY 1985 production rate. The existing crane can only support a production rate of approximately 18 ET's per year and represents a single point of failure in the manufacturing flow. Any breakdowns by this crane would result in a shutdown of the ET manufacturing flow. To support the FY 1985 production rate, it is necessary to program a second 75-

ton crane in FY 1983 because of the long lead time needed for design, fabrication and installation (approximately 20 months). Beyond FY 1983, no production windows or work-arounds can be used for installing the crane without major interruption of the ET delivery schedule. A second crane, using the same set of rails with that of the existing crane, was programmed in FY 1979 to improve the capacity and reliability of the VAB crane system. This concept proved to be unworkable because of limits in the crane coverage. However, the FY 1979 funds have been used to improve the reliability and safety of the existing crane to support the early production requirements.

Production Flow Aisle - A major through aisle in the Manufacturing Plant, Building 103, is required to alleviate material and component crossflow, backflow congestion and aisle blockage in the major weld and subassembly areas. Contributing to constrained traffic flow is the lack of adequate work-in-progress storage next to the fabrication, welding and assembly tools areas, which results in mass movement of components to and from temporary staging areas. To improve production flow, the manufacturing area in Building 103 will be enhanced by the addition of new tooling and relocation of certain existing tooling to eliminate cross and back flows of flight hardware being assembled. A crane system will be provided to decrease the extensive use of dollies which are cumbersome and difficult to maneuver and contribute to the congestion and storage problems. The revised plant layout will also provide staging areas adjacent to the tooling and a major through aisle as an intergal part of the overall manufacturing and production flow plan.

LH_2 Tank Bridge and Hoist Modifications - The crane system in the LH_2 tank welding area requires upgrading to support the new LH_2 tank fabrication process. During the early production phases there is sufficient time to fabricate the entire LH_2 tank in a single major weld fixture. However, to meet later production rates, an assembly line process must be provided using additional tooling fixtures. The aft dome and barrel sections will be welded in a major weld fixture, transferred to an X-ray and mechanical installation fixture, and then to a forward dome weld fixture. The capacity of the existing overhead crane system must be upgraded to support the added weight of heavy roll rings attached to the barrel sections for structural integrity during movement from fixture to fixture. The crane upgrading must be accomplished in the FY 1983 time frame to be compatible with the installation and operation of the new tooling fixtures.

Environmental Control for Final Assembly Position - This project is necessary to control temperatures, humidity and level of cleanliness required to successfully perform TPS closeout operations in the four horizontal final assembly positions in Building 103. Essentially, all external flight hardware (such as the ET/Orbiter interface hardware, feedlines, mechanical hardware and electrical systems) is attached to the external tank in these final assembly positions. TPS closeouts must be made under a closely controlled environment at every point where these components attach to the External Tank to preclude debonding of insulation. Ice formed as a result of such debonding could dislodge during launch and damage the orbiter tiles. The final assembly positions are located adjacent to three large hangar doors that must be opened and closed ten times during the

processing of a single ET. The opening of the hangar doors destroys the required environment and interrupts all TPS closeout applications for approximately eight hours while the necessary environment is reestablished. Installation of fabric wall separations between each position and modifications to the air-conditioning system are necessary to provide the stringent uninterrupted environment essential for TPS closeout activities. The overhead monorail crane system over positions 1 and 2 will be replaced with a bridge crane system similar to position 3 and 4 to preclude possible damage to the external tank while attaching external hardware.

IMPACT OF DELAY:

Production of ET's in sufficient quantities to support the STS Mission Model in the late FY 1984 and mid-FY 1985 time frame cannot be provided without this project. A delay in construction will cause significant production interference and degradation of support of the mission model in later years when production demands will be considerably higher. Failure to construct the TPS spray cells in Building 114 and the 75-ton crane in Building 110 will preclude sustaining the needed ET production in the late FY 1984 and mid-FY 1985 time frame. The overall plant layout for ET production will be extremely inefficient without the through aisle, as it is the basis for the new tooling installations. Upgrading of the LH_2 tank overhead cranes system is necessary to expedite movement of partially completed LH_2 tanks within the building without disrupting the manufacturing flow and to preclude use of LH_2 tank transporters which would slow LH_2 tank production and further add to existing through aisle congestion and blockage. The use of temporary shelters and associated equipment to provide adequate TPS closeout conditions has been environmentally unreliable and is an added recurring cost. In summary, without this project, the ET's cannot be fabricated at a rate sufficient to support the STS mission model, and essential reductions in the cost per ET cannot be achieved.

PROJECT DESCRIPTION:

TPS Spray Cells K&L - Two cells each 41 feet (12.3 meters) in diameter and 85 feet (25.5 meters) high will be constructed in Building 114 (Figure 3) The walls will be structural steel frame with gypsum wall board. Each cell will be provided with a 32-foot (9.6 meter) wide door, personnel access doors, platforms and ladders. Utilities include plant air, breathing air, gaseous nitrogen, fire suppression/detection devices, exhaust system, explosion proof electrical fixtures, and sodium vapor lighting. A controlled cell environment from 150°F to 60°F with relative humidity from 70% maximum to 30% minimum will be provided. Tank heating systems will provide heating temperatures of 140°F to 240°F and cooldown temperatures of 55°F - 60°F.

Additional 75-Ton Crane - A new rail-mounted, low profile 75-ton crane will be installed below the existing 75-ton crane in Building 110 (Figure 4). The crane will travel in an east/west direction and will be cab and radio controlled. A dual crane safety system, emergency stops and a motor control center are also included in this project.

Production Flow Aisle - An east/west aisle, 45 feet (13.7 meters) wide will be provided through the entire length of the Manufacture Plant Building 103 (Figure 5). Work includes relocation of an existing X-ray laboratory, constructing open doorways on three interior walls, raising overhead cranes and rails, and rerouting existing utilities, ducts, and control panels. At the east end of the aisle, the exterior wall of the plant will be penetrated and a new door, apron and driveway will be provided. Also a 5-ton crane system will be provided over the east end of the aisle for movement of LO_2 and LH_2 dome components.

LH_2 Tank Bridge and Hoist Modification - The work includes increasing the rated capacity of four existing 10-ton bridge cranes located in the LH, tank welding area in the Main Manufacturing Plant, Building 103 (Figure 6). Two bridge cranes will be uprated'to 15 tons and the other two bridge cranes to 20 tons. Local structural strengthening and truss modifications will also be accomplished to support the increased capacity of the cranes. Four 7 1/2-ton hoists will also be provided.

Environmental Control for Final Assembly Positions - This project provides for partitioning the four final assembly positions into separate environmental chambers in the Main Manufacturing Plant, Building 103 (Figure 7). The work includes installing fabric type walls with personnel access doors to allow movement from position to position and providing an environmental system capable of maintaining each position at a dew point of $59^{\circ}F \pm 5^{\circ}$ at a temperature of $80^{\circ}F + 5^{\circ}$. The existing monorail system in positions #1 and #2 will also be replaced with a bridge crane system similar to positions #3 and #4.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	
Construction	---	---	---	17.845.000
High bay addition. cells K & L	---	---	---	6.740. 000
Architectural/structural	LS	---	---	(1,860,240)
Mechanical systems	LS	---	---	(3.960. 424)
Electrical systems	LS	---	---	(919.336)
Additional 75-ton crane	---	---	---	4.200. 000
Architectural/structural	LS	---	---	(2.140. 000)
Mechanical systems	LS	---	---	(1.930. 000)
Electrical systems	LS	---	---	(130.000)
Modifications for production flow	---	---	---	2.750. 000
Architectural/structural	Job	---	---	(2.073. 080)
Mechanical systems	Job	---	---	(472.679)
Electrical systems	Job	---	---	(204.241)
LH_2 bridge and hoist modification	---	---	---	1,330,000
Architectural/structural	Job	---	---	(1.321. 635)
Electrical systems	Job	---	---	(8,365)
Environmental control for final assembly positions	---	---	---	2.825.000
Architectural/structural	SF	---	---	(846.750)
Mechanical systems	SF	---	---	(1.789. 750)
Electrical systems	SF	---	---	(188.500)
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				17.845.000

LIST OF RELATED GRAPHICS:

Figure 1 - MAF Location Plan
Figure 2 - MAF Site Plan
Figure 3 - Cells K&L (114)
Figure 4 - Additional 75-Ton Crane (110)
Figure 5 - Modifications for Production Flow (103)
Figure 6 - LH_2 Bridge & Hoist Modifications (103)
Figure 7 - Final Assembly, Positions 1, 2, 3, 4 (103)

OTHER EQUIPMENT SUMMARY:

Special tooling and equipment (e.g., TPS spray and machinery equipment, LH_2 tank welding fixtures and TPS closeout kits) needed for initial operations will be funded from R&D sources.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

CoF resources may be required in the future to provide for additional production related facilities to support the scheduled production rate. These may include a demineralized water tank, storage facilities and related supporting and TPS facilities.

MICHOUD ASSEMBLY FACILITY
FISCAL YEAR 1983 ESTIMATES
MODIFICATION OF MANUFACTURING AND FINAL ASSEMBLY FACILITIES FOR EXTERNAL TANKS
SITE PLAN

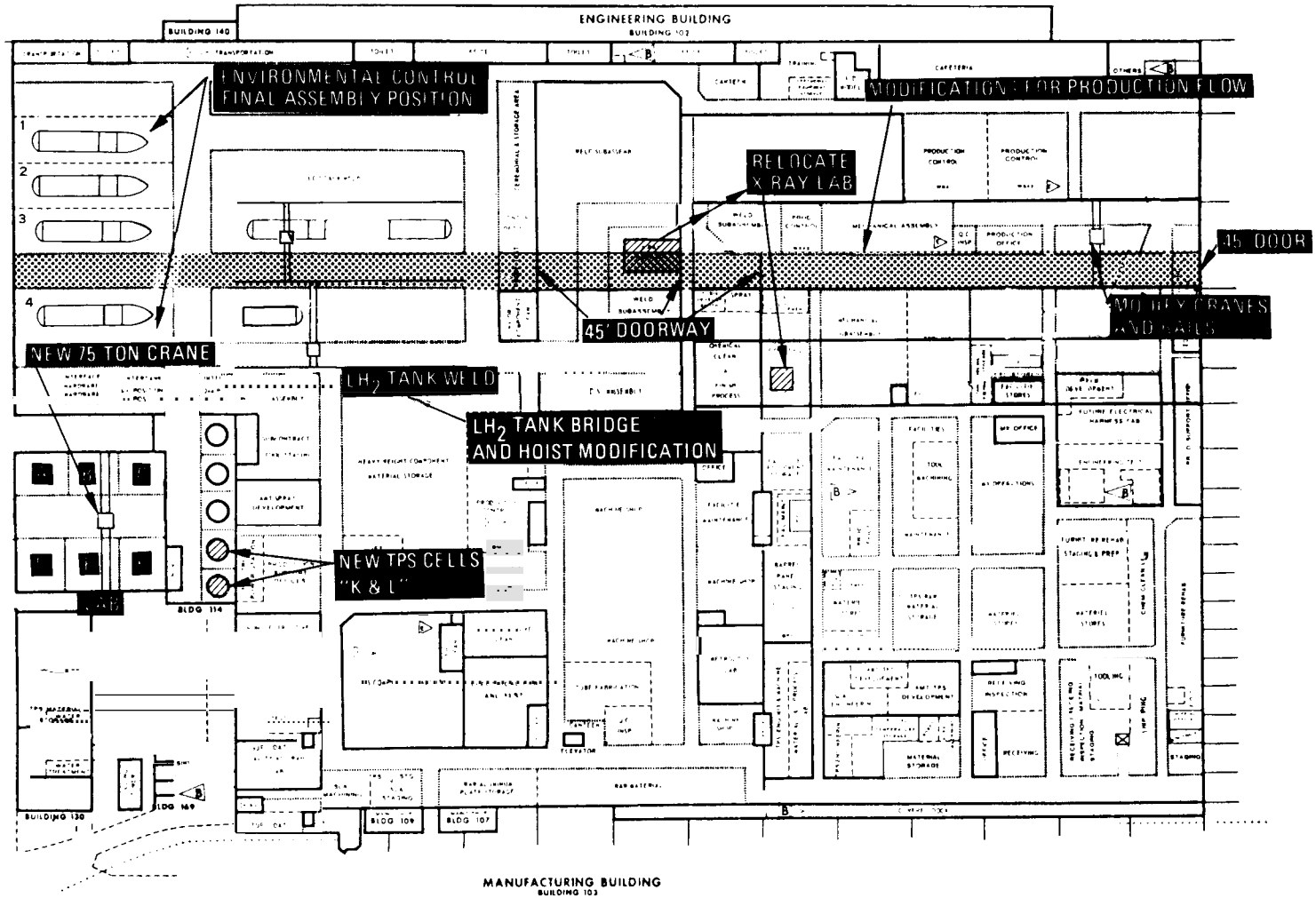


FIGURE 2

MICHOUD ASSEMBLY FACILITY
FISCAL YEAR 1983 ESTIMATES
MODIFICATION OF MANUFACTURING AND FINAL ASSEMBLY FACILITIES FOR EXTERNAL TANKS

CELLS K & L (114)

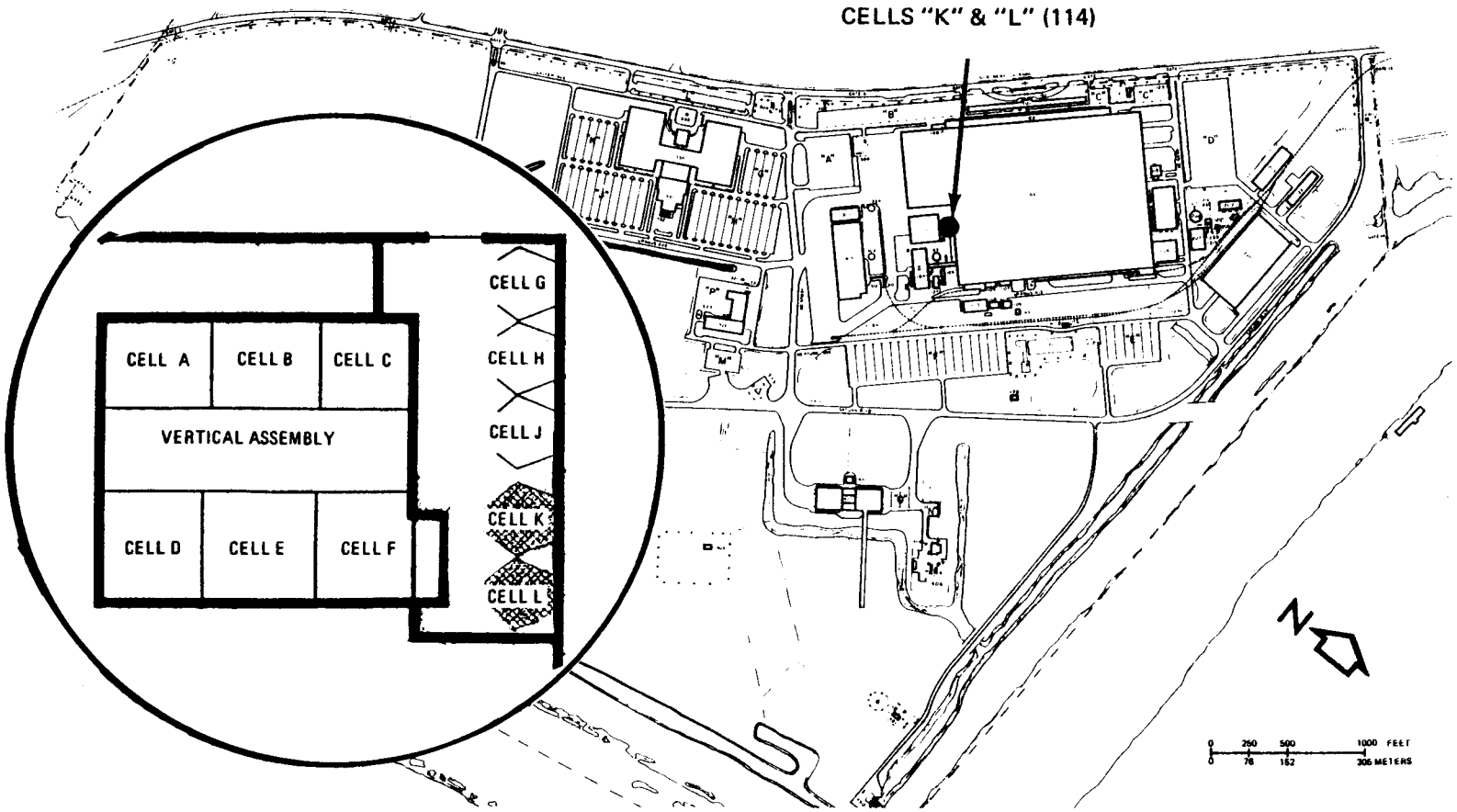


FIGURE 3

MICHOUD ASSEMBLY FACILITY
FISCAL YEAR 1983 ESTIMATES
MODIFICATION OF MANUFACTURING AND FINAL ASSEMBLY FACILITIES FOR EXTERNAL TANKS

ADDITIONAL 75-TON CRANE

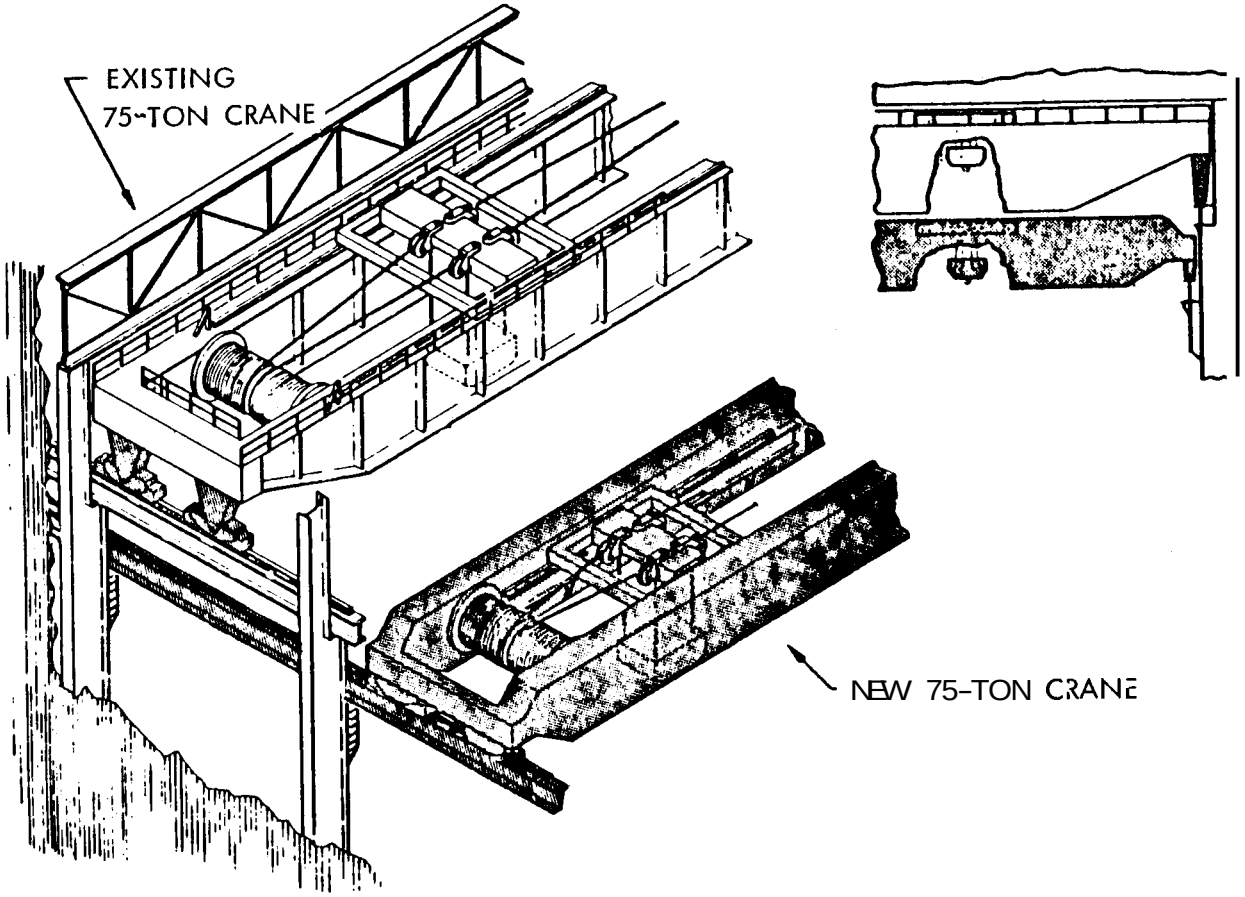


FIGURE 4

MICHOUD ASSEMBLY FACILITY
FISCAL YEAR 1983 ESTIMATES
MODIFICATION OF MANUFACTURING AND FINAL ASSEMBLY FACILITIES FOR EXTERNAL TANKS

MODIFICATIONS FOR PRODUCTION FLOW (103)

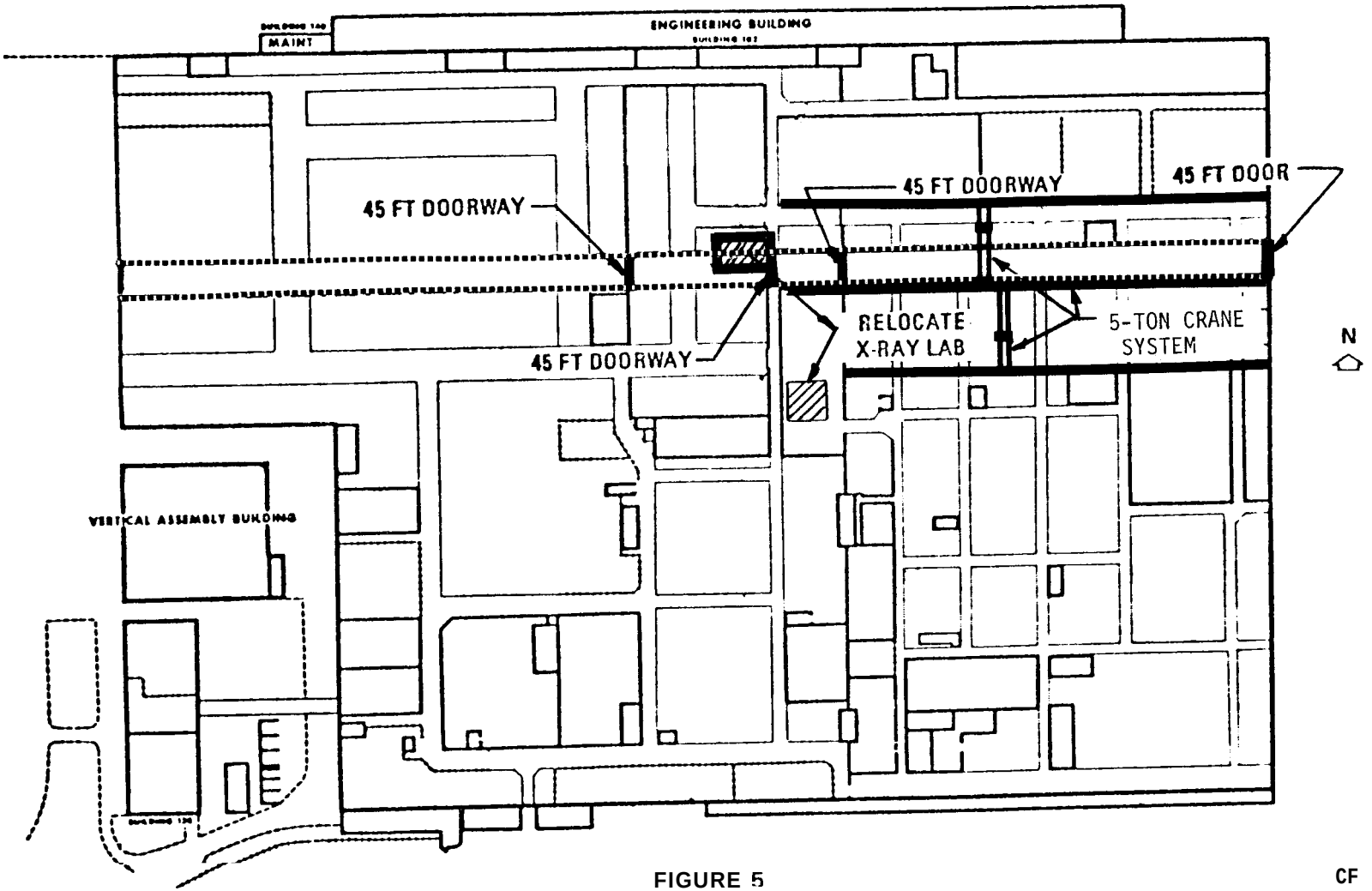
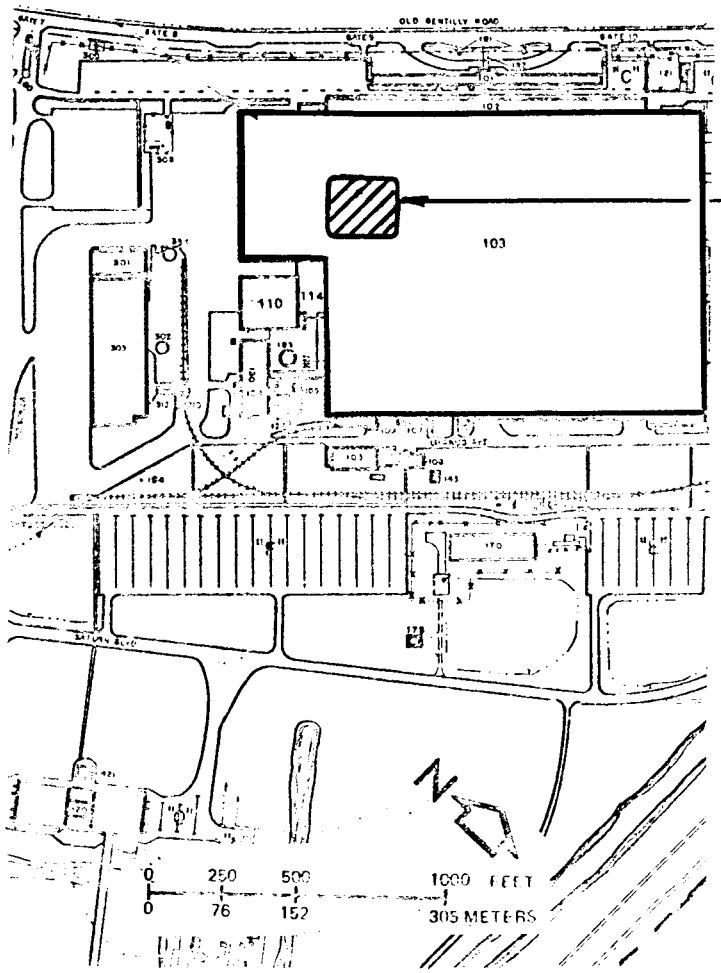


FIGURE 5

MICHOUD ASSEMBLY FACILITY
FISCAL YEAR 1983 ESTIMATES
MODIFICATION OF MANUFACTURING AND FINAL ASSEMBLY FACILITIES FOR EXTERNAL TANKS

LH_2 BRIDGE & HOIST MODIFICATIONS (103)



LOCATION PLAN

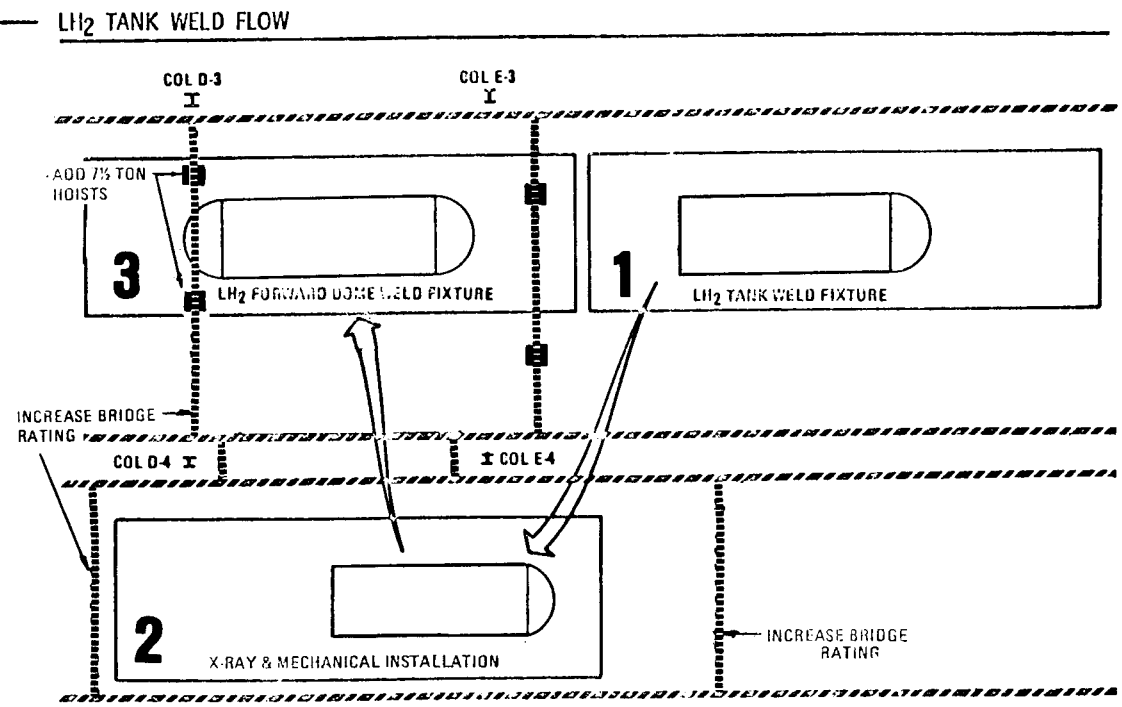


FIGURE 6

MICHOUD ASSEMBLY FACILITY
FISCAL YEAR 1983 ESTIMATES
MODIFICATION OF MANUFACTURING AND FINAL ASSEMBLY FACILITIES FOR EXTERNAL TANKS

EINAL ASSEMBLY, POSITIONS 1, 2, 3, 4 (103)

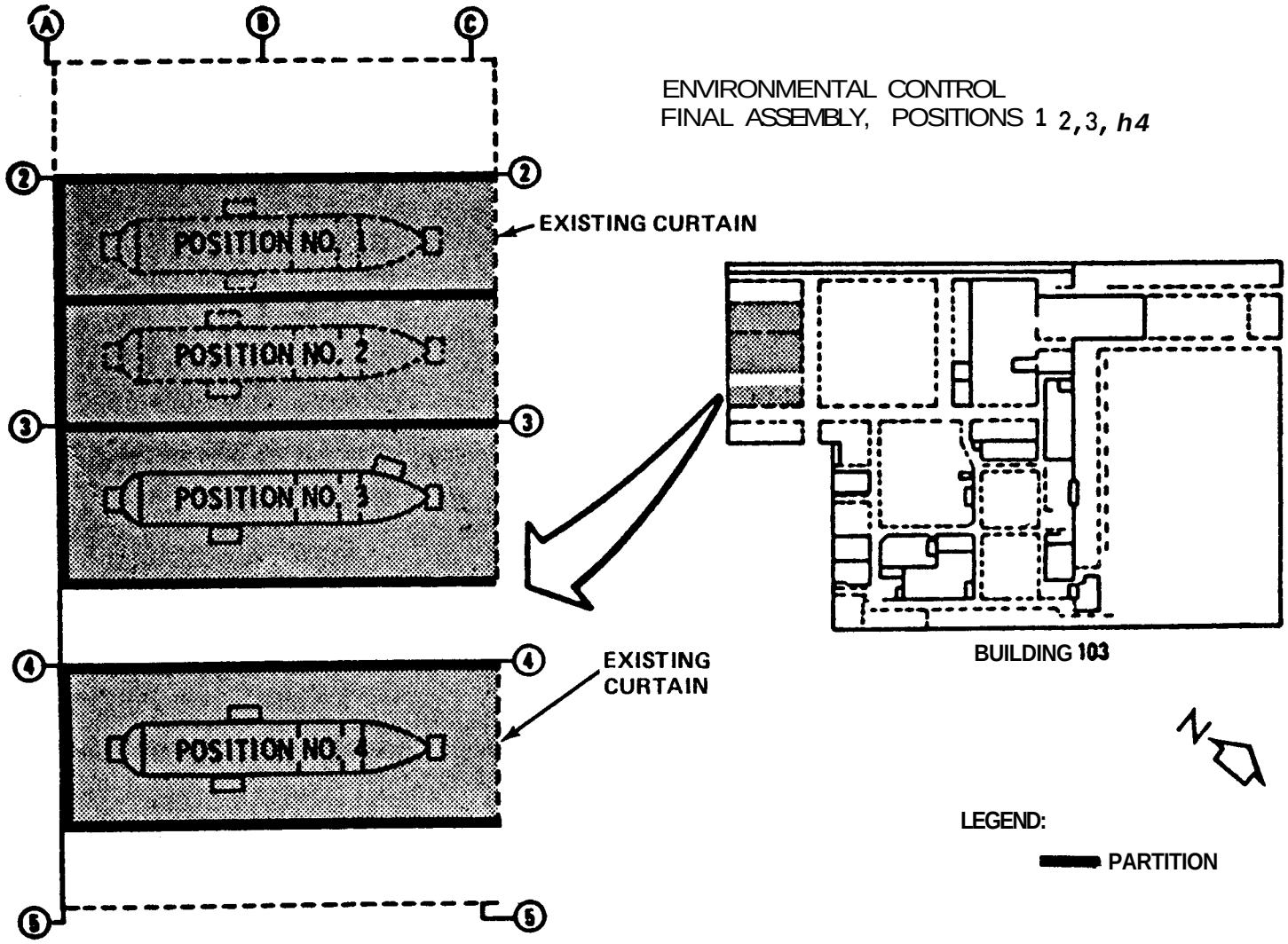


FIGURE 7

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE:	Minor Shuttle-Unique Projects		
INSTALLATION:	Various Locations		
		FY 1983 CoF ESTIMATE:	$1,860,000
	FY 1981: $2,000,000	FY 1982:	$1,115,000

COGNIZANT INSTALLATIONS/LOCATION OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Space Transportation Systems

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to provide minor rehabilitation, modification and construction of facilities necessary for support of the Space Shuttle Program at various NASA field installations. Included in this funding request are facility projects estimated to cost less than $500,000 each. These projects respond to unique requirements of the Space Shuttle Program and are needed to achieve initial operational capability or to meet the program milestones.

PROJECT JUSTIFICATION:

Space Shuttle development, assembly, and test requirements are being accomplished to a large extent in Government facilities at various NASA installations and industrial plants. Any major modifications or new construction required at these locations is described as a major project elsewhere in this budget request. This project includes only those Shuttle-unique facility rehabilitation, modification and construction projects estimated to cost not in excess of $500,000 each. Each item of work listed under "PROJECT DESCRIPTION" is necessary to support a specific Shuttle requirement, insure continued reliability, provide a safer environment,

and/or improve the efficiency and economy of individual facilities supporting the Space Shuttle program. It is recognized, however, that during project planning and implementation some rearrangement of priorities may be necessary. These changes will be accomplished within the available resources.

For clarity, full disclosure purposes, and better fiscal and technical control, all Space Shuttle facility costs for both major and these minor facilities projects, are summarized under "Space Shuttle Facilities-Various Locations".

PROJECT DESCRIPTION:

The justification, description, and cost estimate for all elements of the Shuttle-Unique minor projects are listed below:

A. Johnson Space Center (JSC) 720,000

1. Modifications to Buildng 30 for Shuttle Operations 300,000

This project is Phase V of a multiyear program to reconfigure the Mission Control Center, Building 30, for the Shuttle operations era. The Data Reduction Complex (DRC) is currently designated to meet general onsite operational requirements and specific Shuttle Avionics Integration Laboratory and Orbital Flight Test requirements. This project will permit the installation of necessary equipment to meet the increased data reduction requirements in the 1984-87 period resulting from reconfiguration of the Mission Operations Wing (MOW) to support multiple Shuttle flights and DOD operations. This project provides for the reconfiguration of the DRC by: removal/relocation of walls and doors; modifications to the electrical power distribution system; relocation of computer equipment; installation of new computer equipment; and modifications to the closed-loop coolant system. Modifications to existing lighting, power distribution, air-conditioning and fire detection/suppression systems will also be made.

2. Modifications to the 11-Foot Chamber Complex, Building 7 420,000

The Modifications to the 11-Foot Chamber Complex are required to provide a man-rated facility to simulate the operational configurations of the Orbiter cabin and various airlock/tunnel adapter arrangements. This change will allow evaluation of environmental control systems, extravehicular system hardware and associated procedures under simulated flight conditions. This added capability is essential to adequately evaluate potential Orbiter enhancements and their resulting effect upon operations, to conduct crew training and evaluate crew interfaces for new operational techniques, and to conduct real time/postflight anomaly investigations.

The work includes modifications to an existing airlock to simulate the Shuttle transfer tunnel and modifications to the Environmental Control Life Support Subsystem (ECLSS) Test Article for reduced pressure and oxygen-enriched atmosphere operation. Airlock modifications include the connection of the airlock to the Airlock Test Article cabin. The ECLSS Test Article includes the installation of piping and control valves for fire suppression, emergency repressurization, chamber drainage, and the relocation of piping and control valves in the existing fire suppression system for the existing airlock.

B. Kennedy Space Center (KSC) 1,140,000

1. Construction of Component Cleaning Facility, LC-39 135,000

Certain components of the mobile launcher platform and of the various systems at the launch pad are routinely removed for cleaning and other maintenance activities. These functions are presently performed in the open, on the paved area adjacent to a POL storage facility, Building K7-612. Cleaning and processing of these components is inefficient due to exposure to the elements. This project provides for a 40-foot by 60-foot (12 meter by 18 meter) pre-engineered metal building, a concrete foundation and the extension of electrical and utility lines to yield an enclosed facility in which to more appropriately perform component cleaning and staging.

2. Installation of Permanent MSBLS Cables, White Sands Missile Range 195,000

At the White Sands Missile Range, the Northrup Flight Strip has been used for astronaut training in the Shuttle Training Aircraft and is also designated as a backup Orbiter landing site. To support both requirements, Microwave Scanning Beam Landing System (MSBLS) cables have been installed. These cables were originally installed above ground in a temporary fashion as it was not certain how long they would be required. It has now been determined that this landing site will be used on a continuing basis for training, as well as for an Orbiter contingency landing site. The above ground cables have become weather-worn and must be replaced.

It is prudent to replace these cables with permanent cables. This project provides for the procurement and installation of 28,000 linear feet (8,400 meters) of direct-burial copper cable for the MSBLS.

3. Modifications for Flight Kit Storage, Building M7-505 460,000

Flight kits are items of flight hardware which are installed in the orbiter for a specific flight and removed after landing. They extend the capability of systems on the orbiter and provide an orbiter interface to the payloads. There are approximately 35 different types of flight kits totaling 90 individual pieces of hardware. Examples of flight kits include the remote manipulator system (RMS), the manned maneuvering unit (MMU), Spacelab utility kits, and rescue kits. Because these items are to be used on an intermittent basis, adequate ground storage space must be provided. This project will modify approximately 10,000 square feet (900 square meters) of open space in Building M7-505 (KSC Industrial Area) to provide a dedicated storage area for these high value flight kits. The work includes: removal of approximately 10 linear feet (3 meters) of an existing interior concrete loading dock; installation of a five-ton hoist; upgrading the existing air-conditioning system for 100,000-class cleanliness standards; and upgrading the fire detection and alarm systems.

4. Modifications to Power Distribution System, Pad B..... 350,000

The primary source of electrical power at Pad B is the 60-hertz distribution system. This system was originally installed during the Apollo program and has remained substantially unaltered since that time. Continual exposure to the salt air environment has caused the need for a general refurbishment of this system. The work includes repairing or replacing, as appropriate, the major electrical components servicing the liquid oxygen area, the gaseous hydrogen area, the switching stations, the transformers and the camera pads.

SPACE SHUTTLE
PAYLOAD FACILITIES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

SUMMARY

CS SHUTTLE PAYLOAD FACILITIES

	Amount	Page No.
Office of Space Transportation Systems:		
Rehabilitation and Modification for Payload Ground Support Operations (KSC).....	1,740,000	CF 2-1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1983 ESTIMATES
REHABILITAT ON AND MODIFICATION FOR PAYLOAD GROUND SUPPORT OPERATIONS

LOCATION PLAN

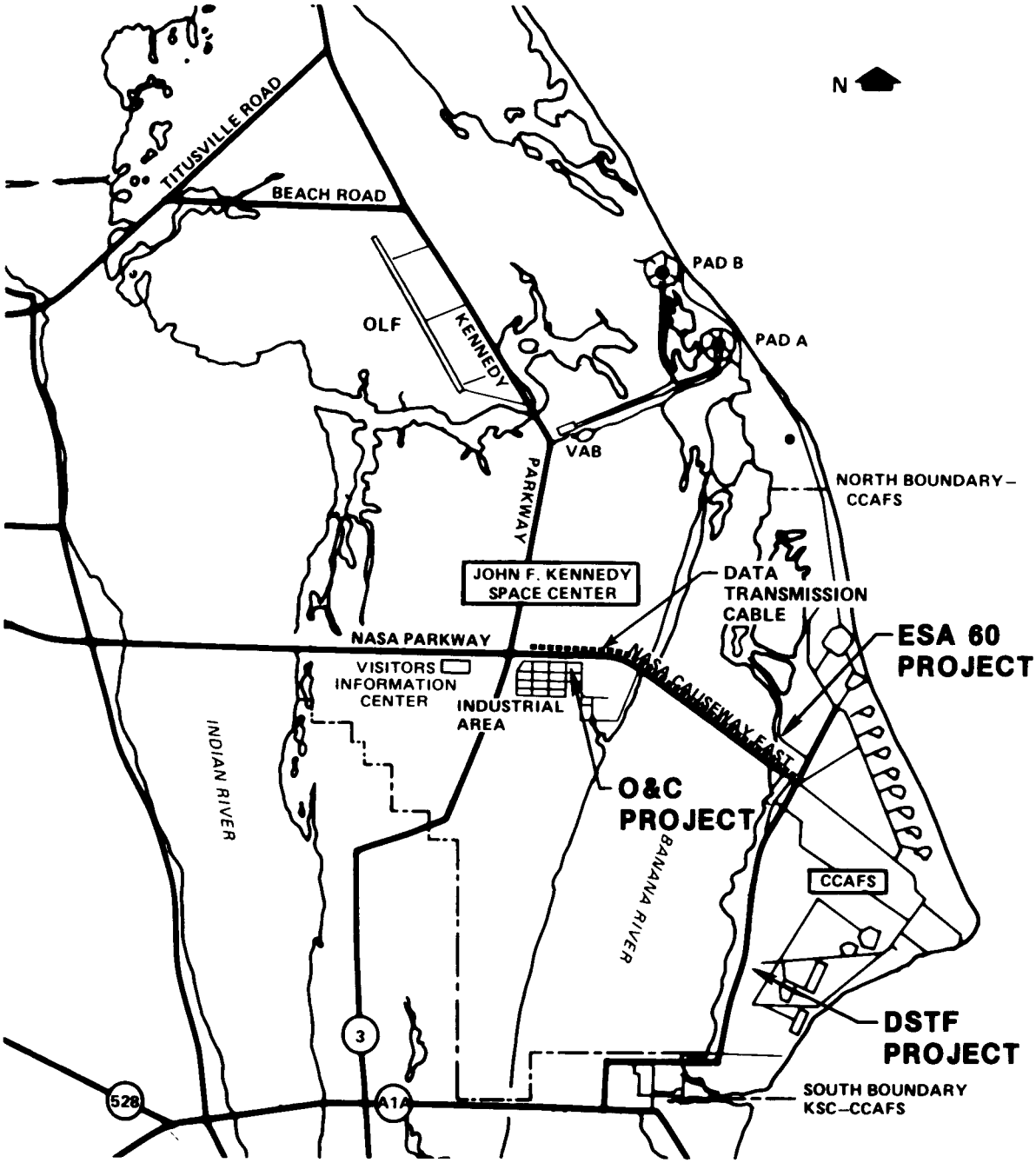


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE:	Rehabilitation and Modification for Payload Ground Support Operations
INSTALLATION:	John F. Kennedy Space Center
FY 1983 CoF ESTIMATE:	$1,740,000

COGNIZANT HEADQUARTERS OFFICE: Office of Space Transportation Systems

FY 1982 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding	219,625	1,170,000	1,389,625
Capitalized investment	N/A	49,277,416	49,277,416
Total	219,625	50,447,416	50,667,041

SUMMARY PURPOSE AND SCOPE:

This project continues construction and rehabilitation/modification of facilities necessary to support Space Shuttle payload ground operations at the NASA launch site, Kennedy Space Center (KSC) (Figure 1), begun with prior year resources. This year's request provides: Modifications to the fire suppression/detection/alarm systems and to the AC power system at both the Delta Spin Test Facility (DSTF) and the Explosive Safe Area-60 (ESA-60) (Figure 2); Modifications to the Operations and Checkout (O&C) Building for human life science experiments and for payload processing monitoring (Figure 3); and Modifications to the communication cabling between KSC and Cape Canaveral Air Force Station (CCAFS).

PROJECT JUSTIFICATION:

The Delta Spin Test Facility (DSTF) and Explosive Safe Area-60 (ESA-60) are existing payload processing facilities located at CCAFS. They are unique and of significant importance as they are the only propellant loading and spin test facilities for spacecraft at either KSC or CCAFS. ESA-60 is used for fueling spacecraft used on Delta and Atlas-Centaur launches. DSTF is used for spin balancing payload assist modules (PAM's) and fueling spacecraft for Delta and Shuttle launches. Because of the hazardous operations performed, both are classified as ordnance facilities and are governed by stringent safety standards and codes. DSTF and ESA-60 were built in the early 1960's when the applicable fire protection codes were less restrictive than those in effect today. The fire detection/suppression/alarm systems, as well as the AC electrical system, must be modified in both facilities to meet these codes.

In the FY 1981 budget, $1,617,000 was authorized and appropriated for modifications to the O&C Building to create designated payload user rooms. In these rooms payload users will monitor their experiments from initial checkout through integration with the orbiter, and during final checkout on the launch pad. Although all architectural and mechanical modifications were programmed in the FY 1981 project, cabling for the final user room was not operationally required until late 1983 and was deferred. FY 1983 funding is now needed to provide data transmission cables between the workstand areas of the O&C Building and this payload user room.

While the payload user rooms fill the need of the principal horizontal payload investigators, they do not monitor payloads which are assembled vertically. Vertical payloads begin integration in various staging areas at CCAFS. These payloads are next moved to the Vertical Processing Facility (VPF) at KSC for insertion into the payload canister, which eventually carries the payload to the launch pad. There are sufficient cable pairs in the existing data transmission cables between the CCAFS X-Y Building and the KSC Communications Data and Switching Center (Building M6-138) to allow the required monitoring until the FY 1984 time frame. Beginning in FY 1984, an estimated deficiency of 20 cable pairs will exist. Therefore the communication cables must be augmented with additional cable in FY 1983.

The final requirement supports human life science experiments scheduled on Spacelab-1 and Spacelab-4. These experiments will gain valuable data about the effect of weightlessness on the astronauts' ability to balance and orient themselves. The experiments call for the collection of baseline physiological data immediately before and after flight. This data will be generated by using a vestibular acceleration sled and associated equipment which will require dedicated space for installation and operation. An area on the first floor of the O&C Building will be modified for this use (Figure 4).

IMPACT OF DELAY:

Delaying the project will cause fueling operations to continue at the DSTF and ESA-60 using systems inadequate by present fire standards; interfere with the ability of payload users to adequately monitor both horizontal and vertical payloads, and cause vestibular acceleration experiments not to be included in Spacelab-1.

PROJECT DESCRIPTION:

At the DSTF and ESA-60, the following modifications will be made to fire detection/alarm/suppression systems and to the AC power system: replacement of existing sprinkler heads with deluge high density-type nozzles; rewiring of all manual pull alarm stations: addition of water deluge remote control activation stations; replacement of power cable seals; and installation of exit lights at all exterior doors.

In the O&C Building, 450 data transmission and control cables of various sizes will be provided to connect the payload user room area of the fourth floor with the workstands, signal acquisition room and lab areas on the first floor. Approximately 5,000 square feet (450 square meters) on the first floor of this building will be modified to house human life science experiment equipment. Modifications consist primarily of rerouting existing HVAC and electrical lines.

To connect the main CCAFS and KSC communication centers, approximately six miles (ten kilometers) of data transmission cable will be installed in existing underground ducting. The project includes cable procurement, installation and all required splicing.

PROJECT COST ESTIMATE:

This cost estimate is based on preliminary engineering reports and related engineering studies.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	1,740,000
Delta spin test facility.	LS	---	---	180,000
Electrical	LS	---	---	(75,800)
Mechanical	LS	---	---	(104,200)
Explosive safe area-60	LS	---		420,000
Electrical	LS	---	---	(171,000)
Mechanical	LS	---	---	(249,000)
Payload user room cabling	LS	---	---	255,000
CCAFS-KSC cabling	LF	30,923	20.21	625,000
Baseline data collection facility	LS	---	---	260,000
Architectural	LS	---	---	(78,500)
Electrical	LS	---	---	(79,600)
Mechanical	LS	---	---	(101,900)
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				1,740,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan, CCAFS
Figure 3 - Site Plan, KSC Industrial Area
Figure 4 - Baseline Data Collection Facility

OTHER EQUIPMENT SUMMARY:

Certain R&D funded equipment, such as payload data transmitters, receivers, and processing systems, estimated to cost approximately $350,000, will be required to activate the KSC-CCAFS data cable.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

It is anticipated that future modification work will be necessary to support additional payload processing tasks at KSC. The requirement for such work and its scope cannot be validated at this time.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1983 ESTIMATES
REHABILITATION AND MODIFICATION FOR PAYLOAD GROUND SUPPORT OPERATIONS

SITE PLAN, CCAFS

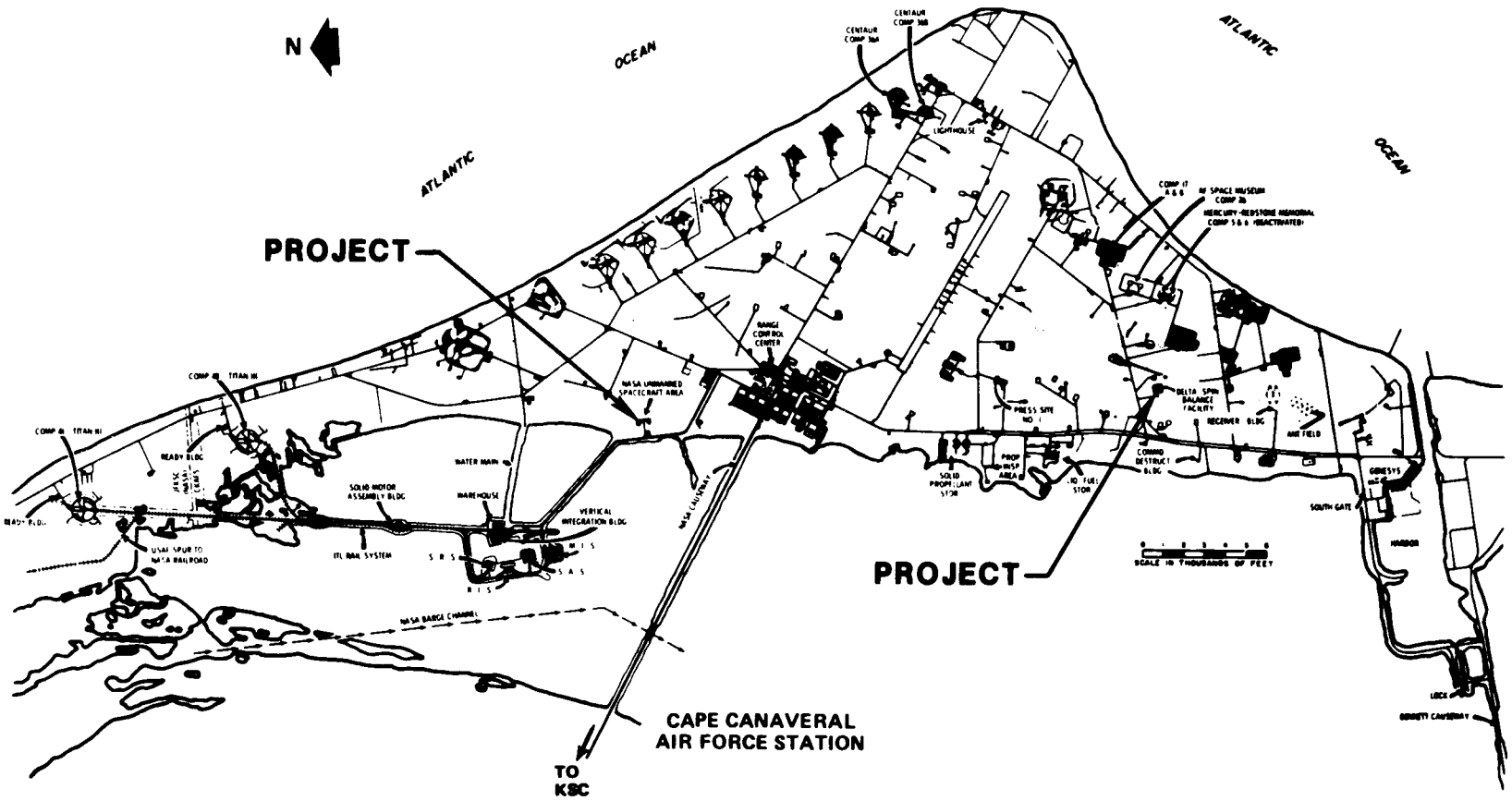


FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1983 ESTIMATES
REHABILITATION AND MODIFICATION FOR PAYLOAD GROUND SUPPORT OPERATIONS

SITE PLAN, KSC INDUSTRIAL AREA

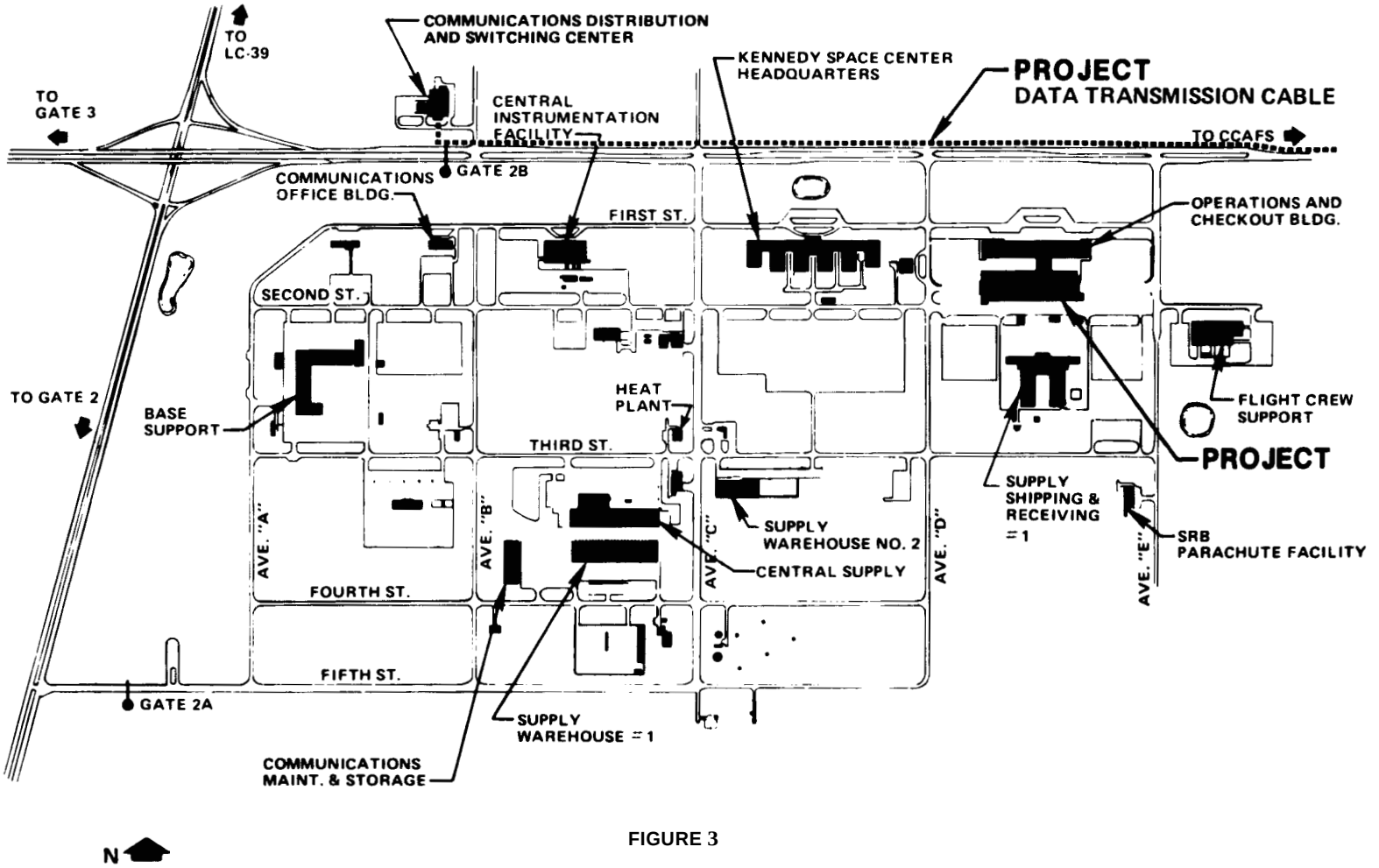


FIGURE 3

BASELINE DATA COLLECTION FACILITY

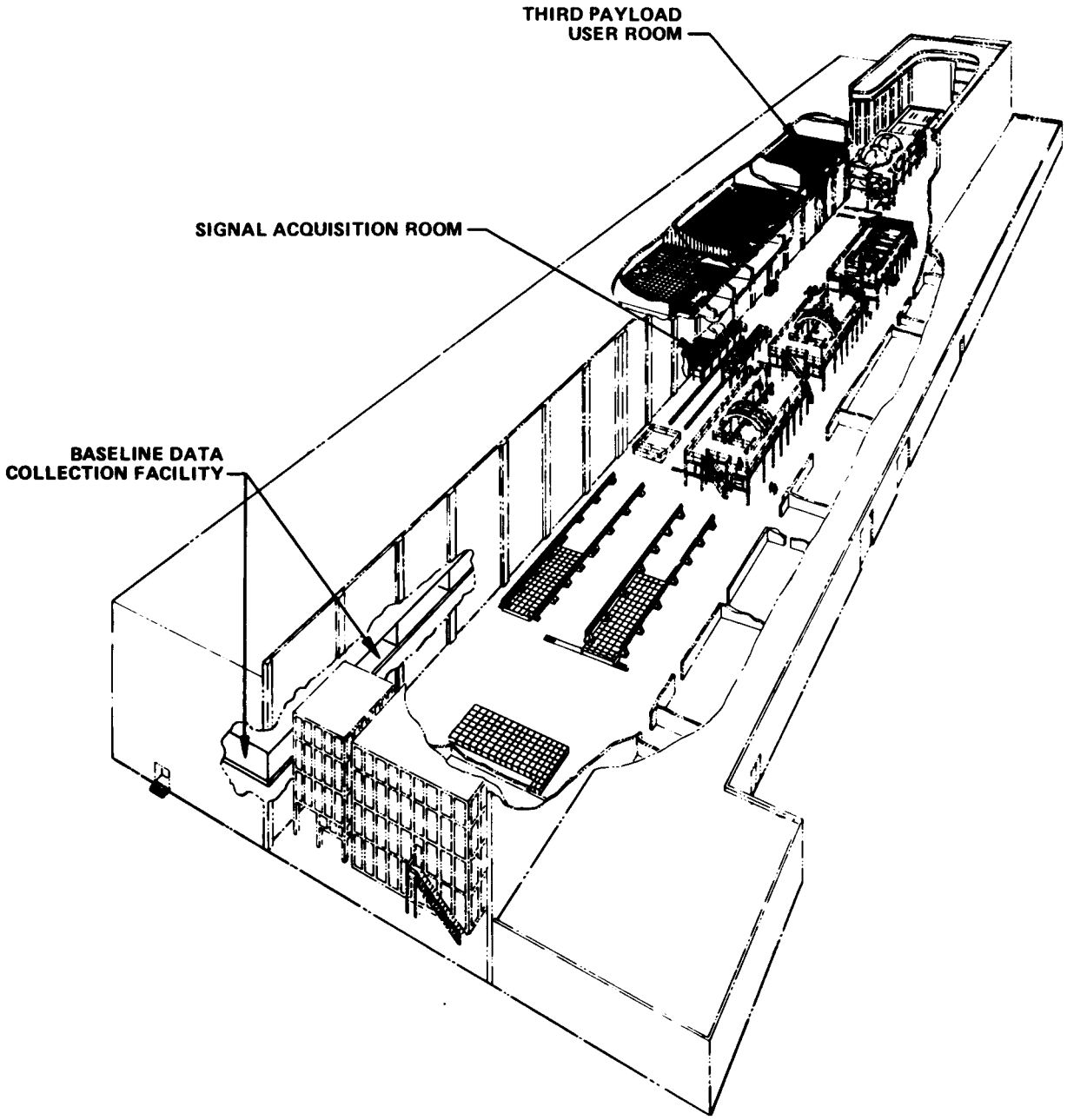


FIGURE 4

GODDARD
SPACE FLIGHT
CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

SUMMARY

GODDARD SPACE FLIGHT CENTER

	Amount	Page No.
Office of Space Science and Applications:		
Rehabilitation and Modification of Utility Systems.....	*2,840,000*	CF 3-1

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
REHABILITATION AND MODIFICATION OF UTILITY SYSTEMS
LOCATION PLAN

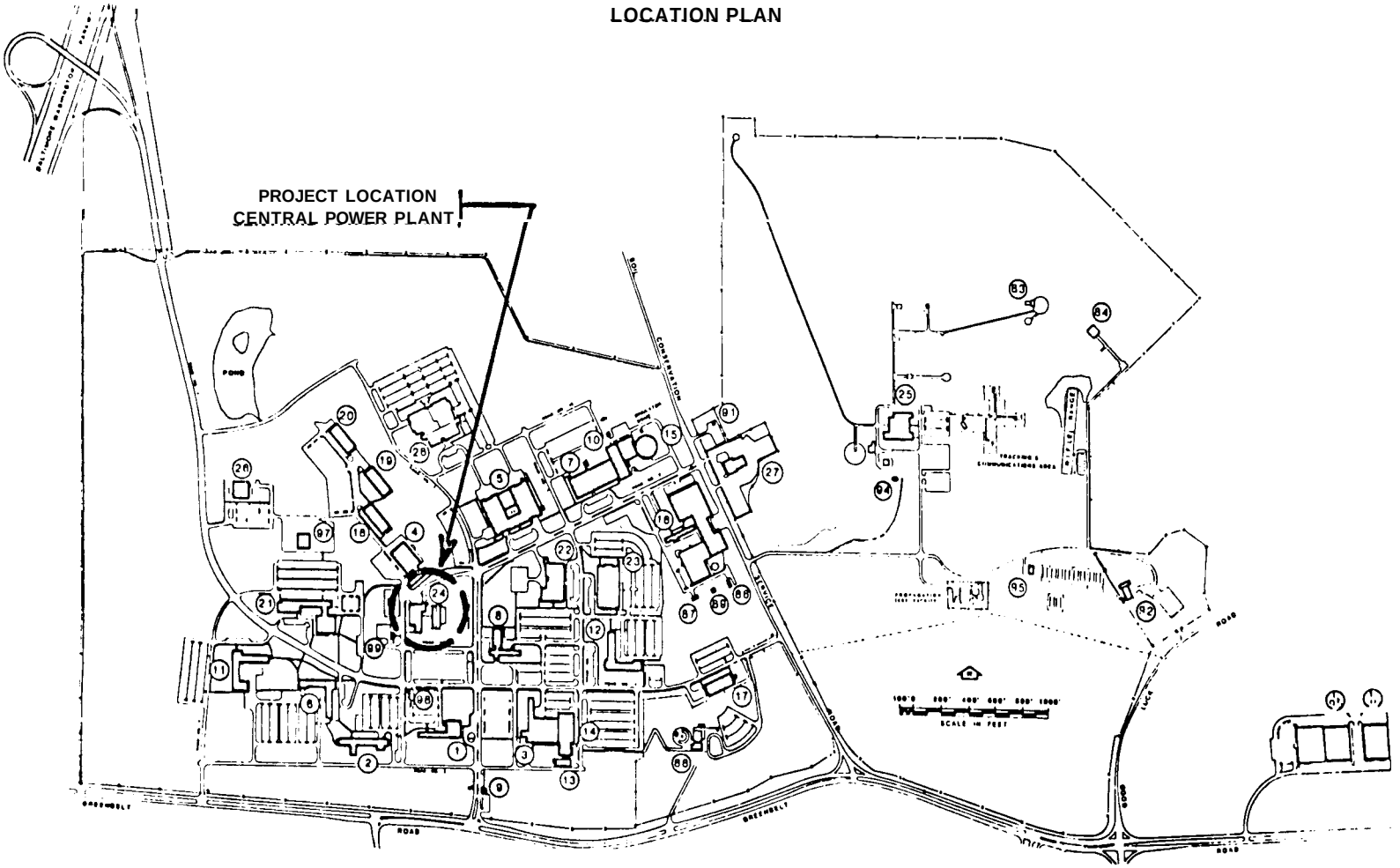


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE: Rehabilitation and Modification of Utility Systems

INSTALLATION: Goddard Space Flight Center

FY 1983 CoF ESTIMATE: $2,840,000

LOCATION OF PROJECT: Greenbelt, Prince Georges County, Maryland

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1982 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding	200,000	---	200,000
Capitalized investment	N/A	2,080,210	2,080,210
Total	200,000	2,080,210	2,280,210

SUMMARY PURPOSE AND SCOPE:

These resources will provide for the rehabilitation and modification of utility systems at the Goddard Space Fight Center (GSFC). The chilled water system in the Central Heating and Refrigeration Plant, Building 24, (Figure 1) will be rehabilitated through replacement of four chillers and cooling tower "A". The present equipment is approximately 20 years old, unreliable, inefficient, and lacking in required capacity. Replacement of this portion of the chilled water system is urgently needed to insure reliable environmental conditions for critical real-time spacecraft and data processing operations.

PROJECT JUSTIFICATION:

GSFC is responsible for program development and management of unmanned earth orbit satellites, the Delta program, and the management and operation of NASA's tracking and communications network. Reliable utility systems are essential to the operation of the technical facilities used for these functions and other vital Center operations. The rehabilitation and modification of the chilled and condenser water utility system is necessary at this time to return the systems to full service and provide reliable operational support.

The Center's chilled water distribution system and the attendant condenser water system were installed in the early 1960's and have since been expanded to meet the cooling requirements for additional facilities. Critical elements of the chilled water equipment and a cooling tower at the Central Heating and Refrigeration Plant, Building 24, have deteriorated to the point that they are now inadequate to support the Center's cooling requirements during peak demand periods. Engineering studies have determined that GSFC has a present cooling load of 8,500 tons (29,866 kilowatts) and that this load is scheduled to increase to over 9,000 tons (31,623 kilowatts) during the next five years. The four original steam driven chillers and cooling tower "A" have reached the end of their economical service life and are now unreliable and inefficient. The four electric chillers and cooling tower "B" are in good operating condition. A comprehensive plan has been developed to rehabilitate and modify the chilled water system to meet future needs while continuing to provide for current Center cooling requirements.

IMPACT OF DELAY:

Delay in accomplishing the rehabilitation and modification of the utility systems will result in the continuation of the present unsatisfactory chiller reliability and marginal effectiveness.

PROJECT DESCRIPTION:

This project provides for the rehabilitation and modification of the Center's chilled water system in the Central Heating and Refrigeration Plant, Building 24 (Figure 2). The work will include the removal of four old chillers and the installation of one electric driven chiller with a capacity of 3,000 tons (10,541 kilowatts) as shown in Figure 3. The installation includes: modification of supply and return water piping and valves with thermal insulation: the strengthening of the foundation and installation of floor supports for piping and other equipment; and electrical modifications to include new power supply and controls with ducts and conduits for cables and wiring.

Cooling tower "A" will be rehabilitated and restored to service as shown in Figure 3. Part of this rehabilitation will be the replacement of existing condenser water pumps and fans. An equalizing line and crossover piping will be installed to connect cooling towers "A" and "B" to allow either or both towers to support both new and existing chillers.

PROJECT COST ESTIMATE:

The project cost estimate is based on a completed preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acauisition.....	---	---	---	---
Construction.....	---	---	---	I,925,000
Demolition.....	LS	---	---	90,000
Install chillers.....	LS	---	---	380,000
Piping, valves and insulation.....	LS	---	---	160,000
Foundation and equipment supports.....	LS	---	---	55,000
Electrical power and controls.....	LS	---	---	125,000
Rehabilitation of cooling tower "A".....	LS	---	---	750,000
Condenser water system modifications.....,	LS	---	---	365,000
Equipment.....	---	---	---	915,000
Electric chiller 3,000 ton.....	LS	---	---	770,000
Condenser water pumps.....	LS	---	---	145,000
Fallout Shelter (not feasible).....	---	---	---	---
Total.....				2,840,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Existing Chilled Water System
Figure 3 - Modifications to Chilled Water System

OTHER EQUIPMENT SUMMARY:

No other equipment is needed to complete this project.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
REHABILITATION AND MODIFICATION OF UTILITY SYSTEMS

EXISTING CHILLED WATER SYSTEM

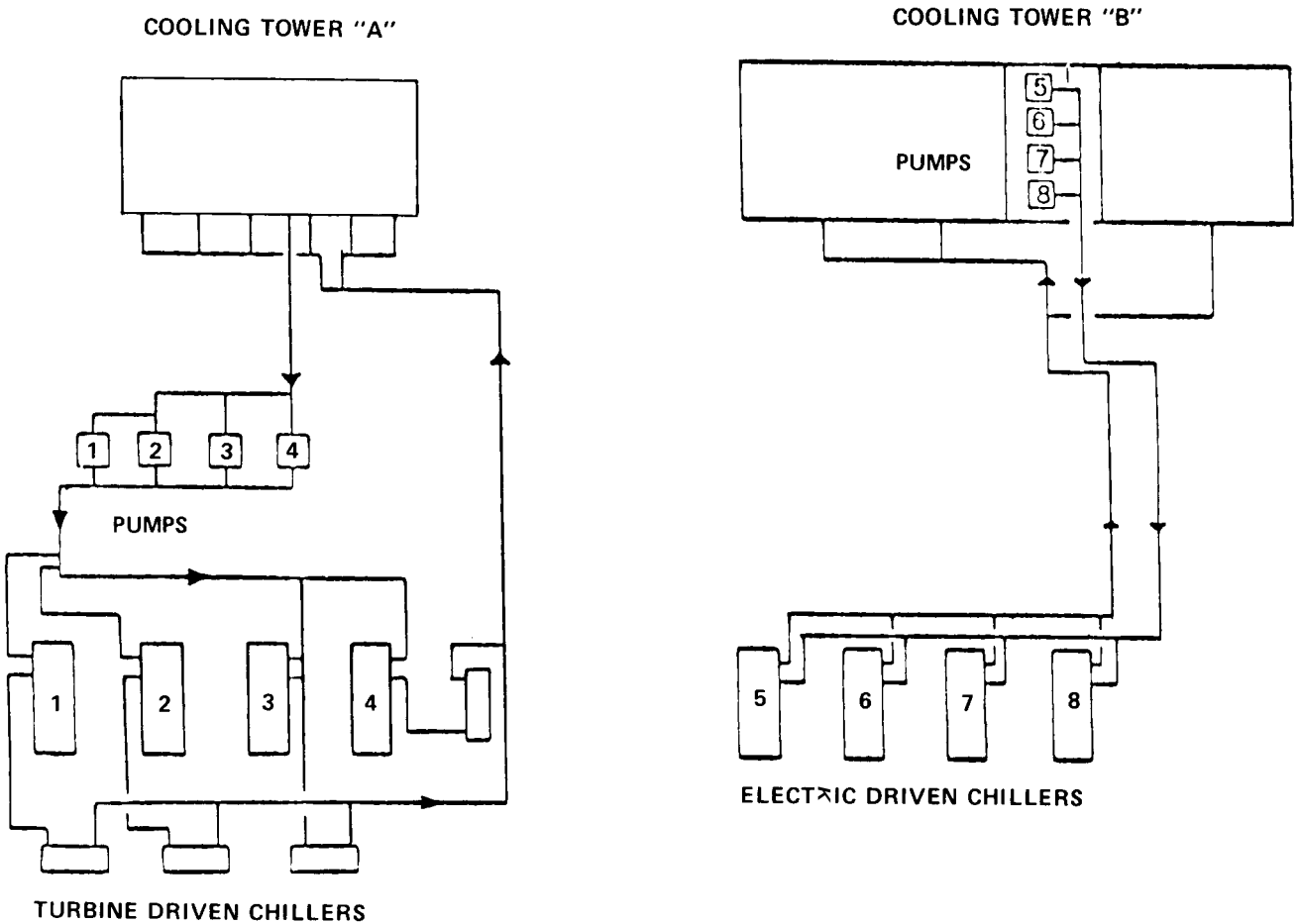


FIGURE 2

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES

REHABILITATION AND MODIFICATION OF UTILITY SYSTEMS

MODIFICATIONS TO CHILLED WATER SYSTEM

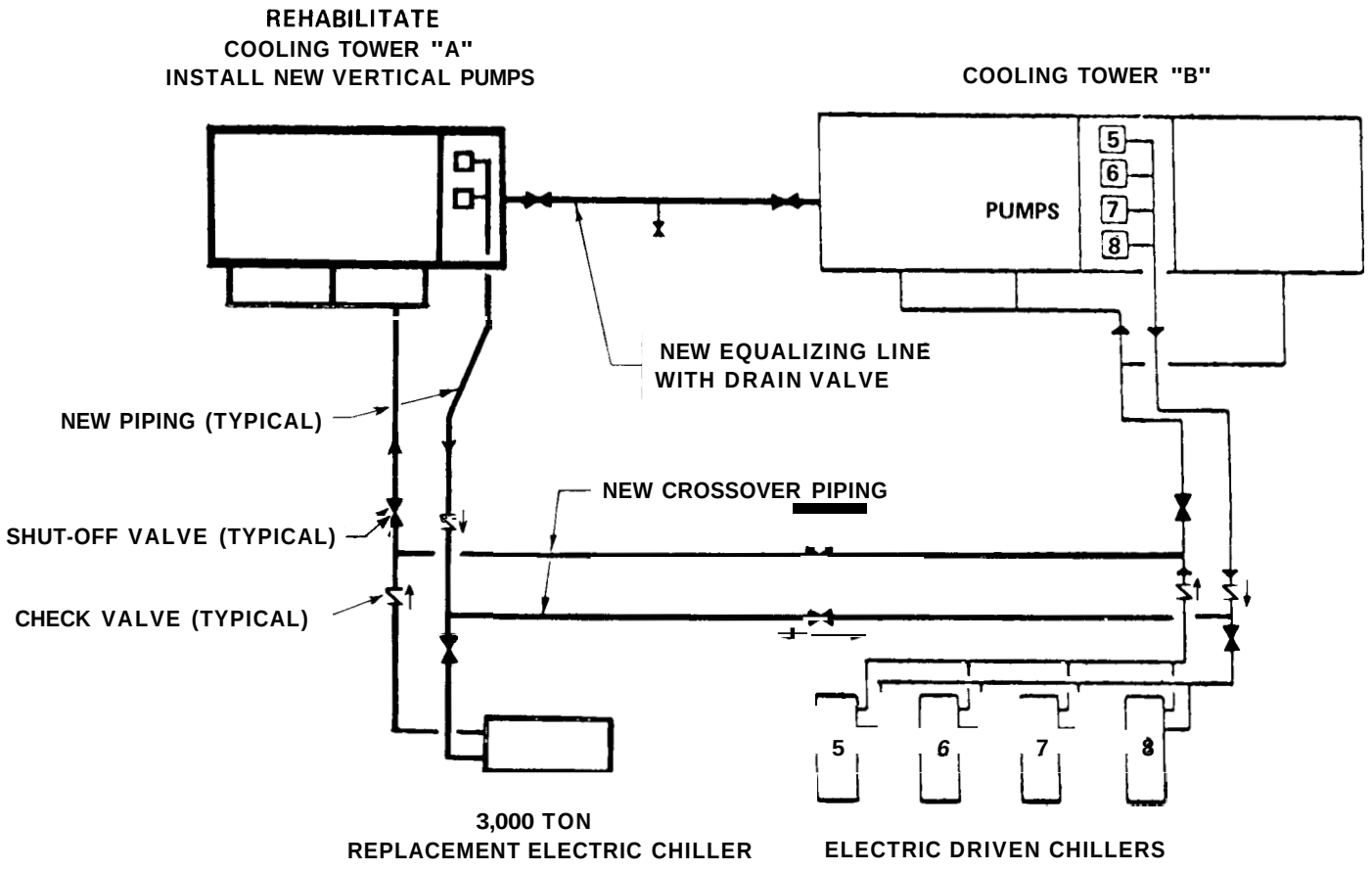


FIGURE 3

WALLOPS
FLIGHT CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

SUMMARY

WALLOPS FLIGHT CENTER

	Amount	Page No.
Office of Space Space Science and Applications:		
Rehabilitation of Airfield	2,150,000	CF 4-1

WALLOPS FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
REHABILITATION OF AIRFIELD

LOCATION PLAN

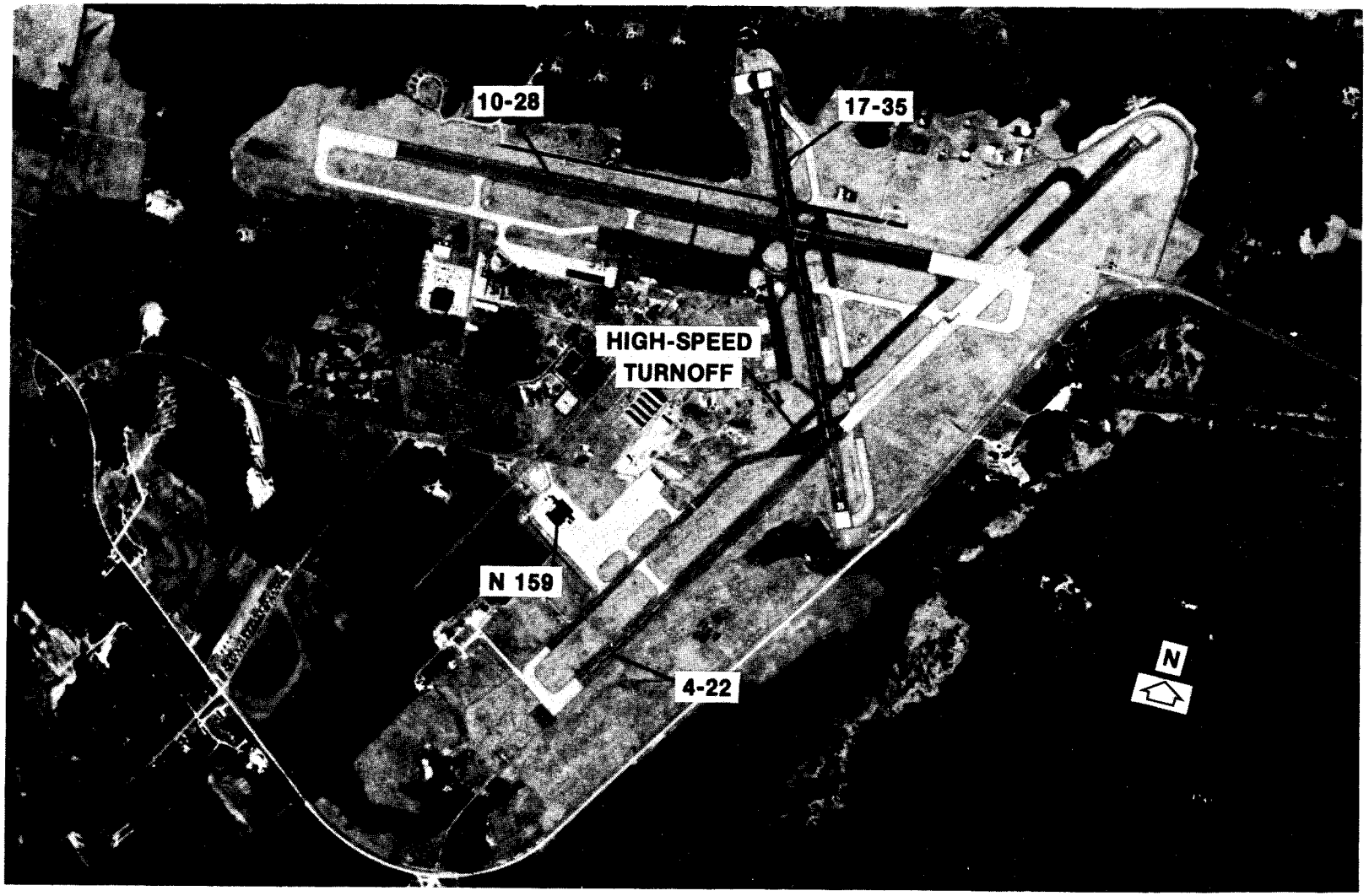


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE:	Rehabilitation of Airfield
INSTALLATION:	Wallops Flight Center
	FY 1983 CoF ESTIMATE: $2,150,000

LOCATION OF PROJECT: Wallops Island, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1982 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding	152,528	---	152,528
Capitalized investment	N/A	13,238,000	13,238,000
Total	152,528	13,238,000	13,390,528

SUMMARY PURPOSE AND SCOPE:

This project rehabilitates the airfield pavements at Wallops Flight Center to assure continuing and reliable operational support for aeronautical research programs. The work includes resurfacing portions of all three runways and a primary taxiway, correction of drainage problems on runway 10-28, and repair of surface spalls, cracked corners and open joints in runway 4-22. These airfield pavements are 26 years old. They require major rehabilitation and repair to prevent further degradation which would require extensive replacement of pavements and subbase. The work needs to be accomplished now to enhance aircraft safety by minimizing foreign object damage to engines and to reduce airfield maintenance and repair costs. The Wallops airfield supports a wide

variety of aeronautical research activities such as terminal area operations including landings and takeoffs, general aviation aircraft spin testing, noise propagation, water spray ingestion, storm hazards, antiskid braking systems, and flight evaluation of advanced avionics systems.

PROJECT JUSTIFICATION:

This project provides for the rehabilitation and repair of pavements that have lasted well beyond their expected life. However, due to age and extensive damage during recent severe winters, these pavements now require major rehabilitation. The bituminous pavements are severely cracked. The concrete paved areas are also cracked and joints need resealing. Joints between bituminous pavement and concrete pavement have buckled and broken. Some concrete slabs are no longer serviceable and must be replaced while others are spalled and require surface repair. In addition, some areas of runway 10–28 require surface drainage improvements and part of the runway's underdrain system is obstructed. If allowed to persist, these conditions and freezing weather will cause further pavement and subbase degradation. Pavement deterioration results in pavement debris on runways and taxiways and subsequent damage to valuable aircraft engines from debris ingestion. Because engines for the Terminal Configured Vehicle (TCV) aircraft cost approximately $250,000 each and F–18 engines cost about $2,000,000 each, avoidance of damage or excessive engine deterioration is a major consideration.

The Wallops airfield is the only NASA–owned fully equipped aeronautical flight research facility. It has three active runways (Figure 1) and special features for supporting fully integrated landing, takeoff, and terminal area operations tests as well as flyby and drop tests. The Wallops airfield is particularly valuable because of its isolation. It is not in the landing pattern for any other operational airfield. Therefore, operations can be conducted when dictated by research program needs without interference from commercial or military traffic.

Runway 4–22 is configured for landing and terminal area operations research. Its special features include a microwave landing-system (MLS), grooved pavement and ponding areas for tests of tire hydroplaning and engine ingestion of water spray, arresting gear, and a high speed turnoff from the runway onto the adjacent taxiway. The runway currently supports NASA's Terminal Configured Vehicle (TCV) program as well as joint NASA and Federal Aviation Administration (FAA) microwave landing systems and terminal area operations testing.

Runway 10-28 features include an FPS-16 radar-laser tracking system, television and film cameras recessed in the runway for glide slope research, and arresting gear. This runway has excellent look angles for unobstructed tracking of research aircraft and has a low ambient noise level. The runway supports the OV-1 Mohawk Aircraft noise tests, the Boeing 747 noise tests, the Terminal Configured Vehicle program, and the General Aviation Terminal Area Operations Research program.

Runway 17-35 is used for instrument landings during inclement weather. It also provides for straight-in landings from the Snow Hill Very High Frequency Omni-Directional Range Station (VOR). A hazardous cargo loading ramp is located adjacent to the runway for loading and unloading rocket motors in support of sounding rocket programs.

Many of the aeronautical test programs require the unique capabilities of a single runway while others require multidirectional runway capability because of aircraft crosswind limitations or to support crosswind landing and takeoff research. Spin research aircraft including the AA-1 Yankee, the C-25 Sundowner, the C-172K Cessna, as well as the high altitude U-2 earth observations research aircraft are examples of such wind sensitive aircraft. The F-18 aircraft test program for the Department of Defense requires the arresting gear installed on runways 10-28 and 4-22.

This project will restore the integrity of the airfield paving and maintain the capability for providing reliable support for flight research activities. This NASA research airfield is expected to remain fully operational for the foreseeable future.

IMPACT OF DELAY:

This work is needed now to arrest pavement and subbase deterioration before more costly work is required for extensive rehabilitation. Aircraft safety will be enhanced and airfield maintenance requirements will be reduced. Keeping Wallops airfield in serviceable condition is essential for providing continuing operational support for current and future aeronautical research programs.

PROJECT DESCRIPTION:

The airfield's three runways will be rehabilitated (Figure 1). The work includes resurfacing of bituminous concrete pavements, repair of portland cement concrete pavement slabs, and repair of pavement joints and cracks.

The entire 6,000-foot (1,800 meter) bituminous portion of runway 10-28 will be rehabilitated. Starting from the west end, the first 1,000-foot (300 meter) bituminous length will be resurfaced with a 5-inch (13 centimeter) thick, overlay on the central strip to 1 inch (2.5 centimeter) thick at the outer edges of the runway. The next 1,800 feet (550 meters) of runway will be resurfaced with an overlay ranging in thickness from 7 inches (18 centimeters) at the center of the runway to 1 inch (2.5 centimeter) at the outer edges. The remaining 3,200 feet (1,000 meters) of the runway will be resurfaced with a slurry seal over the full width. In addition, approximately 3,500 feet (1,100 meters) of the drainage system at the west end of the runway will be rehabilitated. Also, the portion of runway 17-35 between runways 10-28 and 4-22 (approximately 2,200 feet or 670 meters long) will be resurfaced with a slurry seal.

A portion of the portland cement concrete area of runway 4–22 will be overlayed with bituminous concrete. This overlay will be the full width of runway 4–22 and extend from its intersection with runway 10–28 southward approximately 150 feet (45 meters). Throughout the rest of the portland cement concrete portions of runway 4–22, surface spalls, cracked corners and open joints will be repaired. In addition, approximately 2,800 feet (850 meters) of the taxiway for runway 4–22 that extends northward from the high speed turnoff will be resurfaced.

PROJECT COST ESTIMATE:

This cost estimate is based on a completed preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	2,150,000
Runway 10-28	LS	---	---	1,787,000
Runway 17-35	LS	---	---	129,000
Runway 4-22 and taxiway	LS	---	---	234,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				2,150,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan

OTHER EQUIPMENT SUMMARY:

No other equipment is required to complete this project.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this rehabilitation.

WALLOPS FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
REHABILITATION OF AIRFIELD
SITE PLAN

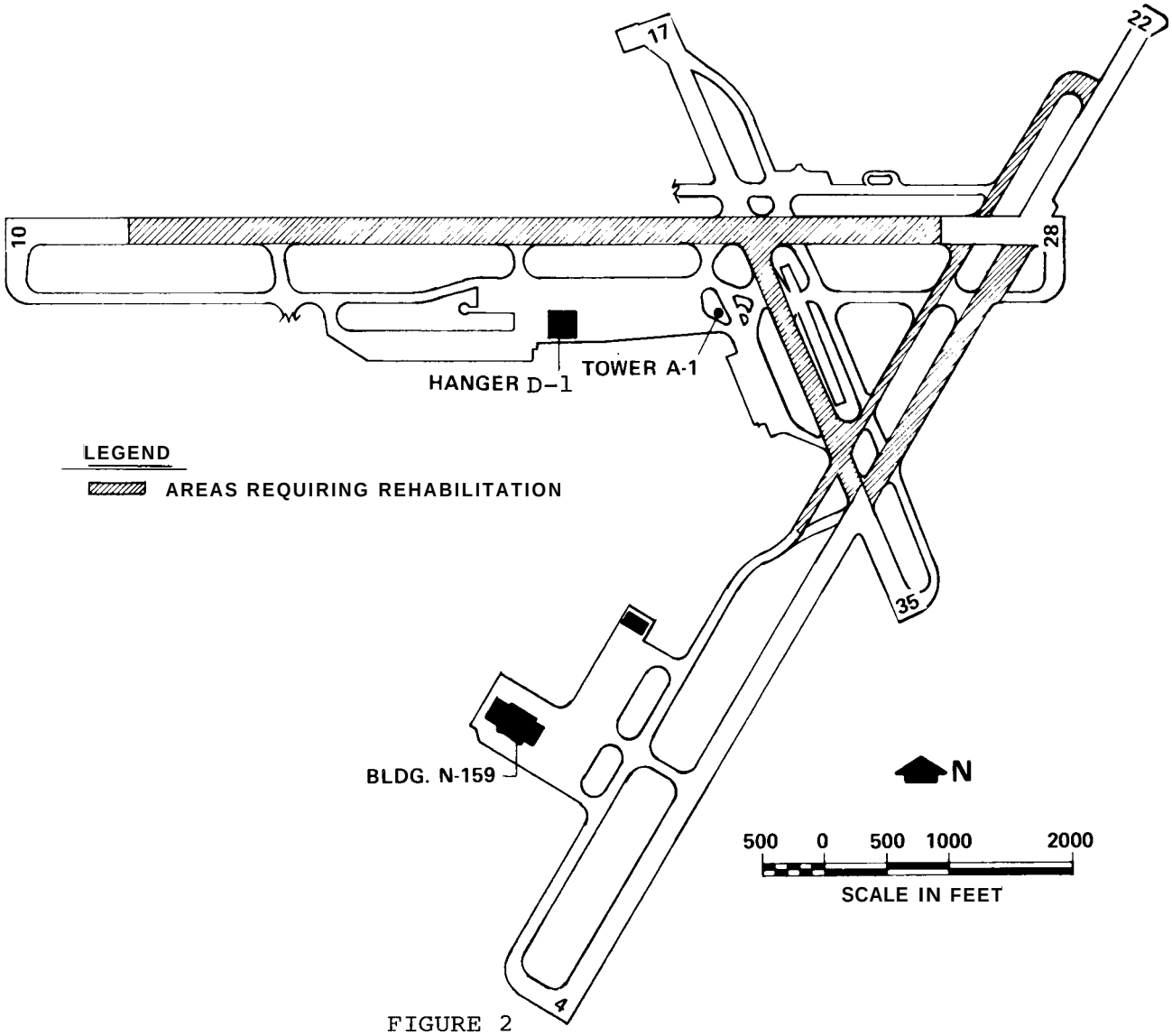


FIGURE 2

DRYDEN FLIGHT
RESEARCH FACILITY

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

SUMMARY

DRYDEN FLIGHT RESEARCH FACILITY

	Amount	Page No.
Office of Aeronautics and Space Technology:		
Construction of Data Analysis Facility..	,500,0	CF 5-1

DRYDEN FLIGHT RESEARCH FACILITY
FISCAL YEAR 1983 ESTIMATES

CONSTRUCTION OF DATA ANALYSIS FACILITY
LOCATION PLAN

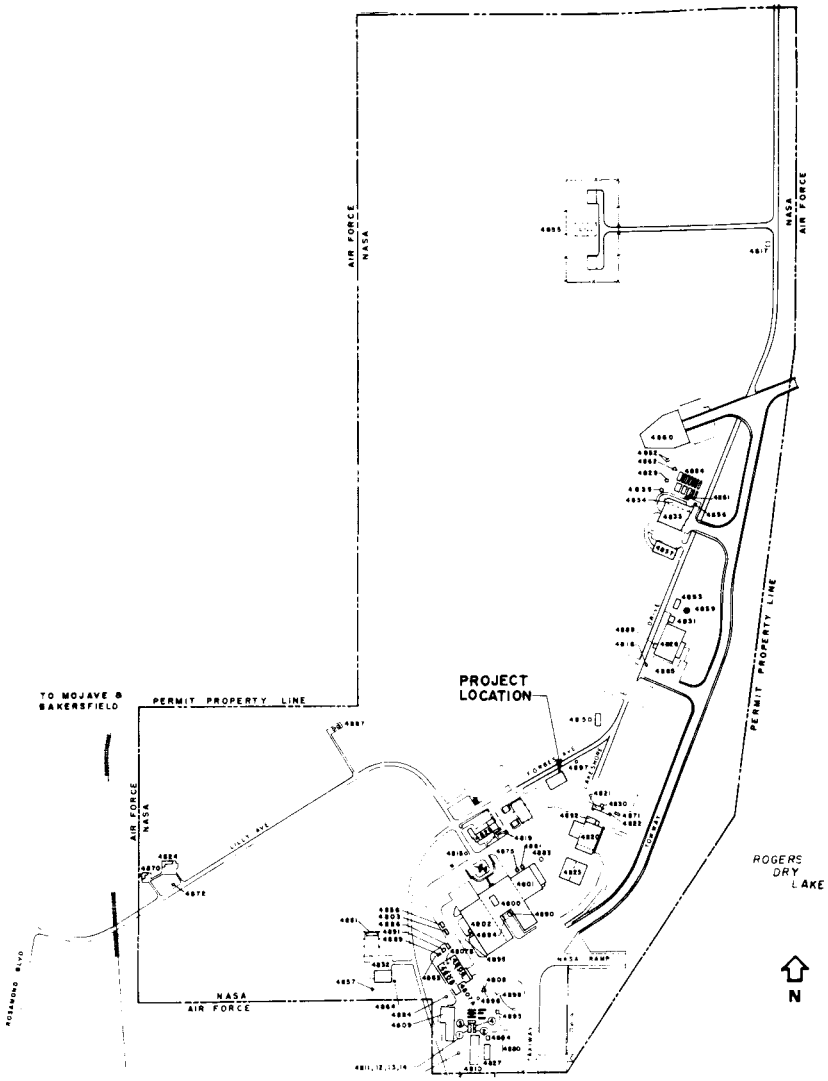


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE: Construction of Data Analysis Facility

INSTALLATION: Dryden Flight Research Facility

FY 1983 CoF ESTIMATE: $4,500,000

LOCATION OF PROJECT: Edwards AFB, Kern County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1982 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding	295,000	---	295,000
Capitalized investment	N/A	---	---
Total	295,000	---	295,000

SUMMARY PURPOSE AND SCOPE:

This project provides for the construction of a Data Analysis Facility at the Dryden Flight Research Facility to consolidate data automation activities and house new computers and ancillary equipment. This facility is required to eliminate serious deficiencies in computer operations space requirements, security and safety problems, fire protection inadequacies, support space, and dispersed operating locations. The Data Analysis Facility includes an operations area, service area, tape storage and office space. The existing fragmented computer operations in the Aircraft Construction and Modification Hanger, Building 4801, will be phased out and personnel, now housed in substandard trailers, will be relocated into the vacated space.

PROJECT JUSTIFICATION:

The Dryden primary mission is to provide staff and facilities for research and testing of aircraft and remotely piloted research vehicles. The flight regimes include the study of takeoff and landing, supersonic and hypersonic flight, and flight vehicle reentry. Modern computer systems are essential for effective operations and control of flight tests at Dryden. The Control Data Computer, Model 7328, presently installed on the mezzanine balcony of Building 4801, Aircraft Construction and Modification Hangar, is over nine years old and marginal at best. Since the present system is operating at full capacity, increased computational capability is vital for research and testing activities such as comprehensive tests to verify predicted critical vehicle and flight characteristics. This drives the requirement for new computer equipment to meet current and future research and test needs at Dryden. The current automatic data processing program provides for this equipment to be purchased in FY 1983 and 1984.

The present facilities are not adequate to accommodate the new equipment due to space and structural limitations. The computer operations are presently dispersed over a number of locations. Data processing for research and testing is located in various locations on the second floor in Building 4801 and in temporary trailers. Space is not available in the facility for storage of associated supplies. Supplies are currently stored in warehouses and hallways remote to the computer Operations. Structural inadequacies include hangar limitations on expansion due to the fact that the existing facility is on a mezzanine floor in an aircraft hangar.

To accommodate the new equipment, which the majority will be purchased in FY 1983, it is necessary that the facility be completed by June 1984. The construction period of 18 months beginning in January 1983 will permit occupancy of the facility beginning in June 1984.

Because this operational facility must continue to function at all times to support on-going tests, a dual operation will be necessary for a period of approximately 6 months. Once the new computers are operational in the new facility, personnel will be relocated to the space vacated by the old equipment and the trailers will be eliminated.

IMPACT OF DELAY

Delay in providing this facility would result in inadequate space for the installation of the critically required new computer equipment. The present unsatisfactory conditions place severe limitations on vital support activities for research flight testing.

PROJECT DESCRIPTION:

This project provides for the construction of a two-story concrete masonry building (Figure 2) approximately 22,000 square feet (2,044 square meters) in area. The first floor will enclose approximately 11,000 square feet (1,022 square meters) and the second floor will contain approximately 11,000 square feet (1,022 square meters). The foundation and structural framing will be of reinforced concrete. Construction will include all utilities, power distribution of 480/208/110 volts, and lighting levels of approximately 50-foot candles (538 lumens/square meter) in office and laboratory areas; heating, ventilating, and air-conditioning (HVAC); plumbing, and fire protection.

The first floor will house the programmers, technical support functions, and mechanical equipment. The second floor will provide approximately 6,500 square feet (604 square meters) of raised floor for new computers and associated equipment. The remaining area will provide space for computer maintenance and the storage of magnetic tapes.

PROJECT COST ESTIMATE:

The current cost estimate is based upon a completed preliminary engineering report (PER).

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	4,500,000
Site preparation	LS	---	---	977,000
Architectural	SF	22,000	44.36	976,000
Structural	SF	22,000	37.36	822,000
Mechanical	SF	22,000	42.82	942,000
Electrical	SF	22,000	35.59	783,000
Equipment	---	---	---	---
Fallout Shelter (not feasible)	---	---	---	---
Total				4,500,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Perspective

OTHER EQUIPMENT SUMMARY:

It is planned to purchase automatic data processing equipment with R&D resources in Fiscal Years 1983, and 1984 at a total estimated cost of approximately $5 milllion.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is needed to complete this work. The vacated space from this project will be converted to offices and the temporary trailers will be eliminated.

DRYDEN FLIGHT RESEARCH FACILITY
FISCAL YEAR 1983 ESTIMATES

CONSTRUCTION OF DATA ANALYSIS FACILITY
PERSPECTIVE

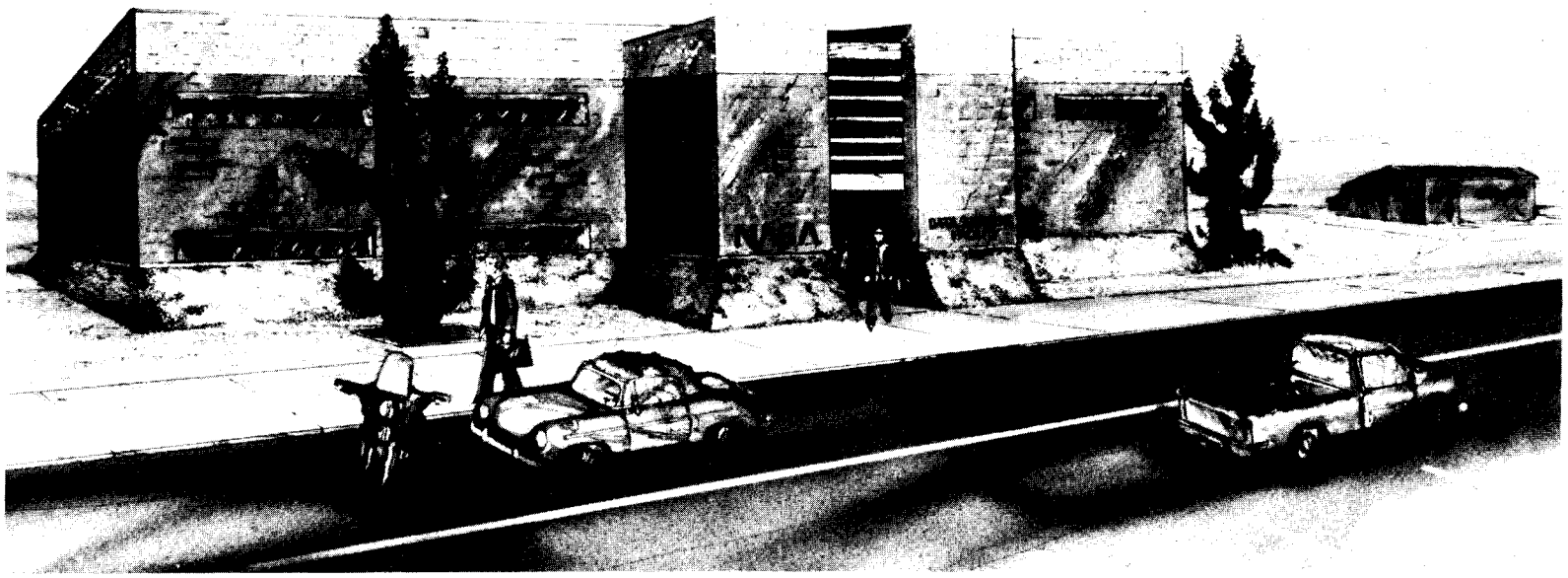


FIGURE 2

LANGLEY
RESEARCH CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

SUMMARY

LANGLEY RESEARCH CENTER

	Amount	Page No.
Office of Aeronautics and Space Technology:		
Modifications to the 4- by 7-Meter Low Speed Tunnel (1212-C).	7,200,000	CF 6-1
Modifications to Upgrade the Transonic Dynamics Tunnel (648).....	9,000,000	CF 6-9
Total.....	16,200,000	

LANGLEY XESEARCII CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATIONS TO THE 4- BY 7-METER LOW SPEED TUNNEL (1212C)

LOCATION PLAN

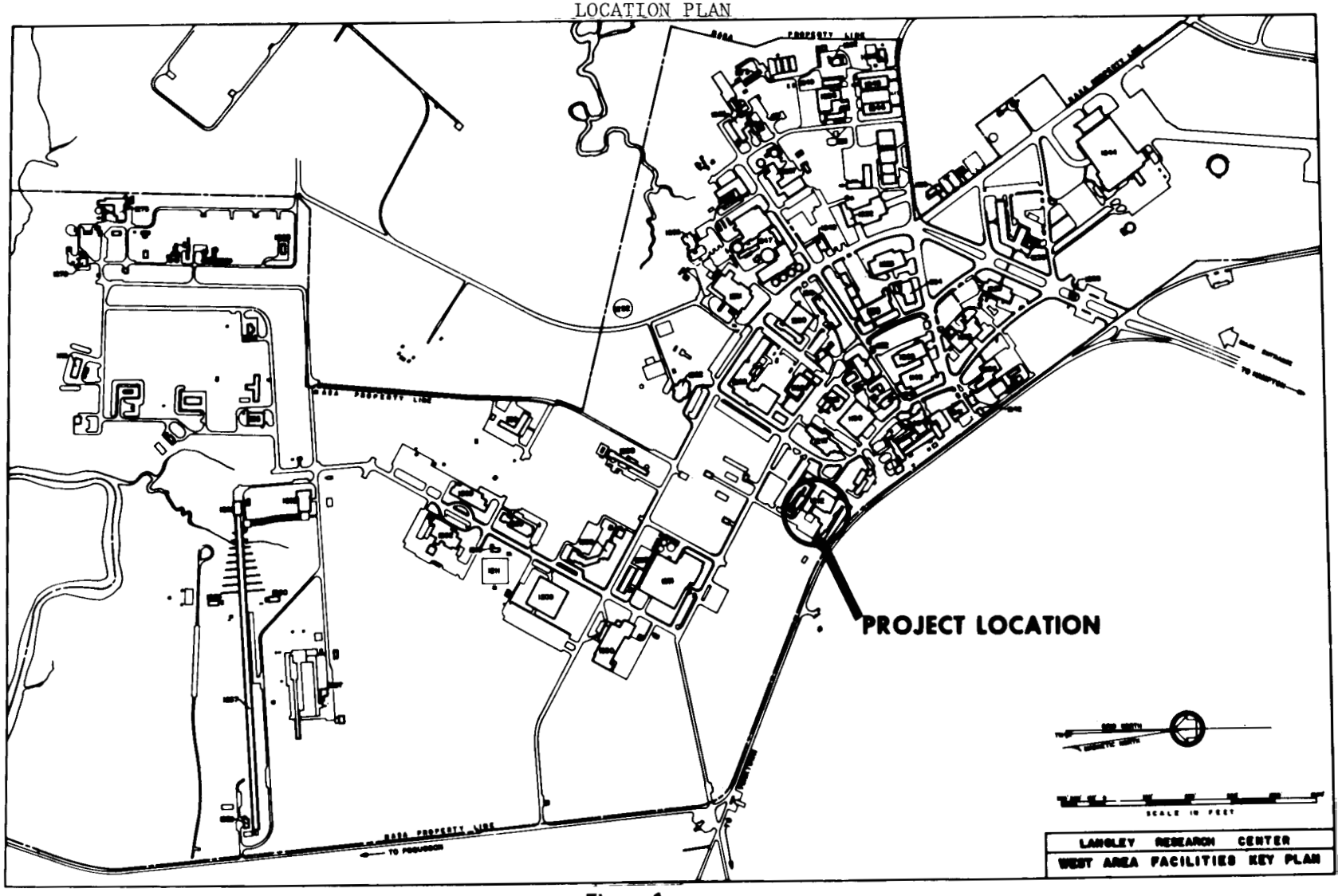


Figure 1

PROJECT TITLE: Modifications to the 4- by 7-Meter Low Speed Tunnel (1212C)

INSTALLATION: Langley Research Center

FY 1983 CoF ESTIMATE: $7,200,000

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1982 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding	588,000	690,000	1,278,000
Capitalized investment	N/A	7,245,726	7,245,726
Total	588,000	7,935,726	8,523,726

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to increase the operational efficiency and productivity of the 4- by 7-meter low speed tunnel (Figure 1) at Langley Research Center (LaRC) which has operated on a 2-shift basis since it was completed in 1970. A constant demand for research testing in the tunnel has resulted in a two-year backlog. This project will produce significant increases in operational efficiency and productivity. As a by-product, test time will be created for previously deferred, high risk ventures that were victims of the backlog. This project includes doubling the size of the model preparation area, building two new model support carts, developing a rotor test area for helicopter model assembly and hover testing, enlarging the tunnel control

room, providing a laser velocimeter (LV) laboratory, providing flow improvement in the tunnel circuit, and rehabilitating support areas in Building 1212.

PROJECT JUSTIFICATION:

This project is required to increase the operational effectiveness and productivity of the 4- by 7-meter low speed tunnel which was placed in operation in 1970 and has operated continuously on a two-shift basis. The tunnel has accumulated a two-year backlog of a wide variety of research and development tests. This demand is projected to continue because critical takeoff and landing characteristics for all aircraft must continue to be checked and verified through low speed aerodynamic testing. Specifically the work performed in this tunnel includes high lift aerodynamics, vortex-wake alleviations, rotorcraft research and fundamental flow measurements to validate analytical methods. Tunnel operation logs show that approximately 20 percent of the occupancy time now is used for model installation and calibration. Analyses show that gains of at least 17 percent in useful test time can be achieved from usage of the proposed model support cart system. Further efficiency gains are forecast from the use of a proposed rotor test cell to do rotorcraft model preparation and testing. Rotorcraft and other powered models are extremely complex and require very time-consuming preparation and calibration periods that should be accomplished off-line to be efficient and preclude loss of test time.

Initial experience with recently installed laser velocimeters (LV) has shown a need to maintain and adjust the optical alignment and detection elements on both a periodic and dedicated basis for specific research investigations. These operations require special safety procedures which can be efficiently accommodated only in the dedicated laboratory proposed in this project. Expansion of the tunnel control room and support areas is required to adequately support the new method of operation.

Test measurements of the flow between the drive fan and test section indicate an increase in flow turbulence and low frequency flow oscillations. These disturbances hinder some research activities, particularly low turbulence rotorcraft aerodynamics and acoustic studies. Tunnel flow improvements are necessary to alleviate these problems.

Various other modifications are required for noise abatement, office and shop rehabilitation and energy conservation.

IMPACT OF DELAY:

Deferral of these improvements and modifications would adversely affect needed timely research for high lift, vortex-wake alleviation, rotorcraft, and fundamental flow-field measurements to validate analytical methods.

Any delay in this project would continue to increase the large two-year backlog. A continued and growing backlog of commitments would necessitate that highest priority be assigned to configuration and concept studies having immediate or near-term military and commercial application. As a result, "high risk" and basic research studies would not be adequately supported and would suffer accordingly.

PROJECT DESCRIPTION:

This project (Figure 2) provides for the modification of the 4- by 7-meter low speed tunnel Building 1212C and the rehabilitation of support areas in Building 1212. A 7,000-square foot (650 square meter) addition including a 2,400-square foot (223 square meter) mezzanine will be constructed adjacent to Building 1212C. This addition will contain a model preparation area, tunnel control room, and technican support area. An LV lab of 875 square feet (82 square meters) will also be constructed. Other elements of the project include the construction of two new model support carts, the modification to an existing cart, and the development of a rotor test area for helicopter model assembly and hover testing. Tunnel modifications for flow quality improvements include the addition of screens and vortex generators. Rehabilitation of offices and restrooms, windows, lights, power distribution system, floor and wall coverings, and ceilings as required will be performed in Building 1212. The heating, ventilating, and air-conditioning (HVAC) system will also be rehabilitated.

PROJECT COST ESTIMATE:

This estimate is based on a completed preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	3,845,000
Building 1212C addition	LS	---	---	2,015,000
Rehabilitation B-1212C	LS	---	---	655,000
Laser velocimeter lab	LS	---	---	275,000
Rehabilitation B-1212	LS	---	---	goo, 000
Equipment	---	---	---	3,355,000
Model support stand number 2	LS	---	---	230,000
Model support stand numbers 3 and 4	LS	---	---	1,415,000
Tunnel flow improvements	LS	---	---	1,710,000
Fallout Shelter (not feasible)	---	---	---	---
Total				7,200,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan
Figure 3 - Tunnel Schematic and Performance Data

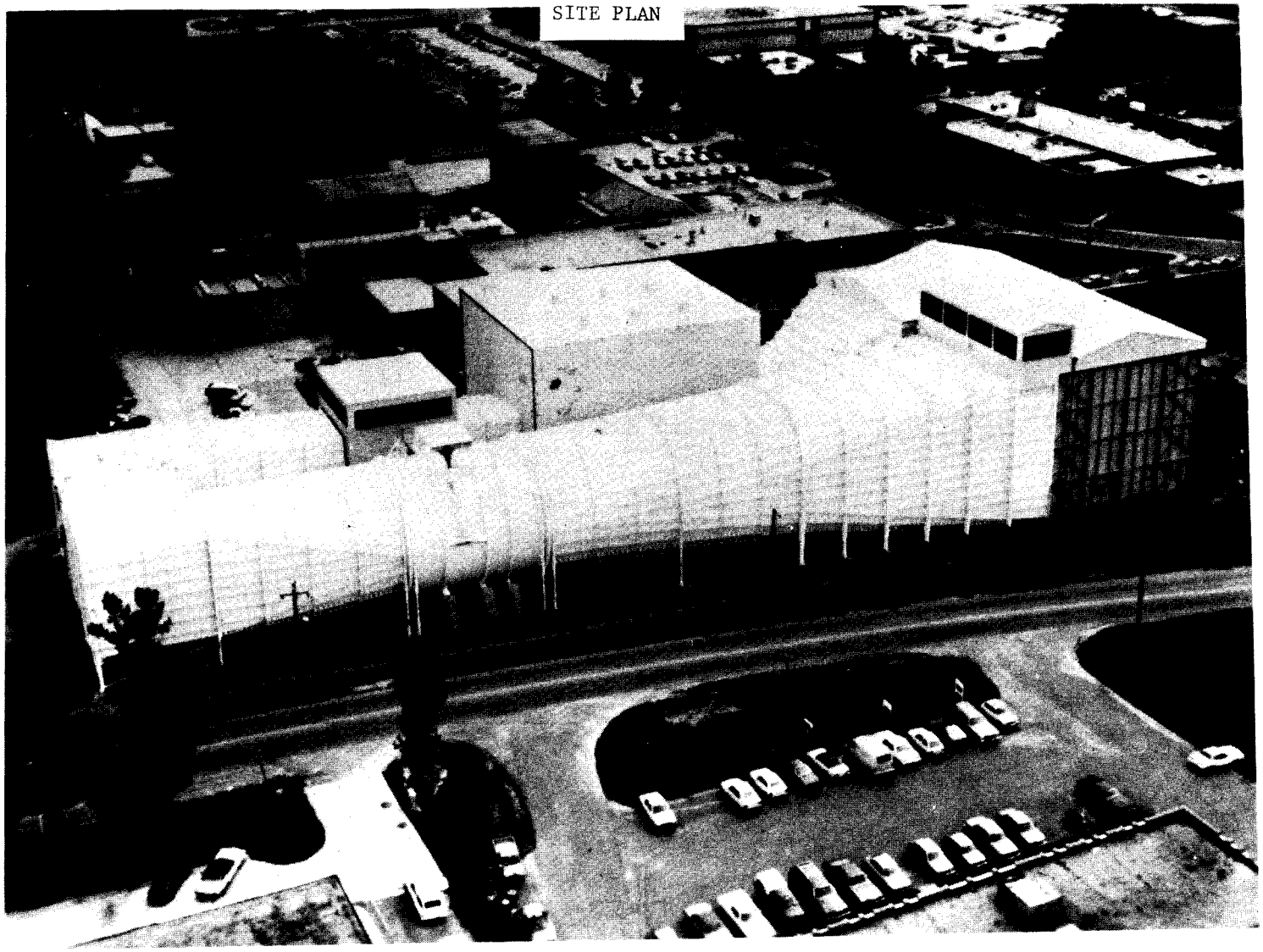
OTHER EQUIPMENT SUMMARY:

Data acquisition equipment upgrading/replacement is planned for a future R&D budget.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETED THIS PROJECT:

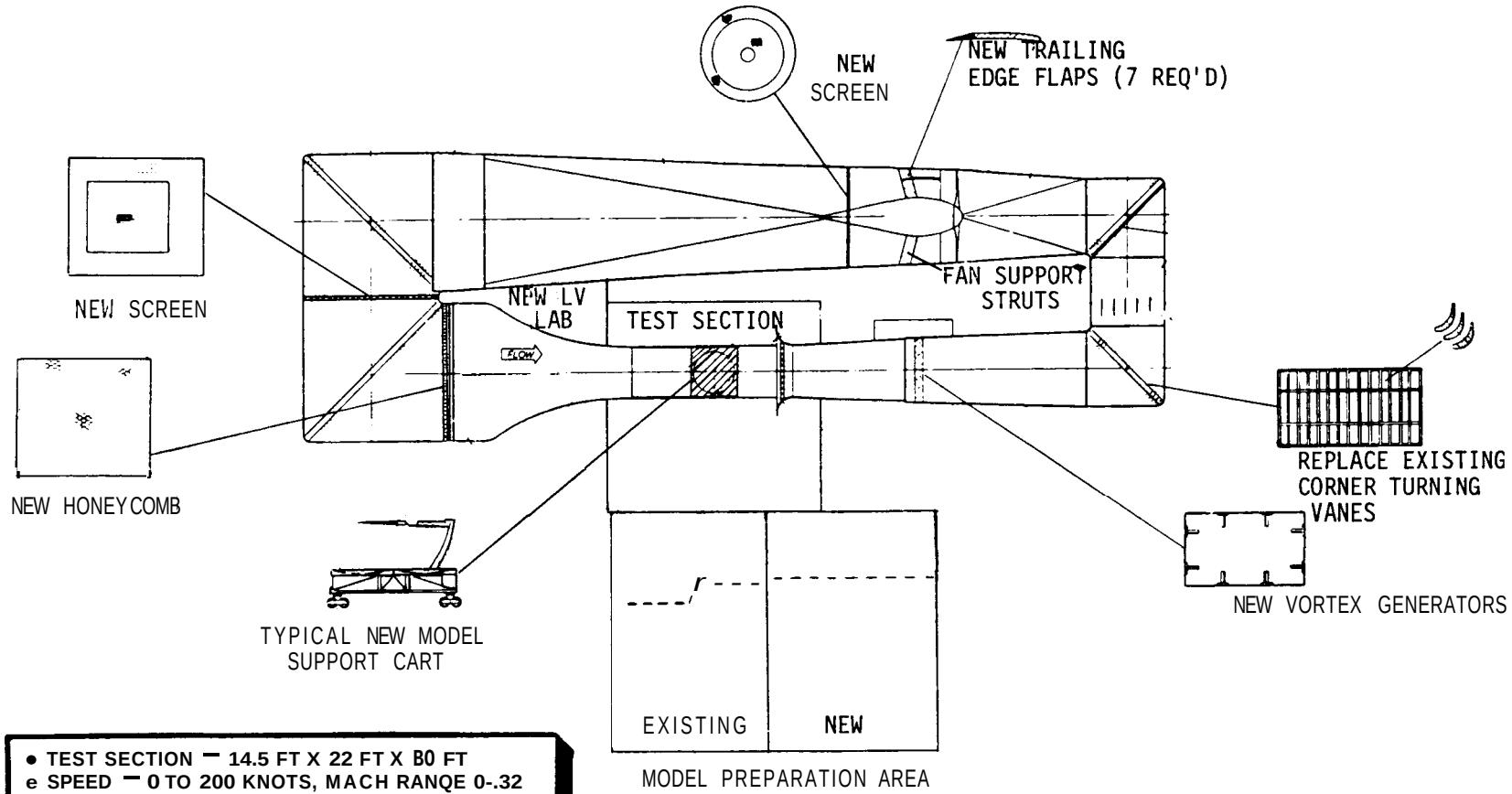
At the present time there are no foreseen requirements which would require future CoF funding for this facility.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATIONS TO THE 4- BY 7-METER LOW SPEED TUNNEL (1212C)



Figue 2

LANGLEY RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATIONS TO THE 4- BY 7-METER LOW SPEED TUNNEL (1212C)
TUNNEL SCHEMATIC AND PERFORMANCE DATA



- TEST SECTION — 14.5 FT X 22 FT X B0 FT
- SPEED — 0 TO 200 KNOTS, MACH RANQE 0-.32
- REYNOLDS NUMBER — 0 TO 2.1 X 10^6 PER FT
- DYNAMIC PRESSURE — 0 TO 13B PSF
- CONTINUOUS FLOW, ATMOSPHERIC PRESSURE
- OENLRAL AERODYNAMIC INVESTIGATIONS AND UNIQUE TEST CAPABILITIES (CLOSED OR OPEN THROAT, MOVING-BELT QROUND BOARD WITH BOUNDARY-LAYER SUCTION)

FIGURE 3

LANGLEY RESEARCH CENTER

FISCAL YEAR 1983 ESTIMATES

MODIFICATIONS TO UPGRADE THE TRANSONIC DYNAMICS TUNNEL (648)

LOCATION PLAN

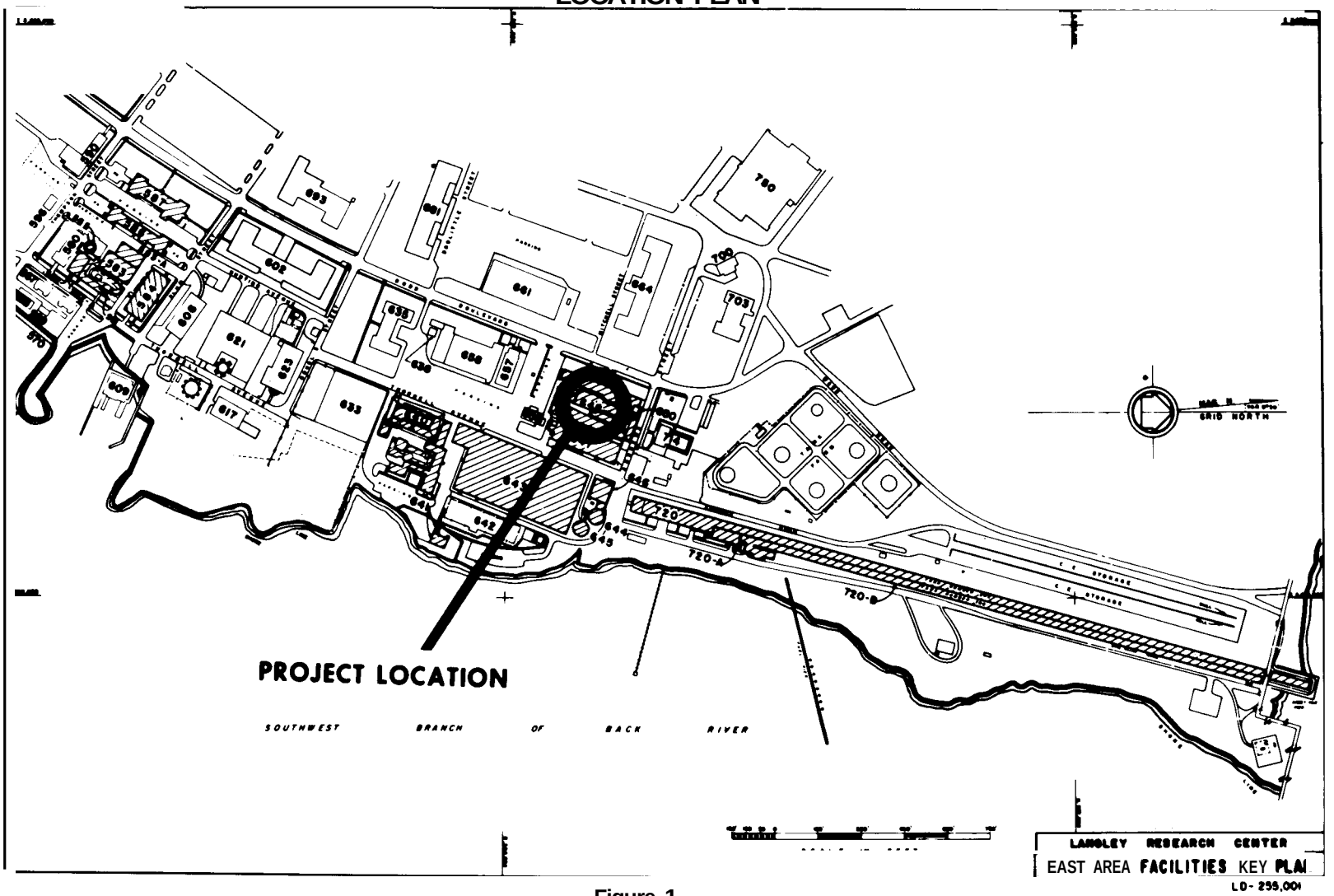


Figure 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE:	Modifications to Upgrade the Transonic Dynamics Tunnel (648)
INSTALLATION:	Langley Research Center
FY 1983 CoF ESTIMATE:	$9,000,000

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1982 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding	598,000	1,370,000	1,968,000
Capitalized investment.	N/A	14,869,845	14,869,845
Total	598,000	16,239,845	16,837,845

SUMMARY PURPOSE AND SCOPE:

The Langley Research Center's (LaRC) Transonic Dynamics Tunnel (TDT) (Figure 1) embodies unique features that make it a national resource in the field of aeroelasticity research. It is used for verifying flutter and other aeroelastic characteristics of high speed aircraft designs; for research on active flutter controls and rotorcraft aeroelasticity; for flutter, buffet and ground wind loads testing of the Space Shuttle and other space and launch vehicles; and for confirmation of unsteady transonic flow theory. These modifications will increase the test medium density range of this tunnel by 50 percent and enable scaling of key aeroelastic parameters for current and anticipated future aircraft designs. This will be achieved by increasing the power

of the drive motor by 50 percent, increasing the tunnel circuit cooling, upgrading the electrical power and control systems and modifying the tunnel fan.

PROJECT JUSTIFICATION:

The TDT's special features include transonic, continuous, variable-density flow; a large 16-foot x 16-foot (5 meter x 5 meter) test section; flexibility to use either dense Freon-I2 gas or air as a test medium; cable-type model mounting systems; a flutter stopping system; safety screens to protect the tunnel drive system; and, good visibility of models during tests. The TDT currently has a backlog of work in excess of two years. The facility is used to verify flutter and aeroelastic characteristics of new high speed aircraft such as the F-16E, FB-111, proposed transport aircraft, Forward Swept Wing demonstrator, and Advanced Fighter Technology Integrator demonstrator. It is also used for active control and rotorcraft research, supporting programs such as the Aircraft Energy Efficiency Program, supersonic cruise research and the verification of unsteady transonic flow theory.

Aeroelastically-scaled models tested in this tunnel must simulate external shapes, stiffness distribution, and mass-density ratio. This ratio of the distributed mass of the vehicle to the mass of the surrounding test medium must be the same for the model as it is for the actual vehicle when in flight. Scaling of the mass-density ratio has been marginal for models of many recent aircraft designs. It is expected to be impossible for future models with active flutter controls and/or with major components made of lightweight composite structure materials unless the test medium density capability is increased. This project will provide for a density increase of 50 percent in the Mach number range of 0.6 to 1.2 when using Freon-12 as the test medium. In addition to making it possible to construct aeroelastically-scaled models for future aircraft designs, the increased density capability will improve the flow simulation for models with control surfaces and flaps. It will also lower the present high costs of aeroelastic models and will permit the timely testing of aircraft designs incorporating ACEE program technology.

IMPACT OF DELAY:

This project must be accomplished now to preclude the necessity for aeroelastic flight testing of current and advanced design aircraft expected to reach the flutter test status in the mid-1980's. These aircraft designs will include such features as active flutter controls and major components of lightweight composite structure materials. Flight testing is more hazardous, more time consuming, and more costly than wind tunnel testing.

PROJECT DESCRIPTION:

This project (Figure 2) provides for rewinding of the 20,000-horsepower (1,500 kilowatt), two-speed electric drive motor to achieve a fan drive of approximately 30,000 horsepower (2,200 kilowatt). Additional tunnel circuit cooling will be provided to accommodate the increased tunnel drive power by installing a cooling coil adjacent to the existing tunnel cooling coil. An existing cooling tower will be modified to provide the additional cooling water required. The 6,600-volt power supply will be modified by installing new circuit breakers and new power cables to the drive motor. The tunnel controls will be updated to provide for smooth, stepless speed control of the repowered drive system. The existing liquid rheostat will be replaced with one of sufficient size to accommodate the increased power requirements. All fan blades and blade holders will be replaced with new units designed for the increased tunnel power.

The high pressure freon, hydraulic, and air systems will be repaired. This will include: (1) the repair of defective welds; (2) replacement of piping and piping components which are not rated for the working pressures; (3) replacement of worn flexible hoses on hydraulic systems; (4) installation of piping supports; (5) replacement of leaking valves; and (6) rerouting of piping to reduce stresses.

PROJECT COST ESTIMATE:

This project cost estimate is based on a completed preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	---
Equipment	---	---	---	9,000,000
Rewind drive motor	LS	---	---	1,845,000
Additional cooling and cooling tower	LS	---	---	2,180,000
Power supply modification	LS	---	---	580,000
Controls	LS	---	---	740,000
New liquid rheostat	LS	---	---	840,000
Fan modification	LS	---	---	1,815,000
Repair freon, hydraulic, and air storage systems	LS	---	---	1,000,000
Fallout Shelter (not feasible)	---	---	---	---
Total				9,000,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan

OTHER EQUIPMENT SUMMARY:

Data acquisition equipment upgrading/replacement is planned for a future R&D budget.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project. An ongoing study for improving productivity of research facilities may identify future facility modifications for this wind tunnel.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATIONS TO UPGRADE THE TRANSONIC DYNAMICS TUNNEL (648)

SITE PLAN

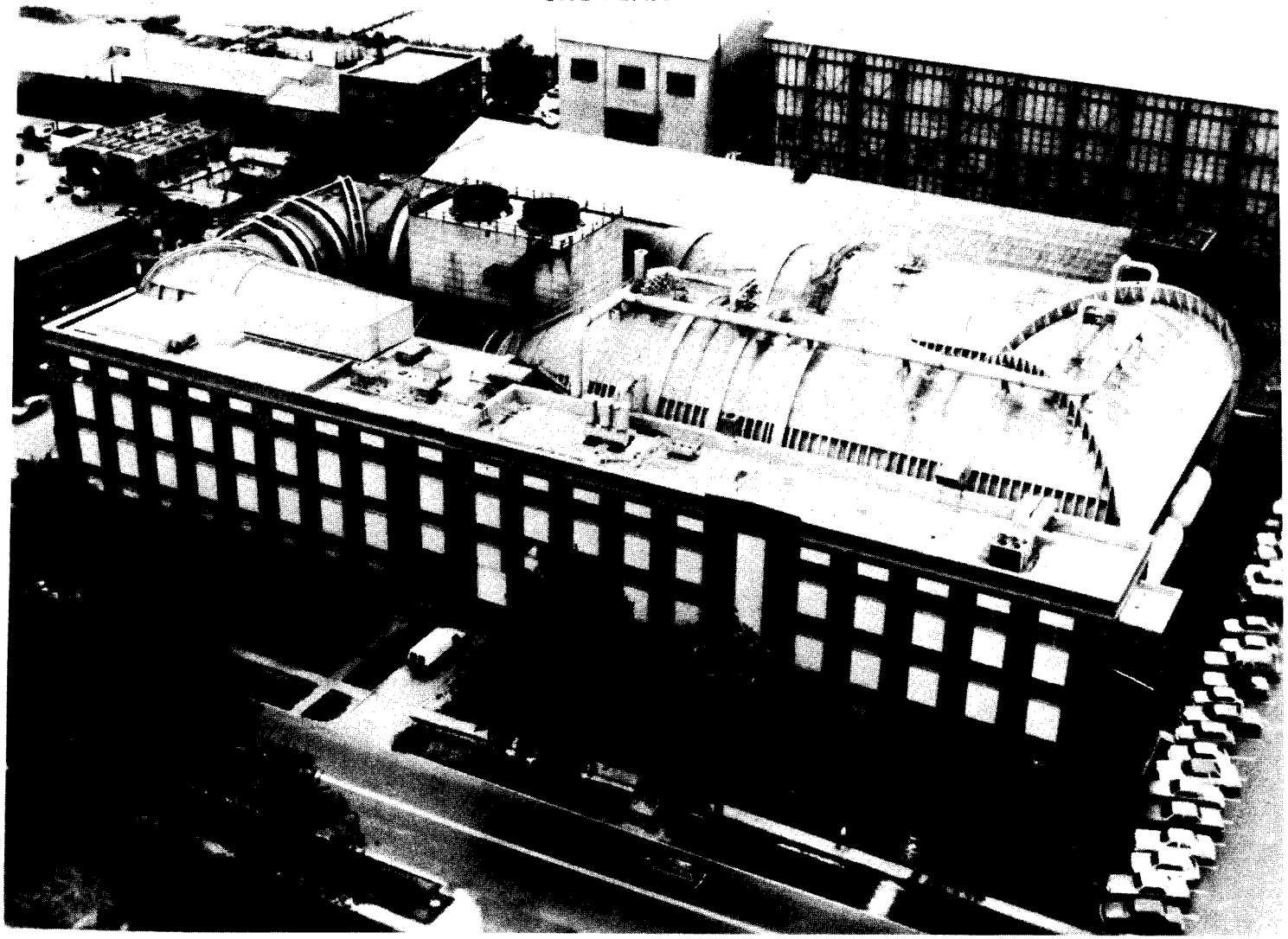


Figure 2

LEWIS
RESEARCH CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

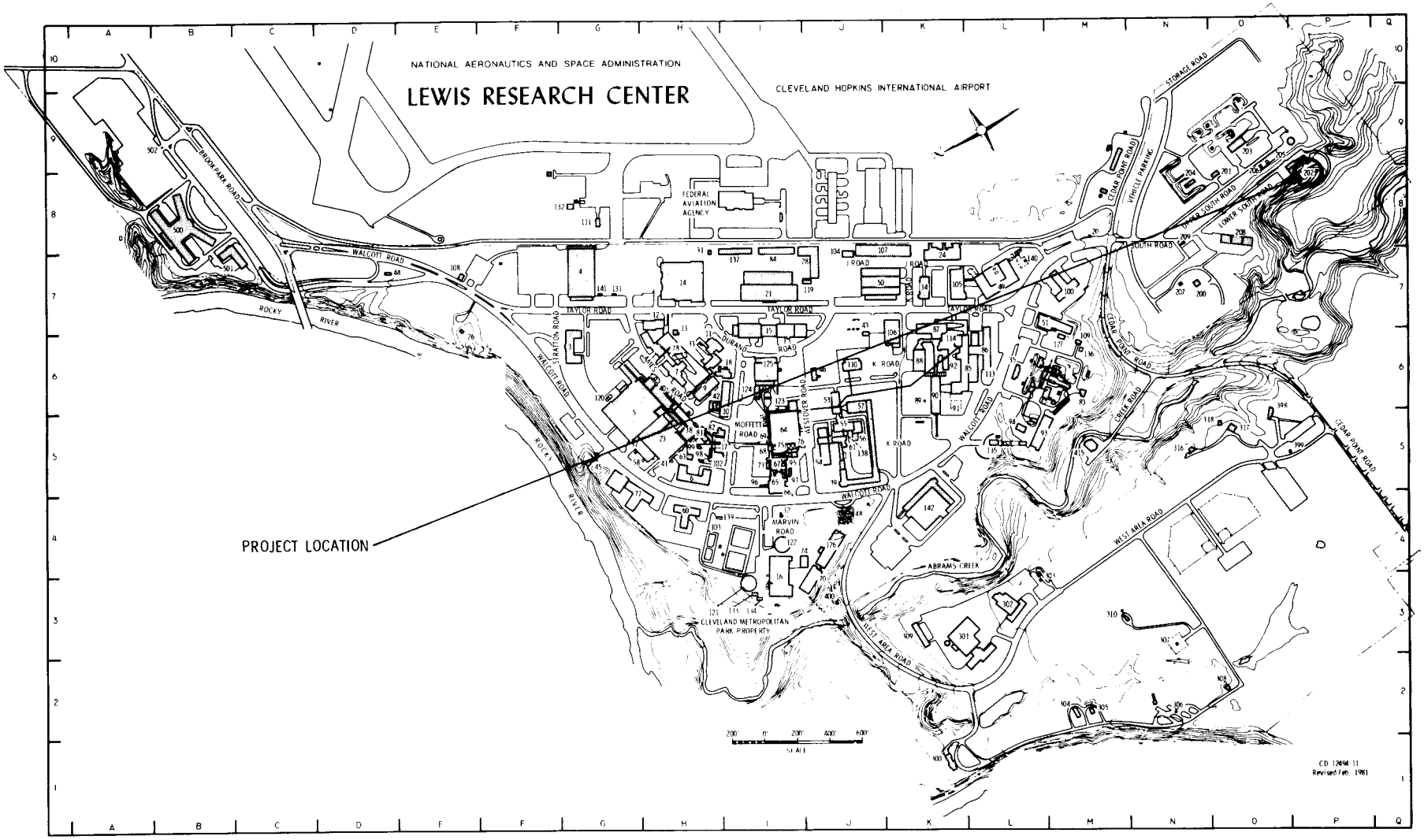
FISCAL YEAR 1983 ESTIMATES

SUMMARY

LEWIS RESEARCH CENTER

	Amount	Page No.
Office of Aeronautics and Space Technology:		
Modification of Rocket Engine Test Facility for Altitude Testing..	995,000	CF 7-1
Modification of 450 PSI Air System in Engine Research Building.....	2,920,000	CF 7-9
Total.....	3,915,000	

LEWIS RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATION OF ROCKET ENGINE TEST FACILITY FOR ALTITUDE TESTING



LOCATION PLAN

FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE:	Modification of Rocket Engine Test Facility for Altitude Testing
INSTALLATION:	Lewis Research Center
FY 1983 CoF ESTIMATE:	$995,000

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1982 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding	95,000	---	95,000
Capitalized investment	N/A	3,361,000	3,361,000
Total	95,000	3,361,000	3,456,000

SUMMARY PURPOSE AND SCOPE:

This project provides modifications to the Rocket Engine Test Facility (202) at the Lewis Research Center for space simulation testing of low thrust chemical rocket engines (Figure 1). Chemical rocket propulsion research and technology cannot be satisfactorily conducted without this capability for space simulation testing. Current programs require altitude simulation testing in calendar year 1984 of low thrust chemical propulsion systems developed for orbit transfer of large space structures. For this technology development testing, the Rocket Engine Test Facility (RETF) must be modified for altitude testing by adding an altitude exhaust system for space simulation. This facility as currently configured has capability for sea level testing only.

PROJECT JUSTIFICATION:

Technology development and testing is required for low thrust chemical rocket engines which will be used for transfer of large space structures from low earth orbit to higher earth orbit. The structures are to be transported to low earth orbit by the Space Shuttle, erected and checked out, and then transferred to high earth obit by a low thrust propulsion system. Low thrust chemical rocket engine requirements are high specific impulse (490 seconds) that can be achieved only with a liquid hydrogen - oxygen propellant combination; high expansion area ratio engine nozzles up to 1,000:1; thrust range of 100 lbs to 1,000 lbs (445-4448 Newtons) and chamber pressure range of 100 psia to 1,000 psia (7-70 kilograms per square centimeter).

A test facility is required to develop these low thrust chemical rocket engines. The altitude conditions of up to 180,000 feet (60,000 meters) must be simulated to design and optimize the performance of the high area ratio engine nozzles required for this application. Test run durations of up to 90 minutes are required for the very long burn times typical of the low thrust application.

This proposed modification adds an altitude simulation capability to a rocket test facility that is otherwise complete. It will be added to an existing test position that now has a thrust stand and a propellant feed system for all cryogenic, hydrocarbon, and storable propellants. All support services in the form of high pressure helium, nitrogen, are presently available. The proposed modifications for altitude simulation include the addition of a test engine capsule, diffuser, spray cooler, ejector, and a supporting control system.

IMPACT OF DELAY:

This project must be implemented now to support research and technology for low thrust chemical rocket propulsion in space. Modification of the Rocket Engine Test Facility (202) for altitude testing is required to be completed by calendar year 1984 to meet the planned research testing schedule for application of low thrust chemical propulsion for orbit-to-orbit transfer of large space structures.

PROJECT DESCRIPTION:

There are two major aspects to the RETF modifications. The first is to structurally modify the test stand and support systems to accommodate the rocket engines that are being developed. The second aspect is to make necessary modifications to this test facility so that the chamber in which the rocket is fired simulates the space environment (low atmospheric pressures up to 180,000 feet).

To accommodate the size, shape and thrust reaction of the rocket engine undergoing testing, the existing test stand and foundations must be modified for the new loads and be reconfigured to support test articles.

Also, the facility must be modified to support the various components of the exhaust system which is specially designed to permit safe release of the rocket products of combustion while maintaining the low pressure test environment in the chamber.

The components required for this are the test engine capsule, the diffuser, the spray cooler and the ejector. The test engine capsule serves as the test chamber which is evacuated to the low pressure simulating the high altitude space environment. The products of combustion from the test rocket engine flow from the capsule into the water jacket cooled diffuser and then into the spray cooler where the exhaust is quenched and scrubbed clean prior to ejection. To permit test setup, checkout and general accessibility, the capsule and diffuser will be mounted on tracks.

In addition to these foundations, supports and the components of the exhaust system, this project also provides the required controls and instrumentation, fire protection, and the associated walkways, platforms and ladders.

PROJECT COST ESTIMATE:

The project cost estimate is based on a completed preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	Cost
Land Acquisition	---	---	---	---
Construction	---	---	---	112,000
Building modifications	LS	---	---	112,000
Equipment	---	---	---	883,000
Diffuser system	LS	---	---	195,000
Spray cooler system	LS	---	---	175,000
Multistage ejector system	LS	---	---	180,000
Test engine capsule.	LS	---	---	122,000
Instrumentation and control system	LS	---	---	211,000
Fallout Shelter (not feasible)	---	---	---	---
Total				995,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan
Figure 3 - General Schematic

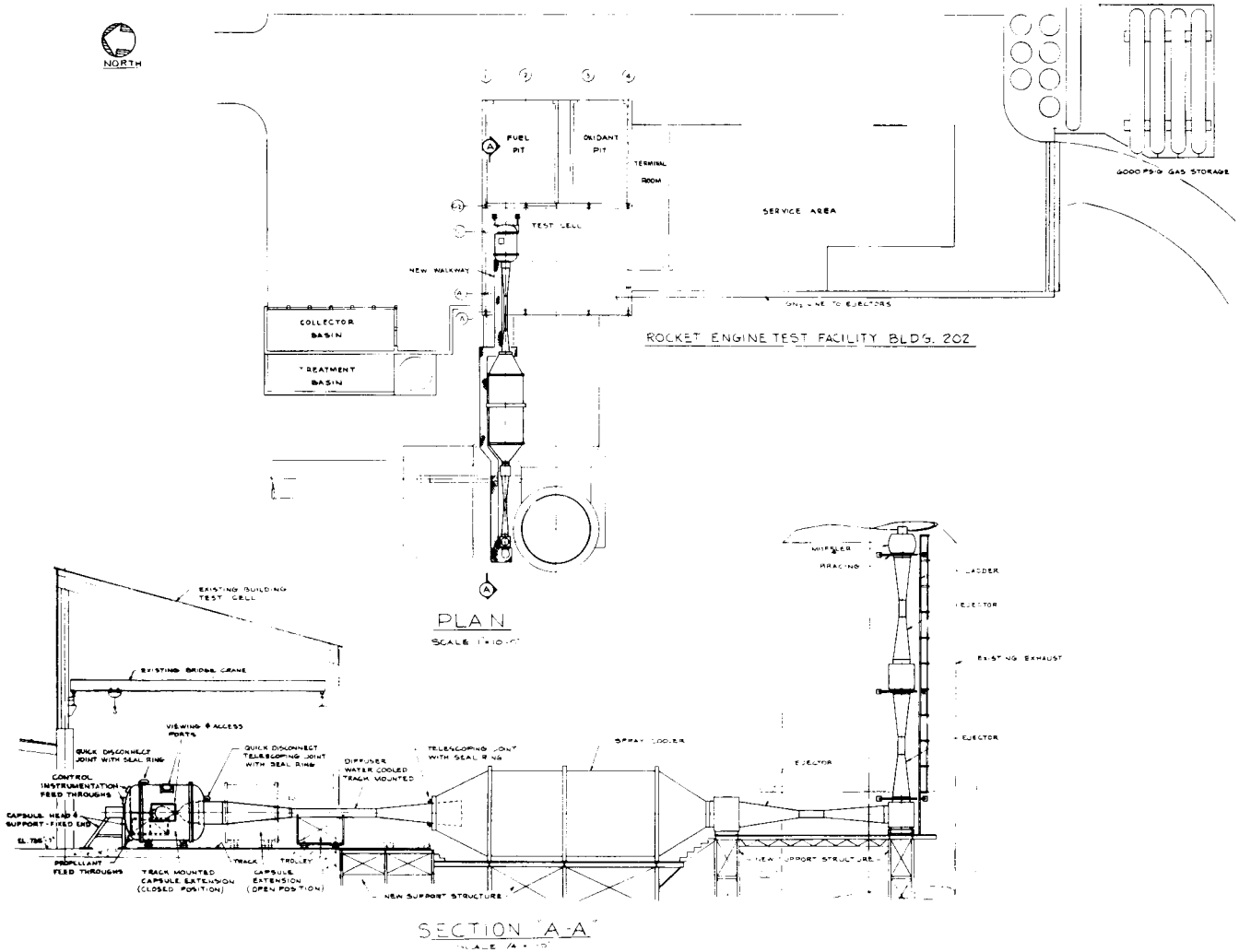
OTHER EQUIPMENT SUMMARY:

No other equipment is required to complete this facility project.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

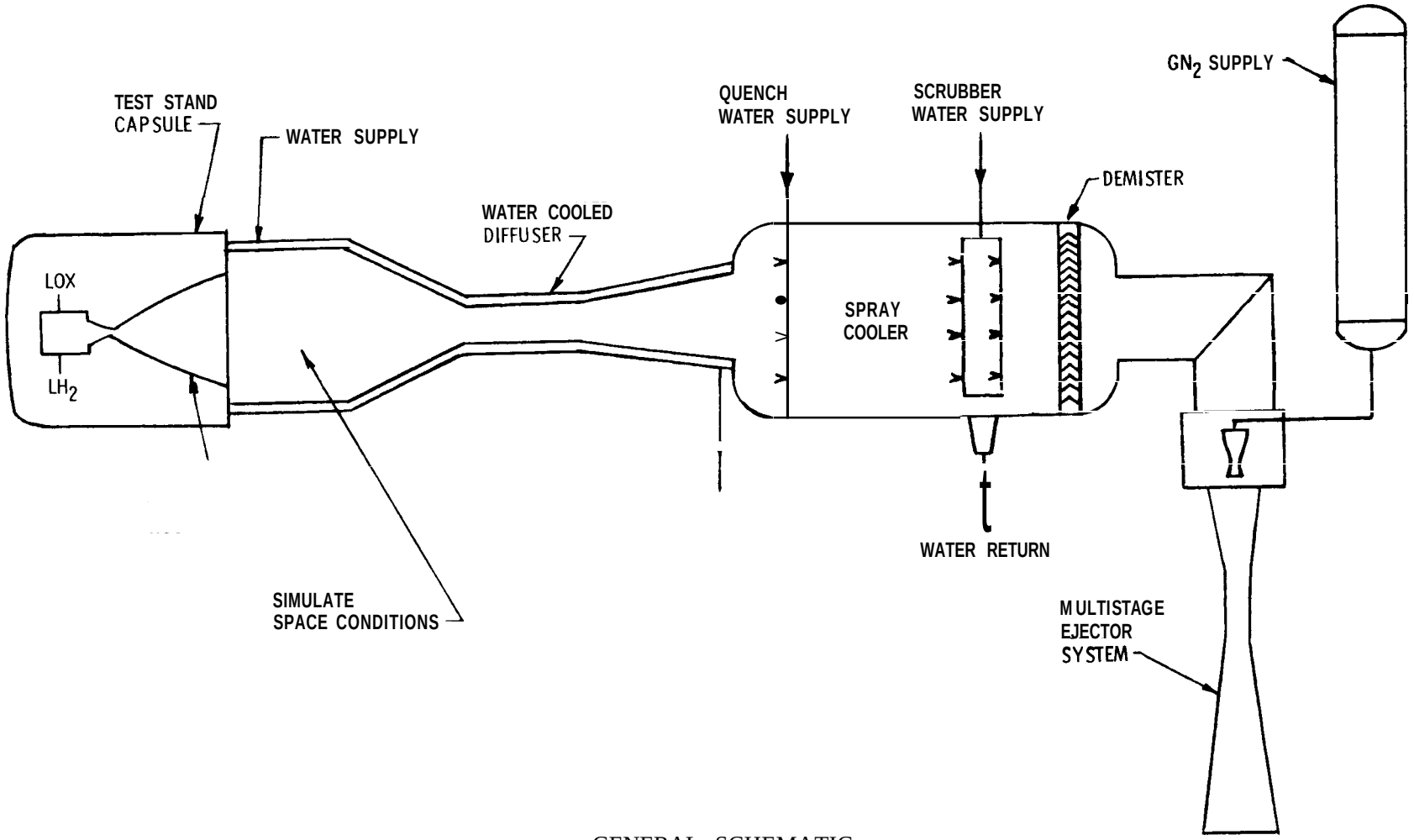
LEWIS RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATION OF ROCKET ENGINE TEST FACILITY FOR ALTITUDE TESTING



SITE PLAN

FIGURE 2

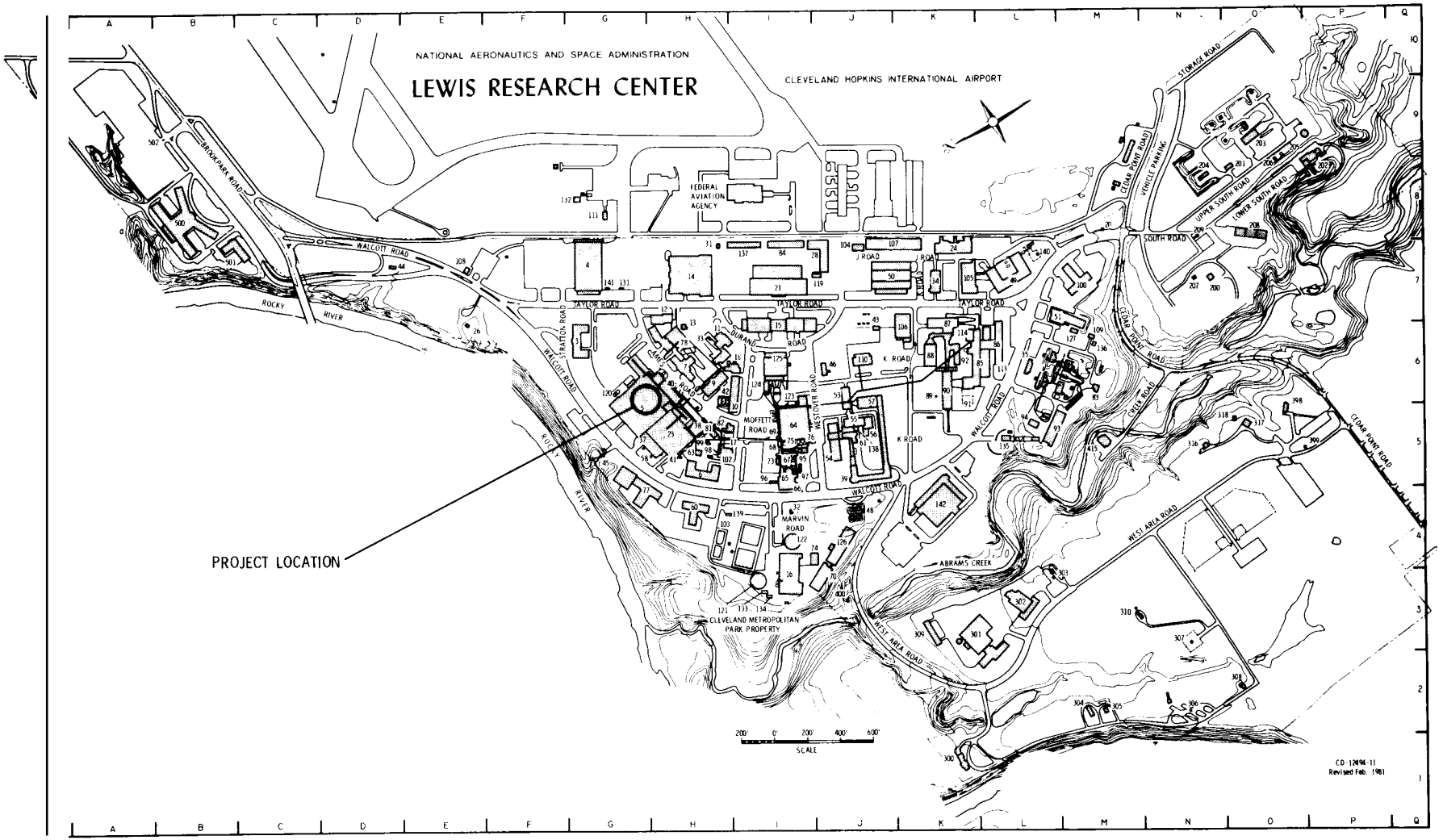
LEWIS RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATION OF ROCKET ENGINE TEST FACILITY FOR ALTITUDE TESTING



GENERAL SCHEMATIC

FIGURE 3

LEWIS RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATION TO 450 PSI AIR SYSTEM IN ENGINE RESEARCH BUILDING



LOCATION PLAN

FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE: Modification to 450 PSI Air System in Engine Research Building

INSTALLATION: Lewis Research Center

FY 1983 CoF ESTIMATE: $2,920,000

LOCATION OF PROJECT: Cleveland, Cuyahoga County, Ohio

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1982 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF funding	227,000	---	227,000
Capitalized investment	N/A	13,299,000	13,299,000
Total	227,000	13,299,000	13,526,000

SUMMARY PURPOSE AND SCOPE:

This project provides for the acquisition and installation of a new 450-pounds per square inch (310 Newtons per square centimeter) air compressor in Engine Research Building 5 with controls, instruments, associated equipment and accessories (Figure 1). This new compressor will replace a 30-year-old existing 450 psi compressor as the primary unit for the 450 psi air system which is a vital component part of the Lewis Central Air System. The existing 450 psi compressor will be retained as backup unit and be used in parallel with the new compressor to provide compressed air flows that exceed the capacity of the present system. The new compressor will be capable of supplying compressed air up to a maximum of 38 pounds per second (17.3 kilograms per second).

Parallel operation with the old compressor will provide a total flow up to 76 pounds per second (34.6 kilograms per second).

PROJECT JUSTIFICATION:

The Central Air System provides compressed air to the majority of research test setups at the Lewis Research Center. The research supported is primarily aeronautical propulsion testing. The affected research programs include improvements in engine performance, durability, efficiency, and the reduction of engine fuel consumption and exhaust emission pollutants.

The current trend in gas turbine research is to higher pressures and temperatures to improve operating efficiencies. The 450 psi air system, the highest pressure component of the Central Air System, supplies air for this research. This 450 psi compressed air is presently provided by a 30-year-old compressor that requires frequent maintenance and repair. Replacement parts must be custom made and delivery times are long. When this compressor is down for maintenance and repair, vital turbojet engine research that requires this high pressure air cannot be accomplished and is delayed.

In addition to alleviating the problems caused by having to depend on the old compressor, this project will also double the 450 psi flow capacity. The new compressor will have a 38-pound per second (17.3 kilograms per second) flow capability which is equal to that of the existing compressor. It will be installed as the primary 450 psi air supply for the Central Air System and the old compressor will be used as backup and will be coupled electrically and mechanically with the new compressor to meet demands for air flows from 38 to 76 pounds per second.

Current and projected requirements for 450 psi air for research testing can be served more effectively by the 76 pounds per second capacity provided by the two compressors in parallel. Decreasing manpower resources necessitate the consolidation of the present three-shift testing schedule into a two-shift operation. The higher flow capacity provided by this project (up to double the existing rate of air flow) will allow many of the present small flow rate research users to run test rigs simultaneously for shorter periods of time. The productivity increase provided by the greater flow rate will counterbalance any adverse effects of reducing test operations from three shifts to two.

IMPACT OF DELAY:

This project needs to be implemented now to provide adequate support of near-term and long-range research on turbojet engines and provide the necessary reliability of a vital system. Because the existing 450 psi compressor is the only compressor serving the system, a breakdown or major maintenance task will seriously

disrupt research and testing of the turbojet engines. A delay will seriously impact the development of turbojet engine technology required for commercial and military applications.

PROJECT DESCRIPTION:

A new 450 psi compressor will be installed as part of the 450 psi (310 Newtons per square centimeter) air system. The proposed location for this new compressor is adjacent to the existing 450 psi machinery (Figure 2). This location will require minimum piping runs and will result in a very effective integration of existing capability and new system. The machine will be fed from existing 125 psi air systems and deliver 450 psi air to the test locations (Figure 3). The new machine will be installed in parallel electrically and mechanically with the old machine, and the installation will include all necessary valves, cooling, piping, controls and instrumentation systems.

PROJECT COST ESTIMATE:

The project cost estimate is based on a completed preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition	---	---	---	---
Construction	---	---	---	245.000
Building 5 modifications	LS	---	---	245,000
Equipment	---	---	---	2,675,000
Compressor	LS	---	---	1,214,000
Electrical systems	LS	---	---	767,000
Mechanical systems	LS	---	---	250,000
Instrumentation and control system	LS	---	---	444,000
Fallout Shelter (not feasible)	---	---	---	---
Total				2,920,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Location of New 450 PSI Air Supply
Figure 3 - Flow Schematic - New 450 PSI Air Supply

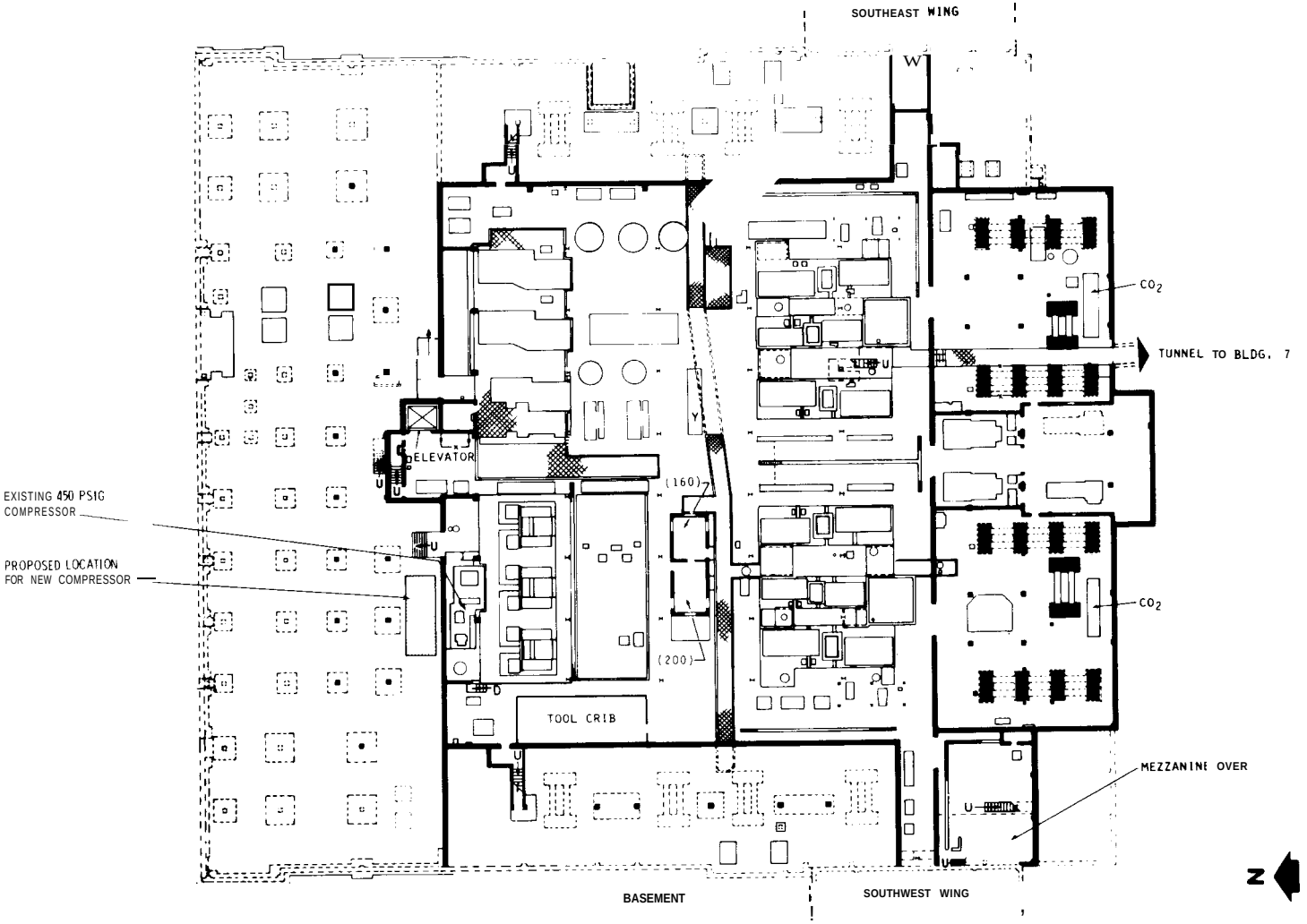
OTHER EQUIPMENT SUMMARY:

No other equipment is required to complete this project.

FUTURE CoF ESTIMATED FUNDING REQUIREMENTS TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

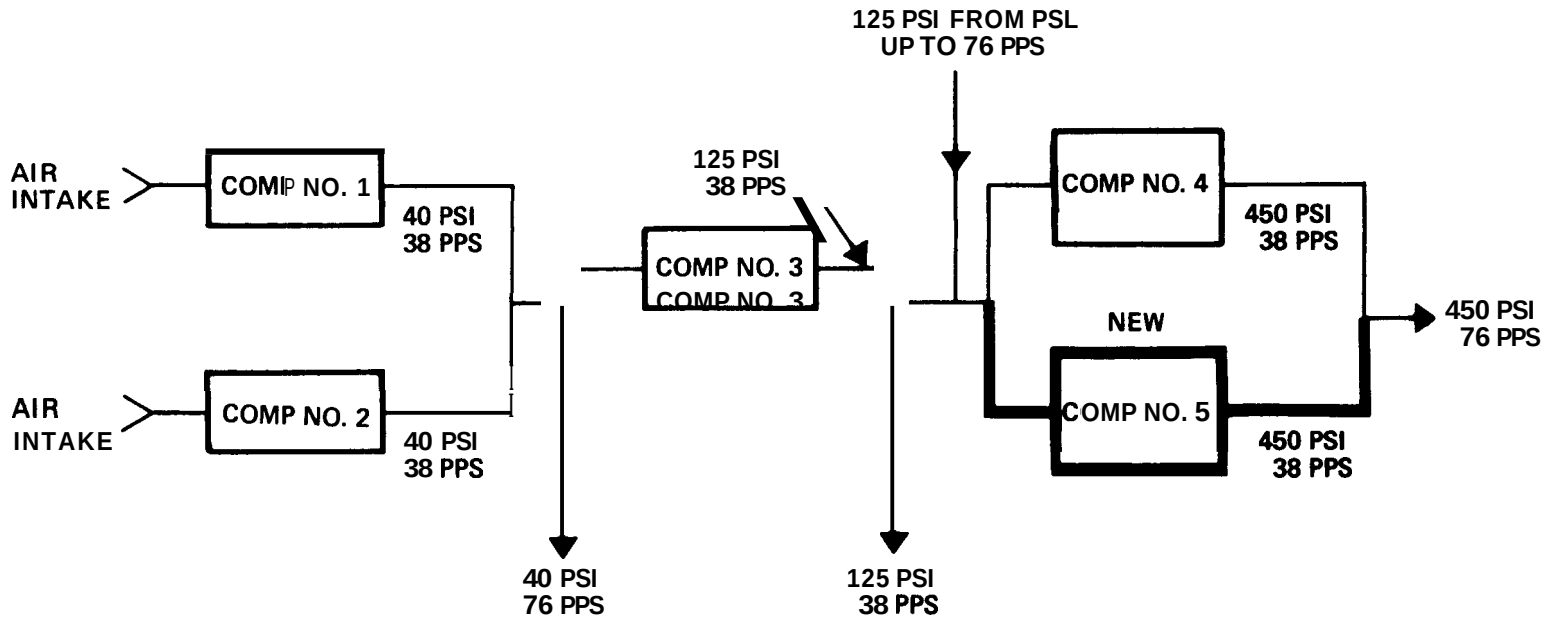
LEWIS RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATION TO 450 PSI AIR SYSTEM IN ENGINE RESEARCH BUILDING



PLAN VIEW - LOCATION OF NEW 450 PSIG AIR SUPPLY

FIGURE 2

LEWIS RESEARCH CENTER
FISCAL YEAR 1983 ESTIMATES
MODIFICATION TO 450 PSI AIR SYSTEM IN ENGINE RESEARCH BUILDING



FLOW SCHEMATIC
NEW 450 PSI AIR SUPPLY

FIGURE 3

REPAIR

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

SUMMARY

REPAIR

Summary of Project Amounts by Location:	Amount	Page No.
Ames Research Center	1.415. 000	CF 8-3
Dryden Flight Research Facility	200. 000	CF 8-3
Coddard Space Flight Center	1,345,000	CF 8-4
Jet Propulsion Laboratory	1,250,000	CF 8-5
Johnson Space Center	1.390. 000	CF 8-6
Kennedy Space Center	780. 000	CF 8-1
Langley Research Center	1.195. 000	CF 8-8
Lewis Research Center	1,275,000	CF 8-9
Marshall Space Flight Center	1.570. 000	CF 8-10
Michoud Assembly Facility	905. 000	CF 8-11
National Space Technology Laboratories	1.250. 000	CF 8-11
Wallops Flight Center	1.165. 000	CF 8-12
Miscellaneous Projects Not Exceeding $150.000 Each	1.260. 000	CF 8-13
Total	15.000. 000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE:	Repair of Facilities, Not in Excess of $500,000 Per Project
INSTALLATION:	Various Locations
	FY 1983 CoF ESTIMATE: $15,000,000
FY 1981: $15,000,000	FY 1982: $12,800,000

COGNIZANT INSTALLATIONS/LOCATION OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE:

These resources will provide for large repairs to facilities at NASA field installations and Government-owned industrial plants supporting NASA activities. Included in the request are those facility repair needs for FY 1983 that can be foreseen at the time of the submission of these estimates, and that are estimated not to exceed $500,000 per project. The thrust of this program is to provide a means to restore facilities or components thereof, including collateral equipment, to a condition substantially equivalent to their originally intended and designed capability. The request includes the substantially equivalent replacement of utility systems and collateral equipment necessitated by incipient or actual breakdown. This work also includes major preventive measures which are normally accomplished on a cyclic schedule of greater than 1 year.

PROJECT JUSTIFICATION:

A major portion of the Agency's buildings exceed 15 years in age, and increases in repair requirements are to be expected. Maintenance and repair costs for mechanical and electrical systems in a typical building are almost three times higher during the 16- to 30-year period of a building's life than they are during the initial 15 years of beneficial occupancy. At about the 15-year point, many electrical and mechanical components reach the end of

their serviceable or economic life and should be replaced in the interest of long-term economy. Continued piecemeal repair of these components usually requires more resources in the long run than replacement after the end of the economic life of the original components. This condition is now being encountered at locations such as Goddard Space Flight Center (GSFC) and Johnson Space Center (JSC). The age of other portions of the NASA plant, such as facilities at Langley Research Center (LaRC) and Lewis Research Center (LeRC), highlight the need for an aggressive repair program. Some 75 percent of the physical plant is in the 16- to 30-year old category.

The major thrust of this repair program, as well as the rehabilitation and modification program, is to preserve the Agency's $7.0 billion (as of September 30, 1981) physical plant. The major distinction between these classes of work is whether or not the intended work is to bring the facility and its components to a condition substantially equivalent to its designed capacity, efficiency, and capabilities. If such is the case, the work is classified as repair. An analysis of each of the projects for which funds are requested indicates that this work must be addressed and progressively accomplished. Otherwise, risks are increased and future costs of the specific work will be greater. More importantly, there will be increased breakdowns and costly emergency repairs required.

This program includes only facility repair work having an estimated cost not in excess of $500,000 per project. The work 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 that are provided for in other than CoF estimates. Each repair project, estimated to cost more than $500,000, is reflected elsewhere as a separate major line item project.

PROJECT DESCRIPTION:

Proposed repair projects for FY 1983 totaling $15,000,000 are described under "PROJECT COST ESTIMATE." Projects estimated to cost not in excess of $150,000 have not been individually described or identified by Center, and the total estimate for these projects is $1,260,000. This repair program has been distilled from requests for FY 1983 exceeding $23,770,000, and thus represents a modest request in relation to the continuing backlog of this type of work. Based on relative urgency and expected return on investment, the projects which comprise this request are of the highest priority. Deferral of this mission-essential work would adversely impact the availability of critical facilities and program schedules.

During the course of the year, it is recognized that some rearrangement of priority may be necessary. This may force a change in some of the items to be accomplished. Any such change, however, will be accomplished within available resources. The following broad categories of work are described further in the "PROJECT COST ESTIMATE":

a.	Utility Systems..	5,285,000
b.	General Purpose Buildings	755,000
c.	Technical Buildings/Structures	2,840,000
d.	Pavements and Drainage	2,230,000
e.	Building Exteriors and Roofs	3,890,000

PROJECT COST ESTIMATE:

A. Ames Research Center (ARC) 1,415,000

1. Repair of Cooling System (227). 485,000

This project provides for the replacement of tne cooling water supply and return piping from the cooling tower to the wind tunnel air coolers for the Unitary Plan Wind Tunnel. All the existing pipes are installed below grade. This piping will be removed and replaced with new piping and installed below grade. It will run from the cooling tower pump discharge manifold to the cooling coils at Cooler No. 2 and to liquid rheostat heat exchangers. New above grade piping will be routed to Cooler No. 1. This work is necessary because the existing system leaks.

2. Repair of High Pressure Systems. 480,000

This project provides for the repair of the 3,000 pounds per square inch (22,988,505 newtons per square meter) air distribution system, the 140 pounds per square inch (965,517 newtons per square meter) vacuum network, and the high pressure air storage system. Part of the system is old and designed to less stringent standards than are now required. The work includes replacing defective piping, valves, welds, and adding supports and restraints to minimize vibrations.

3. Repair of Roofs, Various Buildings. 450,000

This project provides for the repair of roofs on Buildings N-213, N-239, N-239A, N-236, N-212, N-231, N-202, N-202A, N-227A, N-227B, N-227C, and N-227D. The age of these roofs ranges from 15 to 32 years. Only minor repair work has been performed over the last 10 years. Consequently, large portions of the roofs have deteriorated to the extent that total roofing system removal and replacement with new roofing is necessary. Included in this project is the removal of the existing roof, and installation of 2 inches of insulation, new flashing, gravel stops, and a three-layer mineral surfaced roof.

B. Dryden Flight Research Facility (DFRF). 200,000

Repair Aircraft Construction and Modification Hangar (4801) **200,000**

These resources provide for the repair of the Aircraft Construction and Modification Hangar, Building 4801, at Dryden. Work includes replacement of the old roof with one that has greater insulating properties. The existing hot water radiant system will be replaced with space heaters. The electrical, compressed air, and fire protection systems will be repaired. The roof and heating systems are old, energy-inefficient, and must be repaired. Maintenance has become a continuing problem and can be effectively reduced by the project. These repairs are urgently needed at this time for this 27-year old hangar to continue to provide space and environmental protection for the Flight Simulation and Remotely Piloted Research Vehicle Laboratories.

C. Goddard Space Flight Center (GSFC). 1,345,000

1. Repair of HVAC System, Payload Testing Facility, and Environmental Testing Laboratory (7/10) 265,000

These resources provide for replacing approximately 400 linear feet (122 meters) of steel cooling water pipe and repair of the cooling tower serving the Payload Testing Facility and Environmental Testing Laboratory. The cooling system, installed in 1961, provides cooling water to numerous diffusion pumps and other laboratory equipment used for thermal-vacuum testing spacecraft and their components. The steel mains which distribute the cooling water have deteriorated and have been patched in numerous locations to stop leaks. The cooling tower coil has become clogged and must be replaced. These repairs are necessary at this time to preclude system failure.

2. Repair of Exteriors of Two Laboratory Buildings (10 and 16)..... 290,000

These resources provide for the repair of the exteriors of the Environmental Testing Laboratory (10) and the Development Operations Facility (16). The work includes sandblasting, caulking, preparation and prime coats with special paints to prevent deterioration to metal surfaces, as well as the replacement of deteriorated panels. These buildings were resurfaced in 1974, and have now become severely flaked and rusted. These repairs must be accomplished at this time to avoid complete replacement of metal sidings.

3. Repair of Fire and Security Alarm Systems..... 490,000

These resources provide for the replacement of the alarm system which was installed in the late 1960's. The work includes installation of new signal transmitters in existing boxes in most of the buildings at GSFC. In addition, a new central display console and a redundant backup unit will be installed in Building 24 for continuous monitoring. These repairs must be accomplished at this time because repair parts for the existing equipment are virtually unobtainable because the manufacturer is no longer in business. Also, the existing system has a serious operational deficiency. It must be turned off when electrical storms are in the vicinity to prevent false alarms and damage to the system.

4. Repair of Roofs of Various Buildings (5, 11, and 14)..... 300,000

This project provides for the repair of the roofs on three laboratory buildings. Included is approximately 55,000 square feet (4,950 square meters) of the roof on the Instrument Construction and Installation Facility (5); the entire roof of the Applied Sciences Laboratory (11), approximately 20,000 square feet (1,800 square meters); and the roof of the Spacecraft Operations Facility (14), approximately 24,000 square feet (2,160 square meters). The work includes preparation of the existing surface and installation of protection board, new flashing, roof vents, membrane roofing system with reflective finish and new fascia system. The roofs are over 20 years old and have numerous patches and temporary repairs. The heavy traffic associated with the installation and maintenance of equipment on the roofs has resulting in frequent leaks and deterioration.

D. Jet Propulsion Laboratory (JPL)..... 1,250,000

1. Repair Secondary Electrical Power Distribution System. 410,000

These resources provide for the repair of the secondary electrical power distribution system at JPL. Work includes the removal and replacement of two transformer banks and connecting cables. The transformer bank serving Buildings 160, 261, and 283 will be replaced with a 750 kVA outdoor substation. The transformer bank serving the Guidance Laboratory, Building 198, will be replaced with two 500 kVA transformer banks and related equipment. The old deteriorated 2.4 kV cables will be replaced. The existing 2.4 kV BUTYL insulated cables are over 30 years old and the ends and splices are cracked and deteriorated. The 2.4 kV system is vulnerable to cable failures and power outages. The repair of the secondary electric power distribution system is urgently needed at this time to provide a reliable system for continuous operation, and to eliminate a potential safety hazard as the systems continue to deteriorate.

2. Repair Interior, Combined Electronics Laboratory (125)..... 240,000

These resources provide for repair of the first floor of the Combined Electronics Laboratory, Building 125. Work includes replacing the first floor corridor walls and ceiling with fire-rated gypsum wallboard and doors to meet life safety code standards. The deteriorated flooring will be replaced with fire-rated resilient flooring. Energy-efficient lighting and fire protection systems will be installed. This building is over 25 years old and is in serious need of repair to provide acceptable working conditions for over 300 occupants. The exit corridors do not meet minimum fire safety requirements and require substantial repair.

3. Repair Exterior, Material Services Building (171) and Central Engineering Building (180).... 330,000

These resources provide for the repair to the exterior surfaces of the Material Services Building (171) and the Central Engineering Building (180) to stop water leaks and resultant deterioration of building components. Work includes preparation and cleaning, grouting, caulking, painting, and general renewal of 59,000 square feet (5,481 square meters) of exterior wall surfaces. This repair work is required at this time to maintain the exterior integrity of the building, to stop the accelerating deterioration, and to prevent rain water leakage.

4. Repair Storm Drains..... 270,000

These resources provide for repairs to the storm drainage system. It includes the replacement of old deteriorated corrugated metal pipe with reinforced concrete pipe at four locations. This involves the replacement of the old pipe, connections to catch basins, manholes, and branch lines, and rerouting some lines. Work also includes some demolition and replacement of paving, walks, curbs, and landscaped areas. JPL is located on a slope

starting at the base of the foothills of the San Gabriel Mountains to the north and descending southeasterly to the Arroyo Secco natural drainway. The foothill runoff is substantial and constricted by canyons to a high velocity flow. The runoff carries large amounts of sand, rocks, and debris. The combination of sand, rocks, and water at a high velocity has scoured the 25-year old corrugated metal piping. Failure of these storm drainage lines will cause damage by the flooding of several acres and many major buildings. This is a vital phase of a continuing program for the replacement of all of the deteriorated corrugated metal storm drains on the site.

E. Johnson Space Center (JSC)..... 1,390,000

1. Repair of Utility Generation and Distribution System, Building 24..... 250,000

This project is part of a multiyear program to repair various components of the primary utility systems located in the Central Heating and Cooling Plant, Building 24, and the associated distribution system. The purpose is to maintain reliability, efficiency, and safety, on a planned cyclic basis, of the basic utilities that are generated and distributed from the Central Heating and Cooling Plant. This precludes serious outages by scheduling work in relation to the service life expectancy of the various components. Repairs are for all mechanical, electrical, and structural components related to the generation and distribution of steam, chilled water, compressed air, etc. Specifically, this phase includes repair/replacement of 15 valves, 1 boiler, 1 pump, 1 chiller, 5 expansion joints, 1 heat exchanger, 2 tower fans, sump pumps, controls, and insulation.

2. Repair of Heating, Ventilating, and Air-conditioning (HVAC) Systems, Various Buildings..... 225,000

This project is required because age, high humidity, and salt/chemical content of the air have deteriorated the coils, fans, and casings of air handling units in JSC buildings' HVAC systems. Also, the age of some heating and cooling system components are approaching service life expectancy. The work includes repair or replacement of air handler casings and structures, compressors, condensers, controls, valves, pumps, condensate units, and fan/scroll assemblies. In addition, tasks such as coil cleaning, damper and duct repair, suspension replacement, piping replacement or repair, instrumentation calibration, insulating, and painting of all components and ancillary equipment will be performed. This project covers HVAC systems in the mall buildings, and the 300 and 400 areas. Forty chilled water air handlers and ancillary equipment, eight direct expansion air handlers (approximately 60 tons), one condensate return unit, two blending stations, one stream station, three control air compressors, and four hot water converters will be repaired.

3. Repair of Roofs, Buildings 32 and 49..... 250,000

This project includes repairs to the roofs of the Space Environment Simulation Laboratory, Building 32 and the Vibration and Acoustic Test Facility, Building 49. Approximately 60,000 square feet (5,574 square meters) of 17-year-old roofing, 5,000 square feet (464 square meters) of insulation board, and 1,000 linear feet (305 meters) of perimeter flashing will be replaced. Approximately 40 roof vents will be installed in areas containing moisture where deterioration has not proceeded to the point where roof replacement is necessary. The increasing rate of roof deterioration is exceeding local maintenance capability. This project is needed to preclude damage to building structures, as well as interior ceiling panels, electrical panels, and sensitive equipment and electronics.

4. Repair of Water System..... 200,000

This project is the first phase of a two-year program to repair portions of the JSC water system. This work includes repair and/or replacement of shutoff valves in the main distribution lines, and the cathodic protection of two ground water storage tanks and two elevated storage tanks. Included is the painting of the exterior and interior surfaces of these storage tanks. Approximately 30 shutoff valves in the main line and at fire hydrants will be replaced. Work on the cathodic protection system at the water tanks includes repair or replacement of the rectifier units and the anode ground bed system at each tank. The elevated water tanks to be painted are of the spherical type. One elevated tank is approximately 163 feet (49.6 meters) high and has a capacity of 250,000 gallons (946,358 liters). The other tank, located in the Thermochemical Test Area, is approximately 131 feet (39.9 meters) high and has a capacity of 100,000 gallons (378,543 liters). The ground storage tanks to be painted have a capacity of 1,000,000 gallons (3,785,430 liters) and 600,000 gallons (2,271,258 liters) each. This project is required to assure a continuous supply of potable and industrial water. The system is beginning to deteriorate from age, soil conditions, and water chemical compositions.

5. Repair of Roofs, NASA Industrial Plant, Downey, CA..... 465,000

This project is the third phase of a multiyear program for the repair of roofs at the NASA Industrial Plant, Downey, CA. This element of work provides for the repair of approximately 160,000 square feet of roofing on Building 001. As required, flashing, valleys, and gutters will also be replaced. The sawtooth portion of Building 001 was built in increments between 1928 and 1941. It is composed of a combination of wood, steel, and transite decking. The roof has a history of numerous leaks and has required extensive piecemeal repairs and patching over the years. Delay in reroofing could cause damage to building structure, insulation, ceilings, walls, and floors as well as costly hardware and test equipment.

F. Kennedy Space Center (KSC). 780,000

1. Repair of Roof, Central Instrumentation Facility, Building M6-342..... 380,000

These resources provide for the repair of 32,000 square feet (2,880 square meters) of roof on Building M6-342. The work includes removal of all existing roofing materials to the level of the vapor barrier; repairs to the vapor barrier; installation of a new 5-ply built-up roof with aggregate finish; and the installation of new flashings and roof drains. Repair is required due to accumulated deterioration of the built-up roof system as noted in a recently conducted capacitance moisture survey. Failure to perform this repair will result in damage to ceilings, walls, and computers housed in this building.

2. Repair of Kennedy Parkway..... 400,000

These resources provide for the repair and resurfacing of approximately 3.2 miles (5.1 kilometers) of Kennedy Parkway, from the intersection with NASA Parkway, south to Gate 2 on Merritt Island. This part of Kennedy Parkway is the main southern access route to both the KSC Industrial Area and the Launch Complex 39 area. The work includes filling pot holes, applying a tack coat, laying a ½-inch (1.25 centimeter) leveling course and a 1-inch (2.5 centimeter) surface course of asphaltic concrete, and restriping the roadway. Repair is needed now due to deterioration since the last resurfacing in 1965. Failure to perform this repair will result in eventual unsafe driving conditions and extensive damage to the underlying subcourse strata.

G. Langley Research Center (LaRC).... 1,195,000

1. Repair of 600 PSI Air Storage Field..... 450,000

This project provides for the repair of 163 air storage vessels in the 600 pounds per square inch (4,136,400 newtons per square meter) air storage field. This vessel field is one of two principal sources of high pressure air for the west area at LaRC. Both nondestructive examination of a number of vessels and fatigue testing of one vessel showed numerous defects in the nozzles and welds of all of the vessels examined. The work includes replacement of the nozzles and repair of cracks in welds.

2. Repair of Electrical Distribution System for Various Buildings, West Area..... 385,000

This project provides for the repair of numerous electrical and electrical-related items in or in the vicinity of Buildings 720, 1192C, 1221, 1231, 1268B, and 1312. The work includes the replacement of slabs around the substations, splice boxes, transformers, and switchgear. The equipment is in a state of disrepair and can no longer be properly maintained due to discontinued production of spare parts. The concrete slabs do not provide proper drainage, thereby causing premature deterioration of the switchgear. The repair of these items will insure continued operation of the facilities.

3. Repair Pavement, West Area..... 360,000

This project provides for repairs to a taxiway, streets, and other paved areas in the LaRC west area. The work includes repairs to the west taxiway, portion of Walcott, Gregg, and Taylor Roads as well as some parking areas. Typical street repairs consist of an overlay to seal cracked and broken concrete and the filling of rutted open cavities. Repair is required at this time to stop progressive deterioration and avoid future costly rehabilitation.

H. Lewis Research Center (LeRC) 1,275,000

1. Repair Asbestos Insulation, Various Buildings 460,000

This project provides for the elimination of potential asbestos health hazards in Buildings 6, 15, 23, 64, and 500 which were found to have asbestos fibers on the exposed ceilings. The ceiling insulating materials containing asbestos will have to be either removed, encapsulated with a sealant resin, or enclosed within a suspended ceiling to eliminate the potential hazard to building personnel. The work to be done in these buildings will be one or a combination of these three approaches.

2. Repair of Industrial Water Treatment System (103) 200,000

This project provides for the repair of valves, pipe, pumps, and controls at the Industrial Water Treatment Basins, Building 103. Included in this project are the repair of five pumps which transfer industrial water between basins or to the sewer systems, repair of the valve electrical controls, replacement of ten valves, and replacement of various overflow and transfer pipes. The system was installed over 20 years ago and now requires major repairs to the mechanical and electrical systems. The components to be repaired are vital for proper operation of the industrial water treatment and disposal system. This treatment system handles an average of approximately 500,000 gallons (1,892 cubic meters) per day.

3. Repair of the Steam Condensate System in Three Buildings 335,000

This project replaces the existing condensate pipe in the basement, storage, test cell area, and office area heating systems in three buildings. In Chemistry Building 6, the work will consist of replacement of the condensate pipe traps, strainers, and valves to operating heaters, and the insulation of exposed pipe. In Rocket Operations Building 100, the work will consist of replacement of the condensate piping. This includes replacement of all traps, strainers, and valves to operating heaters, and the insulation of exposed pipe. In the Basic Materials Laboratory, Building 106, the work will replace 720 feet (220 meters) of the condensate piping. This work includes replacement of a return pump, traps, strainers, and valves to operating units, and the insulation of exposed pipe. The condensate pipe, valves, and condensate pumps are the original building equipment and are 20 to 38 years old. Systems corrosion and plugging necessitates repair now.

4. Repair of Roofs, Engine Research Building (5). 280,000

This project repairs approximately 50,000 square feet (4,665 square meters) of the Building 5 roof. The work includes installation of a new roofing system with necessary insulation. It also includes replacement of flashing, rehabilitation of roof joints, replacement of gravel, and the installation of walkways on areas subjected to pedestrian traffic. The roofs have exceeded the normal 20-year life expectancy and have deteriorated to a point where routine maintenance is no longer practical. Extensive replacement and repairs are now necessary to avoid damage to the building and the test facilities housed within.

I. Marshall Space Flight Center (MSFC) 1,570,000

1. Repair of Microwave Anechoic Chamber, Building 4190 475,000

This project provides for the repair of the microwave anechoic chamber at Building 4190. The microwave anechoic chamber is 16 years old, and the quality of the shielding and microwave absorber material has deteriorated because of age, roof leaks, and a previous collapse of a section of the ceiling. As a result, its effectiveness is questionable. New absorber materials offer significant improvement in carbon binder material, surface coating, and fire retardant properties. The chamber is used for performance of tests in support of RF subsystem design and development for such programs as 25 kW Power System, Large Space Systems, Solar Electric Propulsion System, Gravity Probe B, and Deployable Antenna Flight Experiment. The work consists of removing the copper shielding and the microwave absorber material and replacing shielding and absorber material on the inner walls, ceiling, and floor of the chamber. The surface area that requires shielding and absorber material is approximately 10,000 square feet (900 square meters). Also included are repairs to exterior and interior building surfaces, lighting, and other utility services.

2. Repair Roofs, Various Buildings 250,000

This project provides for the repair of roofs on 17 buildings at MSFC. Blistering, soft spots, drying-out, and alligatoring conditions necessitate this work. Repairs are essential to protect and preserve facility capability and to eliminate the threat of unscheduled interruption to R&D operations. Most of the roofs have exceeded the normal roof lifetime (15 years in this area). These repairs will prevent possible extensive damage to these buildings which could exceed the cost of roof repairs. The work includes replacing roofing, insulation, damaged flashings, and resaturating roof surfaces to a firm smooth finish. Total area to be repaired is approximately 248,000 square feet (22,320 square meters).

3. Repair of Pressurant Systems 420,000

This project provides for the repair of portions of the pressurant systems which serve the test stands, shops, laboratories, and support facilities. Deterioration of these systems is creating serious potential safety problems and decreases the operational reliability. The work includes the repair/replacement of high pressure manifolds at storage bottle batteries and components in high pressure gas systems, replacement of approximately 25 major high pressure valves, replacement of high pressure underground pipelines, and upgrading of safety pressure relief devices at or near 5 generating stations (3 air, 1 nitrogen, and 1 helium). Also included is cleaning of segments of the high purity air distribution and storage system.

4. Repair Mechanical Components, Various Buildings 425,000

This project provides for the repair of mechanical equipment in various buildings at MSFC. These components have been in service from 15 to 30 years. Repair (or replacement) of the items is needed to provide reliable support to programs, minimize breakdown maintenance, reduce energy consumption, and eliminate the hazardous wooden cooling towers. These facilities directly support the Space Shuttle and Spacelab programs and

other research and development programs. This work involves repair or replacement, as necessary, chilled water pumps, condensate pumps, condenser pumps, central air compressors, hot water expansion tanks, hot water pumps, hot water piping, and heat exchangers in 12 buildings. Also included is the replacement of 3 deteriorated wooden cooling towers with fire resistant cooling towers.

J. Michoud Assembly Facility (MAF) 905,000

1. Repair Electrical Feeder No. 3 225,000

This project provides for the replacement of 3,000 feet (915 meters) of underground electrical feeder cable. This feeder supplies electrical service to the welding areas in the Main Manufacturing Building 103 and the Vertical Assembly Building 110, which are critical to the manufacturing of the Shuttle external tanks. The existing feeder cable is 38 years old, deteriorating, and has exceeded its expected useful life. The new feeder will be ethylene propylene rubber insulated cable, shielded with a polyvinyl chloride jacket.

2. Repair Roadways and Parking Lots 490,000

This project provides for repair of approximately 54,250 square yards (45,353 square meters) of roadways and parking areas with a 1-inch bituminous asphaltic concrete overlay. Areas included in this project are the deteriorated roadway between Building 450 to Saturn Boulevard and Parking Lots E, F, and K located adjacent to Buildings 702 and 350. Unstable soil conditions at MAF causes settlement, ponding of water, pits, and results in rolls in the roadways and parking areas that are hazardous to vehicular and pedestrian traffic.

3. Repair Fire Water Tower 190,000

This project provides for repair of the deteriorating 200,000-gallon (757,000 liters) fire tower (302) which was constructed in 1943 and last rehabilitated in 1968. The removal of corrosion, application of a new protective coating, both inside and outside, and the replacement of corroded bolts are all necessary to prevent further deterioration and to maintain the structural soundness of this water tower.

K. National Space Technology Laboratories (NSTL) 1,250,000

1. Repair of High Pressure Gas (HPG) System Components 450,000

This project provides for the repair of HPG system components within the SSME complex, cross-country HPG systems, and base facilities. Many components in the HPG system are 12 to 15 years old and have been subjected to severe use and stress, including submersion, electrolytic corrosion, and periodic removal and chemical cleaning during system maintenance. Many of the components are obsolete and spare parts cannot be bought; but must be custom-made. Because of the extremely high operating pressures, in addition to normal wear and tear, their continued deterioration constitutes a safety hazard to both personnel and equipment. The work will include the following: component disassembly, cleaning and repair; reassembly and installation; and system certification on completion of installation activities. The components to be repaired include 10 pressure regulators, 20 bleed/drain valves, 60 manual valves, and other candidate components.

2. Repair of Diesel Engine High Pressure Industrial Water (HPIW) Pumps..... 310,000

This project provides for repairs to eight Nordberg and four Cooper Bessemer diesel engines in the HPIW pump and generating plant. The Nordberg diesels, which drive the water pumps, and the Cooper Bessemer diesels, which drive the electric power generators, accumulate an average of 1,000 hours of run time each 2 years in support of the SSME program. The outdoor exhaust system is seriously deteriorated. The high speed (16,000 RPM) turbochargers require repair as evidenced by past problems and to preclude possible failures. A recent diesel engine test revealed developing valve and ring problems that will require repairs to all engines. The HPIW pumps prevent destruction of the concrete flame deflectors during tests. Work will include the repair of diesel engines, exhaust systems, turbochargers, HPIW pumps, and electric power generators. Bearings, drives, couplings, impellers, and housings of the pumps will be repaired or replaced as necessary to preclude fatigue failure during test operations.

3. Repair of Heating, Ventilation, and Air-conditioning (HVAC) Components, Various Buildings... 240,000

This project will provide for repair/replacement of various HVAC components in 16 buildings. These systems have been in operation for 15 years with minor overhaul being performed on an as-required basis. At this age, these HVAC systems have reached the point when minor maintenance cannot correct recurring breakdowns. The work includes replacing internal rotating parts, overhauling electric motors and control valves, rebuilding or replacing control valve internal plugs, seats, and guides. In addition, high temperature hot water converter tubes will be chemically cleaned and tested. These repairs will allow continued use of these existing HVAC systems, and will result in reduced energy consumption.

4. Repair Roofs, Various Buildings..... 250,000

This project provides for the repair of the roofs of seven permanent buildings. These roofs are 15 to 18 years old. Age, foot traffic, and installation of roof-mounted vents and other equipment have, over the years, introduced various stresses that cause cracks, separations, and other defects in the roofs. This allows moisture to seep into the under-roof membranes which accelerates deterioration. Work includes repair of 45,500 square feet (4,095 square meters) of deteriorated bituminous surface, replacement of designated areas of moisture saturated insulation board, and repair of 2,500 linear feet (750 meters) of flashings to complete rehabilitation around roof perimeters and penetrations.

L. Wallops Flight Center (C)..... 1,165,000

1. Repair of Various Roofs..... 305,000

This project repairs roofs on five buildings. Included are 14,000 square feet (1,300 square meters) on the Flight Control and Analysis Laboratory (N-161); 8,000 square feet (745 square meters) on the Communications

Building Shop and Office (E-7); 5,200 square feet (235 square meters) on Blockhouse No. 2 (Y-30); 2,500 square feet (235 square meters) on the AN-FPS-16 Radar Station (Y-55); and 2,500 square feet (235 square meters) on the Launch Control Center Building. These roofs are over 20 years old and have deteriorated to the point that repair by replacement is necessary to prevent interior building damage and to reduce "patchwork" maintenance burdens.

2. Repair of Heating, Ventilation, and Air-conditioning (HVAC) Telemetry Building (N-162)..... 360,000

These resources provide for the repair of the HVAC system in the Telemetry Receiving and Recording Building (N-162). The work includes replacement of the existing air-conditioning system including chillers, cooling towers, air handling units and ductwork, and the portion of the heating system serving the vehicle bay. Also included are replacement of attendant thermostats and control system, and the installation of a new suspended acoustical tile ceiling to replace the existing spline-type ceiling which must be entirely removed to install the new ductwork. The 20-year old HVAC system is no longer providing temperature and humidity conditions needed for the telemetric equipment in this building and can no longer be economically maintained. The replacement system will correct these deficiencies and reduce energy consumption.

3. Repair of Roads..... 300,000

These resources provide for the repair of deteriorated roads and paved areas at the Center. Included is a bituminous overlay to the Wallops Island main road and repairs to secondary roads, curbing, and sidewalks. The major road has received only short-term type repairs such as sealing and patching since 1959. The overlay is needed to prevent further deterioration. Secondary roads repairs include slurry seal to asphalt pavements and crack and joint repairs to concrete payments. These repairs are necessary at this time to protect the pavements and ensure their continuing serviceability.

4. Repair of Maintenance and Storage Facility (X-35)..... 200,000

These resources provide for repair of the deteriorated exterior surfaces and removal of interior block walls of this 35-year old building. The work includes replacement of existing vehicle doors, which are beyond repair; removal of single-pane industrial type windows, many of which are broken; covering the external walls with preformed insulated metal wall panels; and replacement of personnel doors. Interior concrete block walls which obstruct storage capacity will also be removed. These repairs are necessary at this time to allow continued utilization of this building for service shops, maintenance, and storage on Wallops Island.

MISCELLANEOUS PROJECTS NOT EXCEEDING $150,000..... 1,260,000

TOTAL..... **15,000,000**

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated $15,000,000 to $20,000,000 per year will be required for the continuation of this essential repair program.

REHABILITATION
AND MODIFICATION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

SUMMARY

REHABILITATION AND MODIFICATION

Summary of Project Amounts by Location:	Amount	Page No.
Ames Research Center	1.760. 000	CF 9-3
Dryden Flight Research Facility	850. 000	CF 9-4
Goddard Space Flight Center	1,740,000	CF 9-5
Jet Propulsion Laboratory	1.915. 000	CF 9-7
Johnson Space Center	1.830. 000	CF 9-8
Kennedy Space Center	740. 000	CF 9-10
Langley Research Center	1.640. 000	CF 9-11
Lewis Research Center	1,540,000	CF 9-12
Marshall Space Flight Center	3.010. 000	CF 9-13
Michoud Assembly Facility	1.145. 000	CF 9-16
National Space Technology Laboratories	485. 000	CF 9-16
Wallops Flight Center	1.765. 000	CF 9-17
Various Locations	650. 000	CF 9-18
Miscellaneous Projects Not Exceeding $150, 000 Each	930 .000	CF 9-19
Total	20.000. 000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE:	Rehabilitation and Modification of Facilities, Not In Excess Of $500,000 Per Project
INSTALLATION:	Various Locations
	FY 1983 CoF ESTIMATE: $20,000,000
FY 1981: $19,000,000	FY 1982: $17,700,000

COGNIZANT INSTALLATIONS/LOCATION OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE:

These resources will provide for the rehabilitation and modification of facilities at NASA field installations and Government-owned industrial plants supporting NASA activities. Included in this request are those facility rehabilitation and modification needs for FY 1983 that have been fully identified at the time of the submission of these estimates, and that are estimated not to exceed $500,000 per project. The purpose of this program is to restore or enhance the condition of a facility so that it can more effectively accomplish its designated purpose or increase its functional capability.

As part of the rehabilitation and modification work, the Agency continues to emphasize the identification of projects that relate directly to the conservation of energy at the various field installations. Those energy conservation projects constitute $4,085,000 of the total $20,000,000 requested for FY 1983 and include both institutional and programmatic energy conservation initiatives. Each energy project has a simple payback period of 5 years or less.

PROJECT JUSTIFICATION:

Based on the initial investment costs, the existing NASA physical plant totals approximately $7.0 billion (September 30, 1981). A continuing program of rehabilitation and modification of these facilities is required to:

a. Protect the capital investment in these facilities by minimizing the cumulative effects of wear and deterioration.

b. Ensure that these facilities are continuously available and that they operate at peak efficiency.

c. Improve the capabilities and usefulness of these facilities and thereby mitigate the effects of obsolescence.

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

e. Provide significant reductions in energy consumption through the initiation of energy conservat .on projects including improved utility control systems.

This program includes only facility rehabilitation and modification work having an estimated cost not in excess of $500,000. The work is of such a nature and magnitude that it cannot be accomplished by routine day-to-day facility maintenance or by related routine facility work efforts that 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.

PROJECT DESCRIPTION:

Proposed rehabilitation and modification projects for FY 1983 totaling $20,000,000 are described under "PROJECT COST ESTIMATE." Only those projects estimated to cost less than $150,000 have not been individually described or identified by Center. The total cost for these miscellaneous projects is **$930,000.** The total program has been distilled from requests of approximately **$33,000,000** and represents only a modest request in relation to the backlog of this type of work. Based on relative urgency and expected return on investment, the projects which comprise this request are the highest priority requirements. Deferral of this mission-essential work would adversely impact the availability of critical facilities, program schedules, and energy conservation objectives.

During the course of the year, some rearrangement of priorities may be necessary. This may force a change in some of the items to be accomplished. Any such change will be accomplished within available resources. The following broad categories of work are described further in the "PROJECT COST ESTIMATE."

a. Utility Systems.. 5,825,000

b. Fire Detection/Protection Systems. 730,000

c. General Purpose Buildings. 3,580,000

d. Technical Buildings/Structures 9,000,000

e. Pavements and Drainage 165,000

f. Building Exteriors and Roofs..... 700,000

PROJECT COST ESTIMATE:

A. Ames Research Center (ARC)..... 1,760,000

1. Safety Modifications to Various Buildings 280,000

This project provides for fire protection modifications to Buildings N-203, N-216, N-227C, and N-239. The modifications include provisions for a second means of egress and fire sprinklers in laboratory areas. In Buildings N-203 and N-227C, an existing window and part of the wall on the second floor will be removed to accommodate an exit door and stairs; and in Building N-216, part of a ground level window will be removed to enable the installation of a new exit door. In Building N-239, the removal of some ceiling material, lights, ducts, and piping will be necessary for the installation of fire sprinklers. These modifications are necessary to protect life and high value laboratory equipment.

2. Modification of Aircraft Servicing Facility (248)..... 185,000

The project provides for the modification of approximately 3,200 square feet (298 square meters) of space on the second floor of N-248. This facility houses and provides support services for the Kuiper Airborne Infrared Observatory, a C-141A aircraft. A large transient experimenter population as well as maintenance and support services personnel utilize the facility. Overcrowded conditions exist when both groups are occupying the facility. The modifications in this project provide for the installation of partitions; floor and ceiling finishes; electrical distribution; and heating, ventilating, and air-conditioning (HVAC) modifications. The area to be modified is currently used for storage because it is unsuitable for office space in its current configuration.

3. Rehabilitation and Modification of Fire Test Facility (254)..... 155,000

This facility was constructed for the purpose of analyzing the burning characteristics and products of combustion of aircraft components. This is accomplished by installing a portion of an airplane in the test building and igniting it. The type of material being tested is limited because of toxic by-products that are emitted. This project provides for the installation of an air handling and fume scrubber system. The system

will have a 22,000-ccbic foot per minute (622 cubic meter per minute) exhaust fan, a 235-gallon per minute (890 liter per minute) recirculating pump, and an 800-gallon per minute (3,029 liter) sump pump. Also, all necessary duct work and piping will be provided.

4. Modification of High Reynolds Number Channel 11 (231)..... 490,000

The High Reynolds Number Channel II provides high quality data that is used for computer code verification and development. Free-stream turbulence measurements reveal undesirable levels of high frequency turbulence. Acoustical damping will be provided to alleviate this problem. Because this is a blowdown tunnel, run times are on the order of minutes to seconds. Consequently, many of the parameters that must be varied are accomplished too slowly to be done during the run, or require manual adjustment. To reduce the total time for acquiring the data, rapid remote control of the position settings will be accomplished by the installation of a flexible wall and boundary layer bleed control valves.

5. Modification of Chemical Research Projects Facility (223)..... 210,000

This project modifies the Chemical Research Projects Facility, Building N-223, formerly a flight range for hypervelocity ballistic guns. The facility is now being utilized as a test and evaluation laboratory for aircraft materials. Currently, the operation is fragmented in various locations in this building. This project will reconfigure the space to accommodate test equipment and chemical tests. Included is the installation of fume hoods, a new HVAC system, new ceiling and flooring, and necessary electrical work. Approximately 3,000 square feet (228 square meters) of space is involved.

6. Modification of Space Projects Facility (244)..... 440,000

This project provides for the installation of a helium recovery system. Presently, helium used for laboratory and flight technology development of infrared detectors and cryogenics is being vented to the atmosphere. For the Infrared Astronomical Satellite, approximately *$160,000* was spent for helium which was not recovered. The project includes the following items: helium recovery bag, compressor, liquifier, and helium storage cylinders. The system will be located in the Mechanical Equipment Room in N-244 and will provide recovery outlets in various laboratories.

B. Dryden Flight Research Facility (DFRF)..... 850,000

1. Rehabilitation and Modification of Building 4800 for Engineering Support Laboratory..... 450,000

These resources provide for the rehabilitation and modification of 7,500 square feet (700 square meters) of space on the first and second floors of Building 4800 for an Engineering Support Laboratory. A second floor for an electronic equipment laboratory will be constructed in the east patio high bay now used as

a tool crib and for equipment storage. Included is the installation of 3,750 square feet (348 square meters) of flooring and acoustical ceilings; rehabilitation and modification of partitions; lighting; electrical power; heating, ventilating, and air-conditioning (HVAC); and fire protection systems. Dryden has no laboratory space available for 20 engineers and scientists to perform electronic equipment development work in support of aeronautical flight programs. They are presently located in temporary space and share laboratory benches on an "as available" basis. This project is urgently needed to modify the existing building to provide adequate space to improve working conditions and eliminate the use of temporary trailers.

2. Modification of Electrical Power Systems, Hangar Building (4801) 400,000

These resources provide for the modification of the electrical power system in the Hangar Building (4801) at Dryden. A 225 kVA uninterruptible power supply (UPS) will be installed to provide 15 minutes of power should a failure occur. The UPS will include batteries, battery rack, and inverter, and will be installed in a 400-square foot (37.1 square meter) pre-engineered metal building adjacent to Building 4801. This work also includes modification of the electrical power and HVAC systems. This project is required to provide reliable electrical power for the Remotely Piloted Research Vehicle Simulator Facility in Hangar Building 4801. It is also needed to protect computer and electronic equipment from power line transient voltage spikes and random power failures. Unscheduled outages and power line transients result in data losses and damage to electronic equipment.

C. Goddard Space Flight Center (GSFC) 1,740,000

1. Modifications to Mission Operations Computing Facility and Project Operations Control Centers, Building 3/14 475,000

These resources provide for the modification of 7,200 square feet (669 square meters) in the Mission Operations Computing Facility (MOCF) and various Project Operations Control Centers throughout the 15,000-square foot (1,394 square meter) multisatellite area to accommodate the replacement of orbit system computers, and the installation of additional electronic communication and control equipment. The work includes modifications to the air distribution system, electrical service, ceiling system, raised floor system, and interior partitions. Also included is the construction of two firewalls and an entry control system in the MOCF. The project is required at this time to accommodate the installation of the new satellite ground support systems scheduled for procurement and installation during fiscal years 1983 and 1984.

2. Modification to Optical Coating Facility, Building 5 480,000

These resources provide for modifications to the vacuum deposition control area to increase both the quantity and the quality of special mirrors being manufactured for scientific spacecraft optical systems. The project includes enlarging the control area from 12 feet by 15 feet (3.7 meters by 4.6 meters) to 22 feet by 25

feet (6.7 meters by 7.6 meters), installation of a handling system for the electron beam baseplate, and relocation of the existing handling system for the resistance heating baseplate. Also, included are modifications to the ventilating and air-conditioning equipment. These modifications are required to reduce the time to switch between the two deposition techniques, either of which may be required for a particular optical coating. These modifications will also reduce the presence of vaporous irritants, and provide humidity control to minimize degradation of hydroscopic coating materials.

3. Modifications for Flight Control and Operations, Various Buildings 225,000

These resources provide for the modification of approximately 15,000 square feet (1,360 square meters) in the Central Flight Control and Range Operations Facility (3 and 14), Tracking and Telemetry Laboratory (12), Network Control Center Facility (13), Technical Support Building (19), and Network Training and Test Facility (25). The work includes removal and relocation of partitions and doors; relocation of lighting fixtures, power receptables, and fire protection systems; and redistribution of heating, ventilating, and air-conditioning (HVAC) services. These modifications are necessary at this time to accommodate changing mission requirements.

4. Modifications to HVAC System, Central Flight Control and Range Operations Facility (3) 200,000

These resources provide for the modification of HVAC systems serving the basement of Building 3. The project includes conversion of the computer area air distribution systems to underfloor plenums and related modifications to the air distribution system to insure operationally effective and energy-efficient cooling. Building 3 was built in 1961 to provide laboratory and office space for spacecraft mission tracking, data reduction, operations, and control. Since that time, several modifications have been made to the air-conditioning system to provide for the installation of additional computers and related equipment to support new spacecraft programs. The existing systems are unbalanced, inadequate, and require extensive maintenance. This project is part of a continuing program to correct these deficiencies and must be accomplished at this time to insure continued operation of the facility. This is the most effective work that can be accomplished now while continuing the real time tracking and control operations conducted in Building 3.

5. Modifications for Science and Applications Computer Area, Building 1 200,000

These resources provide for modification of 11,000 square feet (1,023 square meters) in the Space Projects Building (1) to support new and replacement computer equipment. The work includes conversion of the existing overhead air distribution system to an underfloor cooling system, changes to the electrical and ceiling systems, replacement of the sprinkler heads to on/off type heads, and interior partition changes necessary to adequately accommodate the computer and peripheral equipment. This project is required at this time to accommodate the replacement of peripheral equipment.

6. Modifications for Computer Area, Data Interpretation Laboratory, Building 23..... 160,000

These resources provide for the modification of 7,900 square feet (734 square meters) of space in Building 23 to support replacement of equipment in the direct access mass storage installation. The work includes replacement of existing raised-floor tiles, relocation of electric power, and installation of filter media for cleaning the supply air to this space. The project is necessary at this time to accommodate the replacement of drum-type data storage units with new disk-type units.

D. Jet Propulsion Laboratory (JPL)..... 1,915,000

1. Modifications to Spacecraft Development Building (233) and Procurement Services Building (291) for Seismic Protection..... 455,000

These resources provide for the modification of the Spacecraft Development Building (233) and the Procurement Services Building (291) at JPL to improve the seismic resistance and basic life safety conditions. Work includes the modification of the structural framing to improve the buildings resistance to seismic forces. Suspended ceilings, partitions, and mechanical and electrical equipment will be braced and anchored to prevent collapse. Also included is other safety related work and the replacement of interior finishes necessary to gain access to the structural framing. Building 233 is a three-story steel-framed structure built in 1964 of approximately 41,000 square feet (3,809 square meters). Building 291 is a two-story steel-framed structure with concrete walls built in 1971 containing 7,500 square feet (697 square meters). These modifications must be accomplished at this time for the safety of the 260 occupants of the buildings.

2. Modifications to Instrument Cable System..... 485,000

These resources provide for modifications to the Instrument Cable System at JPL. Work includes the modification of the fiber optic system to extend it from the Space Flight Operations Facility, Building 230, to Buildings 125, 150 and 179. Two cables will be provided to each building along with the associated terminal equipment. The instrument cable system will also be modified in the 25-Foot Simulator, Building 150, and the Environmental Laboratory, Building 144. Work also includes some related modifications to the instrument cable system in Buildings 32, 107, 125, 126, 159, 161, and 238. The existing instrument cable system transmits data from spacecraft tests, space flight operations, the Utility Control System (UCS), and from various computing and testing sources throughout JPL. The existing duct banks are filled. There is no opportunity for expansion and the system requires continuous maintenance. The wide-band transmission capability will be upgraded by installation of a high speed and interference-free fiber optic cabling system. Tests for new spacecraft programs at JPL require a cable which transmits reliable interference-free data between buildings.

3. Modification of Central Cooling Tower System..... 490,000

These resources provide for the modification of the central cooling tower system at JPL. Work includes the modification of Cooling Tower 296 by tile-filling the east cell and the installation of an additional fan.

The cooling tower water supply and return lines will be extended to serve Buildings **126, 157, 158,** and **238,** and connected to the existing lines in these buildings. This modification work also includes related mechanical and electrical equipment, and UCS connections. Modification of the central cooling tower system will permit efficient water circulation, proper water treatment, and permit the removal of five old cooling towers. Estimated annual savings of **$130,000** a year will result from reduced energy consumption, maintenance, treatment chemicals, and water consumption.

4. Rehabilitation of Air Handling Systems, Buildings **171, 202,** and **241**..... **485,000**

These resources provide for the rehabilitation of the air handling systems in Buildings **171,** 202, and **241** at **JPL.** Work includes replacing six small air handling units with a new unit located in Building **171,** and ten heat pumps with a new air handling unit located in Building **202.** Also included will be the replacement of a roof-mounted heating and ventilating system, and air-cooled condensing units located on the roof of Building **241.** The new air handling systems will include economy cycles and will be monitored by the UCS. The existing HVAC systems serving Buildings **171, 202,** and **241** are a conglomerate of many mini-systems which are in very poor condition and require excessive maintenance and repair. The new central air handling systems are more easily adaptable to building changes and are more energy-effective. This project is part of an overall plan to upgrade the major buildings at **JPL** to make them more energy-efficient, and reduce maintenance and repair costs.

E. Johnson Space Center (JSC)..... 1,830,000

1. Rehabilitation of Electrical Systems, Building 24..... 365,000

This project provides for the replacement of the manually operated 15-kV switchgear in the Central Heating and Cooling Plant with stored-energy type switchgear. Also included is the purchase and installation of one 1,500 kVA transformer; one 1,200-A fused disconnect switch; and one additional 15-kV, 600-A load break switch which will be used to power a 500-hp air compressor motor. This project is required because the switchgear is more than 15 years old and in need of constant repair. Also, this switchgear does not have quick "make/break" capability which is needed for safe and reliable operation. These switches are dangerous to operate during heavy load conditions. If switches are closed too fast, they can close and reopen in the same motion creating dangerous high voltage arcing.

2. Modifications for Replacement of Computer, Building 12..... **420,000**

This project is the final phase of a 2-year program to replace UNIVAC 1108 computer systems in the Central Data Office, Building 12. The work includes redistributing electrical power, installing additional air-conditioning equipment, rebalancing the air-conditioning system, providing a closed-loop cooling system, providing changes to the signal grounding system, relocating walls **to** provide approximately **400** square feet (122 square meters) of tape storage area, providing additional panels of computer flooring, and rehabilitating the existing damaged floor panels. This work is necessary to complete the installation of the second and third

computer systems which replace the UNIVAC 1108, and to reconfigure and upgrade selected peripheral systems. This project is required to accommodate a reliable, state-of-the-art computing system, for support of institutional, engineering, development, and flight planning elements of JSC. The computer systems have been ordered, and the new equipment cannot be installed without these modifications.

3. Rehabilitation of Various Facilities, NASA Industrial Plant, Downey, CA..... 270,000

This project provides for rehabilitation and modification of various buildings and systems at the NASA Industrial Plant, Downcy, CA. The work includes modification of seven elevators located in Buildings 001, 006, and 290 by providing seismic safety devices; replacement of a 400-ton cooling tower and cooling tower station located west of Building 244; and rehabilitation of chemical processing emission control and ventilation systems in Building 001. The buildings to be modified house functions that support the Shuttle program. The cooling tower provides water for the north processing area of the Downey site. It has been in service for approximately 21 years and has deteriorated beyond economical repair. The measured ventilation rates for chemical processing tanks in Building 061 violate the safety standards mandated by the State of California. Adequate ventilation rates must be provided to prevent adverse health effects to personnel involved in open surface tank chemical processing operations.

4. Rehabilitation of Fire Alarm System, Various Buildings..... 270,000

This project provides for the rehabilitation of fire alarm system in 70 buildings at JSC, and 6 buildings at Ellington Air Force Base (EAFB). Work includes the replacement of 114 emergency power supplies on the 12-, 24-, and 220-V DC fire alarm systems. Approximately 94 low voltage power supplies will be replaced with state-of-the-art equipment. In addition, lead acid batteries on approximately 20 high voltage alarm systems will be replaced with new batteries. The existing systems were installed in the 1962-1965 time period and need to be replaced. Cost of maintaining existing power supplies (batteries and chargers) is high. The new equipment will increase efficiency, provide greater safety, and will meet Occupational Safety and Health Administration requirements for fire detection and alarm systems.

5. Rehabilitation of Flight Operations Facilities, Ellington AFB..... 165,000

This project provides for rehabilitation of NASA's EAFB aircraft operation support facilities. The project consists of rehabilitation of aircraft mooring aprons and the heating, ventilating, and air-conditioning (HVAC) systems in Hangar 135 and Building 136. Rehabilitation of mooring aprons consists of replacing 650 square yards (594 square meters) of concrete slab, including base material, tie-down anchors, dowels, and joint sealing. The Hangar 135 work replaces the three 7.5-ton air-conditioning systems in the engine shop. Two supply air handlers (approximately 18,200 cubic feet/minute each) are being replaced in Building 136 (the paint building) along with heating coils, piping, and controls for a 2,500 Btu/hour boiler. JSC's increased utilization of the hangars and apron areas has taxed facility capacity. This project will

provide the necessary rehabilitation of facilities for aircraft flight operations that support ongoing manned space flight programs.

6. Rehabilitate Lighting System, Building 001, NASA Industrial Plant, Downey, CA..... 340,000

This project provides for the rehabilitation of the high bay lighting systems in Building 001, NASA Industrial Plant, Downey, CA, by replacing approximately 7,990 fluorescent lighting fixtures with approximately 717 high pressure sodium lighting fixtures. Electric wiring/conduit systems will be reconfigured as required to obtain switching capability. The high pressure sodium lights produce about 126 lumens per watt; the fluorescent only about 48 lumens per watt. Therefore, the same required lighting level can be maintained with fewer new high pressure sodium lights that also consume less energy. The simple payback for this project is less than 1 year.

F. Kennedy Space Center (KSC)..... 740,000

1. Modifications to Sewage Treatment Plant No. 4..... 450,000

These resources provide for modifications to Sewage Treatment Plant No. 4 at KSC. This plant services the entire Launch Complex 39 area and is presently inadequate to handle peak load flow rates experienced during first-shift operations. This has resulted in a hydraulic overload which adversely effects the quality of effluent to the Banana Creek and Banana River. This overload will be corrected by rerouting the effluent to a new clarifier and oxidation ditch, with the existing aeration tank being converted to a sludge-holding tank. The clarifier will be made of concrete, will have a 25-foot (7.5 meter) diameter, and will be 10.5 feet (3.2 meters) high. The oxidation ditch will also be made of concrete and will be oval in cross-section. The ditch will measure 16 feet (4.8 meters) wide, 8.5 feet (2.6 meters) deep, and 94 feet (28.2 meters) long straight sections, with two curved ends of 16-foot (4.8 meter) radius.

2. Modifications to Utility Control System (UCS)..... 290,000

These resources provide for modifications to the UCS at KSC. The UCS allows automatic operation of utility systems and contributes to energy conservation savings. The system also allows operators to monitor and control these utility systems from centralized consoles, thus improving response to system problems. The basic KSC UCS was installed with resources from FY 1977 and FY 1978 projects. Sufficient experience has been gained where additional cost savings may be realized by the addition of new sensors and remote controls. The work includes the purchase and installation of sensors in the following facilities: Building M7-409 (30 each), Building M7-351 (6 each), Building M7-1212 (16 each), and in the Pad A Pad Terminal Connection Room (4 each). It is estimated that these controls will yield an annual cost savings of over $180,000, for a payback period of less than 2 years.

G. Langley Research Center (LaRC)..... 1,640,000

1. Rehabilitation of 8-Foot Transonic Pressure Tunnel Office Building (641)..... 475,000

This project provides for the modification of approximately 17,500 square feet (1,625 square meters) of the existing heating, ventilating, and air-conditioning system to a variable air volume system, and the addition of insulation, new windows, and new enclosed stairways to meet safety codes. This building was constructed in 1936 and many of the offices are substandard.

2. Rehabilitation of Impact Dynamics Research Facility (1297)..... 215,000

These resources provide for the rehabilitation of approximately 7,500 square feet (697 square meters) of space in the Impact Dynamics Research Facility, Building 1297. This project includes synthetic stucco insulation on the existing metal panels, provision of storm windows, rehabilitation of the existing roof, new floor finishes, and a new acoustical tile ceiling. This building, constructed in 1963, in its present configuration, is inefficient and wastes energy. Several of the offices are not configured to adequately meet the requirements of the users. The floors, roof, and windows have deteriorated badly and are in need of rehabilitation.

3. Modification of Model Positioning System, Building 1299..... 475,000

This facility, Building 1299, contains two antenna test chambers that are used to obtain data for new antenna designs. This project replaces two antenna/model positioning systems with new high accuracy systems. The current system consists of a three-axis positioner on which can be mounted a model tower which supports and positions antenna models. The positioning accuracies of the existing system have degraded and frequent servicing is required to keep them operational. This project supports the Large Space Systems Technology Program, Millimeter Wave Antenna Systems, and the Radar Cross Section Program.

4. Modification of Electrical System, East Area..... 475,000

This project provides for modifications to the electrical distribution system in the East Area to increase the reliability of the system. The work includes modifying the substation to accommodate modern switchgear and auxiliary items. In addition, the substation will be elevated above the storm flood plain. This substation, installed in 1941, is subject to periodic flooding and does not comply with current safety standards.

H. Lewis Research Center (LeRC) 1,540,000

1. Rehabilitation of Mechanical and Electrical System in Propulsion Systems Laboratory (PSL) Engine Test Building (125). 390,000

These resources provide for the rehabilitation of the mechanical and electrical systems in the PSL Engine Research Building 125. The work includes the addition of by-pass valves at the exhaust control station, the addition of two controllers for PSL 3 and 4, and the replacement of the old cooling tower water return and industrial waste return pumps with larger pumps. The exhaust control station was originally designed for large-weight flows. The addition of the by-pass valves will permit the testing of small turbofan and turbojet engines at low-weight flows. The controllers will provide for sequencing functions and permissive safety interlocks that reduce operational costs and provide needed flexibility. The larger pumps will eliminate flooding and freezing problems that now occur. The PSL 3 and 4 have been in continuous use since March 1973 in support of advanced engine systems development. This work is necessary to extend the operating life and to improve the utilization of the facility.

2. Rehabilitation of the Heating, Ventilating, and Air-conditioning Systems (HVAC) in the Engine Research Building (5). 490,000

These resources provide for the rehabilitation of the mechanical systems in the Engine Research Building. The work includes removal of the deteriorated HVAC systems, and the installation of a new variable volume cooling system with a perimeter heating fin-tube system, individual room temperature controls, and related electric work. The HVAC system will incorporate an economizer cycle to use outside air for cooling. This rehabilitation of a 37-year old system is needed now to provide this test facility with an energy-efficient and reliable mechanical system.

3. Rehabilitation of Cooling Tower Fan System. 200,000

This project provides for the rehabilitation of the cooling tower fan system by replacing 18 fan motors on Cooling Tower No. 1 with modern, high efficiency motors, as well as replacement of the motor control center in the Refrigeration Building (9). In addition, two 200 kVA, 208 V transformers at the Refrigeration Building will be replaced by a 500 kVA, 480 V transformer. All of the equipment being replaced is at least 35 years old. The motor control center is obsolete, and maintenance and repair parts are increasingly more difficult to acquire. The work is necessary to maintain an operative and improved system.

4. Modification of Cabling System Between Central and West Area..... 460,000

This project provides modifications to the duct bank system between the Research Analysis Center, Building 142, located in the central area and facilities in the west area. The work includes the installation of a 1,333-foot (407 meter) duct bank between Building 142 in the central area and Building 303 in the west

area. The duct bank will cross Abrams Creek which separates the central and west areas. Dedicated data cables will be relocated from an existing pole line to the new duct bank. The duct bank will have additional capacity to allow for the installation of future cabling. The existing cable system picks up lightning-induced transients data. The new duct bank will provide a shielded path for the cables.

I. Marshall Space Flight Center (MSFC) 3,010,000

1. Modifications to Provide Additional Gas Storage Capacity, East Test Area..... 450,000

This project will provide for the installation of gaseous nitrogen and gaseous hydrogen storage vessels at Test Position 116 in the East Test Area. Test Position 116 is actively supporting propulsion technology test programs and problem resolution for Space Shuttle Main Engine (SSME). Future test programs include SSME life extension, thrust uprating and improvement, and the advanced booster engine and advanced space engine technology programs. The current run duration at Test Stand 116 is limited by the amount of pressurant (GN_2 and GH_2 gases) available. This project will increase the gas storage so that longer duration tests at desired flows and pressures can be accomplished. Four GH_2 tanks are surplus at the Santa Susana Test Complex. They will be relocated to MSFC and installed as part of this project. They will provide 800 CF GN_2 storage and 800 CF GH_2 storage. Concrete foundations for the gas storage vessels, connecting piping, and valves and manifolds will also be provided.

2. Modifications to High Pressure Hydraulic Actuator Facility, Building 4656..... 450,000

This project will provide modifications to the Hydraulic Equipment Development Facility, Building 4656, to permit developmental testing of high pressure (6,000 to 10,000 psi) advanced lightweight/small-volume hydraulic power control systems. This facility is used for the design and development of lightweight, small-volume hydraulic power control systems to demonstrate their capabilities, including thrust vector and engine propellant controls, air surface controls and large experiment point and positioning control systems. Advancements made in recent years in high pressure hydraulic seal configuration make high pressure lightweight hydraulic control systems feasible for future NASA programs. Among the first programs to use this upgraded facility will be the SRB thrust vector control reconfiguration. The project provides a high pressure pump, reservoir, heat exchanger, tubing, valves, pressure regulators, actuator and/or servovalve test bench, and the related flow and pressure instrumentation. The work also includes necessary supporting utilities.

3. Modifications to Install a Low Density Flow Chamber, Experimental Acoustic Test Facility, Building 4776..... 320,000

This project will provide for the procurement and installation of a low density flow chamber and the required supporting operational systems in Building 4776. The importance of plume impingement effects on spacecraft design is exemplified by the plume impingement flight anomalies experienced by the Pegasus and

Voyager spacecraft. Plumes generated in space by reaction control thrusters, overboard dumps, experiment vent gases, or leaks expand widely and may impinge upon surfaces such as solar arrays and thermal radiators. The plume impingement produces undesirable forces which can severely impact the fuel required for spacecraft control. It is necessary to define the effects of plume impingement forces to minimize the amount of reaction control system fuel required. To provide engineering data for space vehicle design and operation, it is necessary to have a long duration continuous flow experimental chamber capable of measuring flow and thermodynamic properties of jet plumes exhausting from scaled rocket nozzles and/or vents at altitudes equivalent to orbiting space stations. There are no vacuum chambers presently available at MSFC which are suited for orbital altitude plume flow work using air as the plume gas. This work will include the installation of: a 12-foot (3.6 meter) diameter by 16-foot (4.8 meter) long vacuum chamber; two 20-inch (4.5 centimeter) oil diffusion pumps; one mechanical vacuum pump; and vibration isolation system. The electrical and mechanical utilities, and the cryogenic systems, will be modified to accept the low density flow chamber and supporting system. A liquid nitrogen storage tank will be relocated from Building 4732.

4. Modifications to Provide Space Power Systems Laboratory, Building 4487..... 190,000

This project provides for modifications to the west end of "C" Wing, Building 4487, to install a breadboard facility. The breadboard will be used to test and evaluate power component technology, establish power quality for various system configurations, evaluate advanced power system management techniques, and support space power systems design and development programs such as the satellite power system, large space systems, and advanced power systems. This work includes the installation of batteries, thermal control equipment, load banks, power system breadboard, and switch gear power control equipment. Heating, ventilation, and air-conditioning (HVAC) systems will also be modified to meet the specific requirements for battery rooms and dissipation of thermal loads to meet safety requirements and energy conservation. Major electrical modifications will be made to the existing 440-volt AC power system.

5. Rehabilitation and Modification of Developmental Processes Laboratory, Building 4711.... 490,000

This project provides for modification to the Developmental Processes Laboratory, Building 4711. The building was originally constructed in 1943 and used to house a machine shop for approximately 30 years. In the mid-1970's, without any major renovation, the machine shop was removed, and the building reverted to office and laboratory space to support material research activities for the design of spacecraft structures. Major renovations are needed at this time due to deterioration of the original wooden floor, electrical and mechanical systems, and due to deficiencies in the original architectural layout to support present research functions. The work includes: removal of 3,600 square feet (325 square meters) of woodblock flooring and replacement with a concrete floor; installation of DC power lines to laboratory areas; expansion of HVAC system to laboratory areas; replacement of lighting fixtures where necessary; installation of 850 feet (255 meters) of interior walls; and installation of 4,600 square feet (415 square meters) of drop ceiling.

6. Modifications to Various Buildings for Energy Conservation..... 290,000

This project provides for modifications to various buildings to provide an annual savings of approximately 5.8 billion Btu's of fossil fuel, resulting in a 2-year payback period. The work includes: (1) the replacement of existing steam summer reheat and the hot water supply in Building 4207 with a natural gas-fired boiler for summer reheat; (2) separation of humidity controlled areas from comfort heated/cooled areas in four buildings; (3) installation of economizer cycle on air handling units in ten buildings to permit use of outside air to meet cooling requirements when feasible; and (4) replacement of existing outside air dampers on four buildings with low-leakage type dampers to reduce unwanted outside air.

7. Modifications to Install Fire Suppression Systems..... 185,000

This project provides for the installation of fire suppression systems in two buildings. The systems will be automated water sprinkler systems for Office Building 4485, and a fire suppression system for the NASA aircraft hangar, Building 4815. Also included are ventilation system changes in Building 4815. Building 4485 houses the MSFC Finance Office and contains personnel payroll, finance, and vendor records and electronic equipment. Building 4815 is the maintenance facility for the two MSFC aircraft. The fire protection system for these buildings must be updated to meet Federal fire codes and protect the aircraft.

8. Rehabilitation and Modification of Shop and Assembly, Building 4707..... 465,000

This project provides for the rehabilitation of the interior and exterior of the high bay and office areas of Building 4707. This facility was constructed in the late 1950's, and has been extensively used. The many minor additions, modifications, and changes in utilization have overloaded the utilities and mechanical systems. Maintenance and utilities operating costs can be reduced by major rehabilitation of the building structure and rework of mechanical, power, and lighting distribution systems. The work will include upgrading the lighting and mechanical systems, insulating the high bay and installing eight heat recovery units, repairing floors, walls, and ceilings in the office areas and painting as required. Two new heat pump units will be installed to provide heating and cooling to the office areas; the existing steam heating units and window-type air conditioners will be removed.

9. Rehabilitation of Office and Engineering Building 4610..... 170,000

This project provides for the general rehabilitation of the interior of Building 4610. The work includes the upgrading of wall coverings, base boards, lighting, floors, ceilings and painted surfaces, as well as renovation of the elevators and installation of fire doors in the 5-story office and engineering portion of the building. The rehabilitation of the office and engineering areas will greatly improve working conditions and reduce maintenance costs. Also included are modifications to the HVAC system to rehabilitate the cafeteria kitchen air conditioning and ventilation system and rehabilitation of the serving area. The cafeteria work is necessary to improve sanitary and environmental conditions and raise food-serving standards. This will be the first rehabilitation of the building since its construction in 1966.

J. Michoud Assembly Facility (MAF) 1,145,000

1. Rehabilitation and Modification to Heating, Ventilating, and Air-conditioning System, Building 320 300,000

This project provides for the installation of a new 320-ton chiller, and rehabilitation of deteriorated fan houses located on Building 320. This building houses the facility operating contractor, the fire protection contractor, and the reproduction service contractor at MAF. The existing chiller is over 15 years old and is of the same vintage as similar chillers that recently had to be replaced in another building because of major failures. Repair of the fan houses will include replacement of fan motors and heating and cooling coils that are experiencing excessive breakdowns and repairs. The work is needed now to provide required reliability and sustained operations.

2. Modification to Boilers, Building 207 350,000

This project provides for the installation of economizer systems on four boilers in the Central Heating and Cooling Plant, Building 207. The economizers will preheat the boiler feedwater, thus reducing fuel consumption and achieving an annual savings of 64 billion Btu's of energy. Simple payback for this project is estimated to be less than 1 year.

3. Modifications to the Utility Control System (UCS).. 495,000

This project provides for expanding the existing UCS to conserve additional electricity/natural gas and permit better utilization of maintenance personnel through expanded use of the existing UCS software capability. Work includes installation of additional hardware (temperature and pressure sensors, status and alarm points, and start-stop relays) to provide more data collection and automatic control of pumps, motors, and other equipment. This hardware will be added to 14 buildings and the natural gas, storm drainage, and steam distribution systems. It is estimated that the payback for this project is less than 2 years.

K. National Space Technology Laboratories (NSTL).. 485,000

1. Modification to Heating, Ventilation, and Air-conditioning (HVAC) Systems, Various Buildings 210,000

This project provides for modification to the HVAC systems in Buildings 1110, 1200, 1201, 4110, 4995, and 8100 to improve system efficiencies and thereby conserve energy. The HVAC system will be modified by converting the present air delivery systems to a variable air volume (VAV) system. The VAV conversions in these six building systems will provide energy savings estimated to be 8.0×10^4 Btu's/year. One of the major causes of excessive energy consumption in air-conditioning equipment is fouling of the heat exchanger surfaces. Tube-fouling usually clings to the inside of the condenser tubes and can be minimized by the

installation of automatic tube cleaners. This modification will save an estimated 0.9 X 10^9 Btu's/year.

2. Modifications to Oral Warning and Paging Systems..... 275,000

This project provides for the replacement of cables for the oral warning and paging systems. This is the second phase of a multiyear project. This system was installed in 1965 and the cables have now deteriorated to such an extent that, when a fault occurs, it is extremely difficult to find a spare circuit to replace the damaged cable. Failure to implement this project may result in interruption to the oral warning and paging system during periods of hazardous testing or emergency weather conditions. This system is used for primary notification to the working population on NSTL. Work consists of installing new cables in existing ducts, and installing above ground pedestal terminations for all cable splices. The project provides for the installation of approximately 55,000 feet of cable in the industrial area and the administrative areas.

L. Wallops Flight Center (WFC)..... 1,765,000

1. Modification of Central Heating, Ventilating, and Air-conditioning (HVAC) Systems..... 400,000

These resources provide for the installation of a hot- and chilled-water distribution system and related improvements to eight major facilities at the Center. The work includes installation of 3,000 feet (279 meters) of pre-insulated pipe with associated pumps and valves for the distribution of hot and chilled water for heating or cooling. Also included is the installation of chillers, cooling towers, and related equipment. These modifications will allow conversion from steam to hot water heating in the eight buildings, and the abandonment of approximately one-third of an inefficient, deteriorated steam distribution system. This project will result in a ten percent reduction in the Center's annual utility energy use and simple payback of the investment in 4 years.

2. Rehabilitation of the Range Control and Evaluation Facilities Building (N-159)..... 450,000

These resources provide for the rehabilitation of the west wing of Building N-159 to allow improved utilization and to reduce energy consumption. The work includes replacement of the deteriorated roof, rusting exterior doors, and window systems. In addition, insulation will be applied to all exterior walls and the interior surfaces will be refinished along with additional partitions and minor mechanical modifications. This effort is necessary at this time to allow continued utilization of Building N-159 for project management activities, operations, the environmental laboratory for sounding rocket test and evaluation, and aircraft project space.

3. Rehabilitation of Launch Support Building (X-15)..... 250,000

These resources provide for the rehabilitation of the exterior of this deteriorated 30-year old building. The work includes replacement of exterior siding and windows with insulated metal siding, thermal

windows, and aluminum doors. This rehabilitation work is necessary at this time to allow Building X-15 to continue to function as the central location for operational and engineering launch support activities. The project will provide adequate environmental control and reduce energy consumption.

4. Rehabilitation of Various Instrumentation Facilities (A-1, U-70, X-85). 440,000

These resources provide for the rehabilitation of the Aircraft Control Tower (A-1), the AN/FPQ-6 Radar Building (U-70), **and the Meteorological Observation Center (X-15). The work includes replacement of roofs,** windows, doors, ceilings, and lighting. Also included are insulating exterior walls, renovating interiors and HVAC systems, repair of ladders and railings, and repair of asphalt and concrete exteriors. These buildings were constructed from 1944 through 1964 and have not received any major rehabilitation. The work is necessary at this time to correct the environmental conditions for sophisticated instrumentation, radar, and related equipment in these buildings.

5. Rehabilitation of Launch Area 2 (Y-30) 225,000

This project provides for the rehabilitation of Launch Area 2 to permit consolidation of meteorological and sounding rocket launches into one central area. The work includes rehabilitation of 5,300 square feet (492 square meters) of interior and exterior surfaces, toilets, lighting, and mechanical systems in Blockhouse Y-30, and modification of the launch area and instrumentation cable system. The work is necessary at this time to concentrate meteorological and sounding rocket launch activities in one area and thus reduce operations and maintenance requirements.

M. Various Locations 650,000

1. Modifications for Utility Control Systems (UCS) at DSS-12, Goldstone, California..... 390,000

These resources will provide a UCS for the DSS-12 site at the Goldstone Deep Space Communications Complex. This system includes a real time microprocessor subsystem, which will provide local monitoring and control of the engine generator plants; heating, ventilating, and air-conditioning (HVAC) systems; lighting; fire protection; security; and power and water distribution systems. The UCS center will be located in the Operations Building. This project is designed to reduce operating costs by reducing energy consumption through improved control of facilities and equipment and by reducing manpower requirements while continuing to maintain operation at adequate levels. Programmatic support of spacecraft missions will also be improved through increased reliability and monitoring.

2. Rehabilitation and Modification of Various Buildings at Goldstone, California..... 260,000

This project rehabilitates and modifies various buildings at the Goldstone Deep Space Communications Complex. Included is the rehabilitation and modification of roofs, walls and ceilings, vestibules, and weather

stripping. HVAC equipment will be rehabilitated, and duct work will be modified to incorporate economizer cycles and to provide improved HVAC balancing. Obsolete control equipment will be replaced with more efficient control systems. Lighting systems will be modified by adding timer controls and daylight turnoff sensors, reducing lighting levels, and changing from incandescent to fluorescent fixtures. The buildings being rehabilitated are over 15 years old and have only received the maintenance required to correct emergency problems. This work will correct these deficiencies and insure that these buildings continue to support NASA missions at minimum operating costs.

MISCELLANEOUS PROJECTS LESS THAN $150,000	930,000
TOTAL	$20,000,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated $20,000,000 per year will be required for continuing rehabilitation and modification needs.

MINOR
CONSTRUCTION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

SUMMARY

MINOR 'I

Summary of Project Amounts by Location:	Amount	Page No.
Ames Research Center	520.000	CF 10-2
Dryden Flight Research Facility	555.000	CF 10-3
Goddard Space Flight Center	460.000	CF 10-4
Jet Propulsion Laboratory	700.000	CF 10-4
Langley Research Center	615.000	CF 10-5
Lewis Research Center	200.000	CF 10-6
National Space Technology Laboratories	480.000	CF 10-6
Wallops Flight Center	470.000	CF 10-7
Total	4.000.000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE:	Minor Construction of New Facilities and Additions to Facilities, Not in Excess of $250,000 Per Project
INSTALLATION:	Various Locations
	FY 1983 CoF ESTIMATE: $4,000,000
FY 1981: $4,000,000	FY 1982: $2,300,000

COGNIZANT INSTALLATIONS/LOCATION OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE:

These resources will provide for minor facility construction at NASA field installations and Government-owned industrial plants supporting NASA activities. Each project included in this program is estimated to cost not more than $250,000, and involves either the construction of new facilities or additions to facilities. The FY 1983 request of $4,000,000 will improve the usefulness of NASA's physical plant by changing the utilization of or augmenting the capabilities of various facilities. Included in this request are those programmatic and institutional projects that are essential to the accomplishment of mission objectives.

PROJECT JUSTIFICATION:

The configuration of NASA's physical plant necessarily must respond to changes in utilization and adaptations required by changes in technology or in mission needs. Demands are generated by research, development, test, and similar activities. Specific justification for each minor construction project is provided under "PROJECT COST ESTIMATE."

PROJECT DESCRIPTION:

Included in the FY 1983 minor construction program are those facility projects for institutional or technical facility needs which could be fully identified at the time of submission of this budget estimate. Items of work totalling $4,000,000 are included in this resource request and have been distilled from a list totalling over $7,000,000. Projects were selected on the basis of the relative urgency of each item and the expected return on the investment. During the course of the year, rearrangement of priorities may require changes in some of the items to be accomplished. Such changes will be accommodated within the resources allocated.

These projects represent requirements that must be met in this time frame to support institutional needs and programmatic objectives. The following listing summarizes the cost distribution by category of work:

a.	Utility Systems	$245,000
b.	General Purpose Buildings	2,000,000
c.	Technical Buildings/Structures	1,755,000

PROJECT COST ESTIMATE:

A. Ames Research Center (ARC).. 520,000

1. Construction of Computer Labs in Flight and Guidance Simulation Lab..... 240,000

This project provides for the construction of approximately a 2,500-square foot (232 square meter), 3-story addition in the high bay area of Building N-243. A new computer system was recently installed in the existing laboratory space in N-243. Additional support space is needed to accommodate the increased usage planned for the computer system. The need includes space for terminal rooms, graphics display laboratories, and peripheral equipment rooms. The structure is to be designed as an independent building with floors of lightweight concrete with light gauge steel decking. This addition will relieve severely crowded conditions. This facility directly supports the operation of the Vertical Motion Simulator and Flight Simulator for Advanced Aircraft.

2. Construction of a Compressed Gas Cylinder Facility..... 175,000

These resources provide for construction of a covered storage building for segregated storage of cylinders containing flammable and inert gases and oxidizers. The cylinders are now stored with highly flammable substances in overcrowded conditions. Also, the existing compressed gas cylinder storage facility is inadequate because it does not have a loading dock. This has led to two recent accidents in which cylinders fell from truck beds. This project provides for the construction of a 3,850-square foot (357 square meter) block building and a loading dock. The floor will be a concrete slab over compacted fill. The roof will be plywood over wood joists supported by wood beams. The building will be located on the north side of the Supply Support Facility, N-255.

3. Construction of Roof in Bioscience Laboratory (236) 105,000

This project will provide approximately a 4,000-square foot (370 meter) roof enclosure to protect the cage storage area of the Animal Care Facility in Building N-236. The Animal Care Facility currently must store clean cages in an open area. Open storage subjects the cages to sun oxidation, deterioration, and exposure to rain and debris. This is a health hazard to the laboratory animals that are used in the Life Sciences programs.

B. Dryden Flight Research Facility (DFRF)... 555,000

1. Construction of Addition to Aeronautical Test Range Building 4800 245,000

These resources provide for the construction of an addition of approximately 3,300 square feet (306.6 square meters) to Building 4800 for the Aeronautical Test Range at Dryden. Work includes enclosing a 40-foot (12.1 meter) wide by 95-foot (29 meter) long area under the second and third floors of Building 4800 to provide additional technical support space. This work includes an exterior wall of construction similar to Building 4800 and a concrete floor. Inside partitions, flooring, ceilings, lighting, electrical power, and heating, ventilating, and air-conditioning (HVAC) systems will be installed. The Aeronautical Test Range supports all flight activities at Dryden. The growth of real-time requirements in support of flight activities has resulted in insufficient space to accommodate equipment and personnel. Additional support space is needed for the technical personnel performing real-time, pre- and post-mission analyses of aeronautical flight tests. The project is urgently needed to improve conditions for expanded aeronautical flight test activities.

2. Construction of Addition to Instrumentation Maintenance Facility (4870)..... 165,000

These resources provide for the construction of a single-story masonry addition of approximately 1,300 square feet (120.7 square meters) to the Instrumentation Maintenance Facility, Building 4870. The addition will be 21 feet (6.4 meters) wide by 61 feet (18.6 meters) long on a reinforced concrete slab. The required work includes partitions, lighting, electrical power, HVAC, and fire alarm systems. The laboratory and shop space in Building 4870 is inadequate for the increased radar and electronics instrumentation maintenance functions that support flight test activities. Two temporary trailers are being used to supplement the laboratory and shop space now. The trailers are old, in poor condition, and no longer adequate. This addition is vitally needed at this time to provide adequate space for these flight test support activities, and to replace the two trailers.

3. Construction of Addition to Building 4800, Freight Elevator..... 145,000

These resources provide for the installation of a freight elevator in Building 4800. Work includes the installation of a hydraulic elevator with a capacity of 6,000 pounds (272 kilograms) to serve the second and third floors of Building 4800. Also included is the related structural, electrical, and mechanical work for the installation of the elevator. The second and third floors of Building 4800 are presently served by a single

passenger elevator which is not capable of lifting heavy computers and large electronic equipment. Large cranes have been used to accomplish heavy equipment lifting to the second and third floors of Building 4800. This lifting method has frequently caused major damage to sensitive equipment.

C. Goddard Space Flight Center (GSFC). 460,000

1. Addition to Visitor Center Building (88)..... 230,000

These resources provide for the construction of a 2,100-square foot (195 square meter) addition to the Visitor Center which will include seating space, projection room, and an entrance area. The addition will be a concrete slab-on-grade, steel-framed structure with metal stud walls and roof system to match the existing building. Also included is additional electric power, four 10-ton roof-mounted heat pumps, fire alarm and sprinkler system, lighting, and communication system connected to the Spacecraft Operations Facility, Building 14. The Visitor Center has maintained a viewing area in Building 14 with the capability for media representatives, and interested members of the public to view real-time spacecraft mission operations. Increased security measures for the Space Shuttle Program require that this activity be relocated to the Visitor Center during FY 1982.

2. Construction of a Propulsion, Cryogenic, and Fluid Flow Facility..... 230,000

These resources provide for construction of a 2,500-square foot (230 square meter) one-story brick and concrete masonry building at the Propulsion Test Site in Area 400. Space will be provided for instrumentation control, equipment testing, two electronic laboratories, a data reduction room, and support space. Heating, ventilating, air-conditioning, lighting, electrical power, water, and restroom facilities will be provided. This building is needed to replace instrumentation and office trailers which have exceeded their useful life, require frequent repairs, and have inadequate heating and air-conditioning systems. The project is needed at this time to provide adequate facilities for testing of high energy propellant systems proposed for Shuttle-deployed spacecraft.

D. Jet Propulsion Laboratory (JPL)..... 700,000

1. Construction of Water Storage Facility, Edwards Test Station (ETS)..... 245,000

These resources provide for an addition to the water storage facility at the JPL ETS. Work includes the construction of a 200,000-gallon (757 kiloliter) water storage tank with booster pump and related equipment. Work also includes the construction of a one-story metal pump station structure of 150 square feet (13.9 square meters). The existing ETS water system has a single supply source without a backup supply or emergency storage system. Several recent supply shutdowns due to maintenance and equipment failures have resulted in the the station being without an adequate water supply for fire protection for extended periods. During water outages, no hazardous propellant testing or mixing may be performed. The testing and mixing of propellant is required for flight hardware and causes serious delays in flight hardware deliveries. This project is urgently required to provide an adequate water supply system for fire protection and to support test activities.

2. Construction of Systems Assembly Building, ETS..... 235,000

These resources provide for construction of a 970-square foot (90.1 square meter) assembly building to support Test Stands A and B at ETS, California. The building will be 22 feet (6.8 meters) wide and 44 feet (13.4 meters) long, including a 30-foot (9.1 meter) high bay assembly and checkout area of approximately 370 square feet (34.4 square meters). This work also includes lighting, electrical power, fire protection, and heating, ventilating, and air-conditioning (HVAC) systems. This facility is required to consolidate scattered test and systems preparation shop work which supports spacecraft propulsion research and development, It will replace several small, old, substandard shop buildings. Combining these shops into one central location will improve assembly and maintenance activity efficiency. This new facility is needed support high energy propulsion systems for future flight programs.

3. Construction of Addition to 10-Foot Space Simulator Facility (248)..... 220,000

These resources provide for the construction of an addition to the 10-Foot Space Simulator Facility (248) at JPL. Work includes the addition of a one-story metal addition of approximately 1,400 square feet (130 square meters), 25 feet (7.6 meters) high, to the end of Building 248, with a roll-up door, lights, electric power, HVAC, and fire protection systems. The addition is required to provide storage space for the 15-foot (4.6 meter) diameter optical collimating mirror used in the 25-foot space simulator for high intensity solar simulation tests. This mirror has a replacement value of $1,500,000 and must be maintained in an enclosed weather-protected housing. Outside storage would create extreme environmental hazards that would jeopardize the quality and performance of the mirror for flight project testing. Projected test activities will preclude further use of existing buildings for storage of the mirror.

E. Langley Research Center (LaRC)..... 615,000

1. Construction of Addition to Environmental and Space Science Laboratory (1250)..... 235,000

This project provides for the construction of a 3,500-square foot (325 square meter) addition to Building 1250. It will be constructed with a reinforced concrete foundation and floor slabs, a structural steel frame, and brick veneer walls with metal window units. All necessary heating, ventilating, and air-conditioning (HVAC), plumbing, lighting, and power distribution will be provided. The Atmosphere Environmental Sciences Division has major science and data analysis responsibility for satellite and aircraft experiments. Due to the expansion of the program, an additional 10 to 20 people will be assigned to support LaRC's satellite data analysis commitments over the next 5 years. This addition will provide office space for present employees now located in laboratory space and for those to be assigned to this program.

2. Construction of Multipurpose Room Addition to Building (1213)..... 240,000

This project provides for the construction of a 3,200-square foot (298 square meter) addition to the cafeteria. The addition will include the necessary HVAC, electrical, and plumbing. The addition will be divided

into two areas by an accordian wall. The ability of the cafeteria to serve its customers is now limited by the seating capacity in the existing dining room. This is the only cafeteria on the Langley Research Center and is extremely crowded during peak hours. In addition, special groups requesting reserved dining space for conferences and symposiums have contributed to the present congestion and overcrowding. This project will also provide multipurpose meeting space as well as relieving the existing congestion.

3. Construction of Addition to Laser Research and Applications Laboratory (1201). 140,000

This project provides for the construction of a 1,400-square foot (130 square meter) addition to the south side of Building 1201. The addition will include the necessary HVAC, power, and plumbing. Building 1201 and an adjacent trailer house the Laser and Spectroscopy Branch. The laboratory space in Building 1201 is severely overcrowded making it difficult to perform experiments. This addition will relieve these conditions and allow for the removal of an existing trailer.

F. Lewis Research Center (LeRC) 200,000

Construction of Materials Storage Building 200,000

This project provides for the construction of a Materials Storage Building in the south storage area. The storage building will store 700 tons (630,000 kilograms) of salt-cinder material for winter road sanding/salting. The building consists of a wood-framed dome structure with exhaust fans, 60 feet (18 meters) in diameter, 27 feet (8 meters) high, with reinforced concrete foundation wall and base, and a 20-foot by 20-foot (6 meter by 6 meter) door opening with canopy. The project also includes electrical power, lighting, site work, and paving around the building, a 10-foot by 10-foot (3 meter by 3 meter) prefabricated personnel shelter, and demolition of existing salt containment boxes in Cryogenic Equipment and Vehicle Repair Building 107. Presently, salts are stored in Building 107, and cinders are stored at the south area and at Shop and Grounds Maintenance Building 208. A new building and location will eliminate the health hazards caused to individuals who inhale salt dust during the filling operation within Building 107. It will stop the corrosive action and deterioration of the structural steel system and all exposed metals in Building 107. It will also allow all mixing operations of salts and cinders to be performed in one central location.

G. National Space Technology Laboratories (NSTL) 480,000

1. Construction of Addition to and Rehabilitation of Environmental Research Laboratory, Building 2423 245,000

These resources provide for the addition of a 1,050-square foot wing, and reroofing and modernizing the exterior of the Environmental Research Laboratory building. Large wood framed windows and doors, and wooden porches will be replaced by smaller insulating glass metal windows/doors and concrete porches. The asbestos siding will be replaced by an insulating exterior facade extending to the ground to enclose the exposed underside. The enclosure of exposed rafter overhang with fascia/soffit and use of paneling/plaster at the window openings will modernize the appearance while reducing maintenance costs. Rearrangement of the internal laboratory and office space will be accomplished to provide more efficient space utilization.

The chemists, microbiologists, and biologists of the Environmental System Laboratory (a part of the NASA Earth Resources Laboratory) who occupy this facility are responsible for a number of research programs and environmental monitoring actions which have been modified into laboratory space. Rearrangement of the existing space and the new addition will improve operations by consolidating the laboratories. It will allow the disposal of a 1,000-square foot (92.9 square meter) trailer, which is in poor condition, and a 120-square foot (11.1 square meter) adjacent portable building which presently supports laboratory activities.

2. Construction of Addition to the Repair and Fabrication Shop (2201) 235,000

These resources provide for the construction of a 4,750-square foot (442 square meter) addition to the Repair and Fabrication Shop, Building 2201. This addition will be constructed of reinforced concrete masonry unit walls with a reinforced concrete slab and grade beam foundation. The roof system will be of insulated built-up roofing membrane supported by steel deck and bar joists. HVAC, electrical, and plumbing systems will be included. The existing 5,520-square foot (496 square meter) building will be modified by rearranging partitions and relocating lighting and other utility systems. The new addition will provide space for the central work control function and support areas for shops and the fire department. The existing facility will be modified to effectively accommodate the 24-hour-a-day operation of the fire and security departments. The fire and security services are staffed 24 hours per day, 7 days a week, with the fire department requiring overnight accommodations. These modifications will separate these activities and also relieve the present overcrowded conditions.

H. Wallops Flight Center (WFC) 470,000

1. Addition to Building F-10 for Environmental Laboratory 240,000

These resources provide for the construction of a 4,800 square foot (446 square meters) high bay addition to the Technical Service Shops and Office Building (F-10) to house the environmental laboratory payload test and checkout equipment. This equipment is presently located in Building N-159 where limited overhead light restricts the laboratory's capabilities to process the longer payloads associated with Wallops' sounding rocket program. New program requirements have resulted in payloads of 168 to 255 inches (427 to 648 centimeters) in length which cannot be processed by the present facility. Work includes a pre-engineered 60- by 80-foot (18- by 24-meter) metal building, special foundations for the test equipment, and the necessary lighting power and HVAC systems. Building F-10 houses the sounding rocket program machine shop and payload assembly facilities. This project will result in a consolidated facility for increased flexibility and safter handling of rocket system.

2. Construction of Storage Facility 230,000

These resources provide for the construction of a 5,000-square foot (465 square meter) storage facility to replace a 25-year old substandard corrugated storage building (F-157). The work includes construction of a pre-engineered metal building on the existing site. Also included is provision of electric service, lighting, and a minimum amount of climatic control equipment to preserve the materials to be stored. The existing structure is beyond economical repair and is energy-inefficient. Construction is necessary at this time because no other space is available, and the stored equipment is subject to severe deterioration under present conditions.

TOTAL 4,000,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated $5,000,000 to $6,000,000 per year will be required for the continuation of this minor construction program.

FACILITY PLANNING AND DESIGN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

SUMMARY

FACILITY PLANNING AND DESIGN

	Amount	Page No.
Regular Requirements:	6,350,000	
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Final Design	3,700,000	CF 11-6
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Space Shuttle Facility Planning and Design	1,300,000	CF 11-6
Payload Facility Planning and Design	600,000	CF 11-7
Total	8,250,000	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1983 ESTIMATES

PROJECT TITLE: Facility Planning and Design

FY 1983 CoF ESTIMATE: 8,250,000

FY 1981: $10,000,000 FY 1982: $10,000,000

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 provision of continuing engineering support and special engineering management and other services.

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

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

d. The accomplishment of facilities siting and other investigations, studies and reports.

Regular requirements encompass the basic purposes outlined above. The "other requirements," while also in support of these purposes, cover those special needs related to large, complex projects or specific programs considered to represent high potential future construction requirements and for which early definition is essential. The large projects require more planning and longer lead time than is normally involved. Much of this planning must be completed prior to inclusion of the project in a budget request.

1. REGULAR REQUIREMENTS 6,350,000

A. Master Planning 100,000

Provides for the updating and further development of 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. Provides for the documentation of 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 4-year intervals. Approximately one-fourth of the field installations are involved in any one fiscal year, keeping the level of effort relatively modest and 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 1982 are:

(1) National Space Technology Laboratories

An update of the facilities inventory base to include new NASA and major tenant facilities as well as the Army Ammunition Plant development.

(2) ARC/Dryden Flight Research Facility (Dryden)

An update of the facilities inventory base to include the installation's role in suporting the Space Shuttle as it enters the operational phase, and emerging Ames Research Center assignment and management objectives.

B. Sustaining Engineering Support 450,000

Provisions for facility studies and specific engineering support continue in importance as evidenced in recent years, and must be given high priority throughout FY 1983. These efforts are important due to the unpredictable cost situation which currently exists and may continue; cost trends in construction materials

and fuels; the continuing importance of energy conservation and efficiency; and the operation and maintenance cost for the physical plant. This includes provisions for 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 1983 requirements:

(1) Building Research Advisory Board Support

Covers annual support to the Federal Construction Council's (FCC) operations and provides for special studies that the Council will perform throughout FY 1982 to help advance the science and technology of Federal Government building and construction. The FCC is subordinate to the Building Research Advisory Board, National Academy of Sciences, and its activities are supported by several Federal Agencies including NASA.

(2) Utilities Services/Rates Analysis

Provides resources for the availability of continuous services in support of utilities procurement and utilities control systems. This includes, but is not limited to, technical assistance, surveillance, and recommendations with regard to utility rates, contract negotiations, systems operations, and utilities control systems. Because of continuing increases in energy costs, these services are an annual requirement and continue to be essential.

These resources enable the Agency to insure that fair and reasonable rates are charged under its major utility contracts. Essential and valuable technical assistance is provided to our field installations so that effective negotiations can be conducted with utility companies. Several major utility contracts per year require technical assistance as utility contract rates are renewed throughout the Agency.

NASA's significant ongoing investment in utility control and management systems requires a high level of technical maintenance and support. The proper function and operation of the equipment are essential in order to realize the benefits. These resources provide the high technical capabilities needed to maintain the system and insure proper operation and use.

These resources will provide for an updating of our system for forecasting utility costs and rates, so that better and more reliable utility budget requirements can be established. The accuracy and credibility of these forecasts impact the Agency's planning for other resources.

These and other similar utility system services are provided for by these resources in order to insure technical competence and properly manage this function.

(3) Facility Operation and Maintenance Analysis

Provides for continued engineering support for implementing improvements at NASA field installations relative to manpower utilization, work control systems, preventive maintenance, facilities management and reporting systems. Improvements will also involve techniques to identify where and how increases in productivity are possible by using earlier, reliable measurement methods. Included in this activity are field surveys to be conducted on a priority basis at selected NASA field installations to evaluate the effectiveness of the operations and maintenance management systems.

(4) Value Engineering Cost Validations and Analyses

Provides for engineering services to improve 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. Also provides services necessary to accurately predict and validate facility costs which will aid in resources planning for the various field installations.

(5) Facilities Utilization Analyses

Provides for the analyses of Agency-wide facilities utilization data covering: (1) office and other types of building space; (2) designated major technical facilities; and (3) special studies comparing the utilization of technical facilities which are similar in type or capability, such as wind tunnels. Such analyses provide for: (1) insights into and development of better methods of identifying underutilized facilities; (2) improved techniques of quantifying level of facilities use; and, (3) actions for improved facilities utilization. Work provides for review of each installation's inventory data base in support of the facilities utilization program. Surveys are necessary to validate the reported data in relation to a specific problem or need, and to assist in providing a credible foundation for plans to improve the utilization of facilities.

(6) Environmental Studies

Provides for the identification of potential environmental problems or the quick resolution of any related controversies at the NASA field installations. These conditions may be brought about by:

- New federal, state and local environmental regulations, emission standards and environmental management planning programs that must be considered at various installations;

- Changes resulting from new or expanded program activities, new facilities, or major site expansions at NASA installations; and,

- Changes that take place in the external environmental conditions at NASA installations.

Early identification of potential environmental problems and quick resolution of these and related controversies at the installations are important. Project managers and facility planners require up-to-date, accurate information to comply with legal and regulatory requirements.

C. Preliminary Engineering Reports and Related Special Engineering Support 2,100,000

(1) Preliminary Engineering Reports (PER's) ..... (1,550,000)

Preparation of PER's, investigations, and project studies related to proposed facility projects in the FY 1985 and FY 1986 Construction of Facilities programs are provided for by this estimate. These reports are required to permit the early and timely development of the most suitable project to meet the stated functional need. Reports provide basic data, cost estimates and schedules relating to future budgetary proposals. This request provides for PER work associated with proposed construction except as provided for in other requirements (paragraph 2) for Shuttle Spacelab/Payload and certain energy conservation initiatives.

The estimated cost of PER support for FY 1985 construction projects is $950,000 which will permit updating of PERs for $35-45 million of construction, and the development of new PERs for an additional $25-30 million of projects.

An additional $600,000 has been included in this line for the completion of new PER's for approximately $25-30 million of construction projects which will be high priority candidates for inclusion in the FY 1986 Construction of Facilities program. The activity associated with FY 1986 will be confined to the most urgent and clear-cut priority candidates.

(2) Related Special Engineering Support ..... (550,000)

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 involve documentation and validation of "as built" conditions, survey/study of present condition of such items as roofing and cooling towers, utility plant condition and operational modes, analysis and support of environmental impact assessments and statements, and other 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 3,700,000

The amount requested will provide for the preparation of designs, plans, drawings, and specifications necessary for the accomplishment of projects other than Space Shuttle, Spacelab, Payloads and certain energy conservation initiatives. Amounts required for those efforts are included under other requirements (paragraph 2). Projects involved are planned for inclusion in the FY 1984 and FY 1985 programs. The goal is to obtain better facilities on line earlier at a lower cost.

The request will provide for final design work associated with construction proposed for the FY 1984 Program, estimated to cost $50 to $55 million, and for $10 to $15 million of high potential projects proposed for the FY 1985 program. The amount included for FY 1984 candidates and for residual requirements of this nature which have accumulated from prior years' final design activities is $3,000,000. For FY 1985, $700,000 is included and the supporting rationale is much the same as that set out in the PER estimate.

2. OTHER REQUIREMENTS 1,900,000

Other facilities planning and design requirements are generated by programs which are large in size and of a complex nature. Those in this particular request are primarily associated with space programs which require a long planning cycle. Early and progressive design work is essential to ultimately ensure the best design, cost estimate and schedule. These programs require planning effort and associated design lead time well beyond that normally associated with general type facility projects. These requirements must be provided for beyond the regular and most recurrent facility planning and design needs.

A. Space Shuttle Facilities Planning and Design 1,300,000

This requirement is primarily for the preparation of the final design drawings, specifications and associated site investigations required for construction of future Space Shuttle facilities that have been

validated. These requirements are related to the requirements for a third module launch platform, facilities for personnel and logistic support of Space Transportation System operations, expanding and improving SRB processing capabilities at Kennedy Space Center, and additional production related facilities to support External Tanks (ET) production at the Michoud Assembly Facility such as ET storage, production optimization and associated supporting facilities.

B. Payload Facility Planning and Design 600,000

The requirement is for the preparation of Preliminary Engineering Reports (PER's), facility site investigations, design of facility projects, and studies to determine facility capabilities required to support the operational phase of the Space Transportation System pertaining to payloads. Included are facilities for the checkout/fueling and spin test of upper stage vehicles or payloads, and also modification of facilities for processing and housing vertical payloads. In addition, facilities projects are forecasted for the logistical and maintenance support of payloads and storage of associated flight and support equipment.

TOTAL 8,250,000

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