



Budget Estimates

Fiscal Year 1993

Volume II

Construction of Facilities

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 CONSTRUCTION OF FACILITIES
 FISCAL YEAR 1993 ESTIMATES

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SUMMARY
INFORMATION

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
GENERAL STATEMENT

The Construction of Facilities (COF) appropriation provides contractual services for the repair, rehabilitation, and modification of existing facilities; the construction of new facilities and the acquisition of related facility collateral equipment; environmental compliance and restoration activities; the design of facilities projects; and advanced planning related to future facilities needs.

The funds requested for FY 1993 provide for continuing prior year endeavors to meet facilities requirements for the Space Station Freedom, the Repair and Modernization of the Ames 12-Foot Pressure Wind Tunnel, and the Earth Observing System (EOS) Facility at Goddard; construction of two 34-meter antennas to complete the first 34-meter beam waveguide subnet in time for the Galileo encounter; repair, rehabilitation, and modification of other facilities to restore, upgrade, and improve the usefulness of the NASA physical plant; minor construction of new facilities, facility planning, and design activities; and environmental compliance and restoration.

The projects and amounts in the budget estimates reflect Space Station Freedom, Space Flight, EOS, and Space Communications facilities requirements that are time-sensitive to meet specific program objectives. Other program requirements for 1993 include rehabilitation and expansion of communication duct banks at the Kennedy Space Center; replacement of one chiller and two cooling tower cells at the Johnson Space Center; restoration of the underground communication distribution system at the Stennis Space Center; replacement of four steam boilers with two dual fuel, gas turbine-generator sets at the Goddard Space Flight Center; continuation of projects to repair, restore, and modernize NASA's aeronautical research and development facilities at Ames, Lewis, and Langley Research Centers; and restoration and modernization of the Infrared Telescope Facility in Mauna Kea, Hawaii.

The FY 1993 program continues to meet the objectives of preserving and enhancing the capabilities and usefulness of existing facilities and ensuring safe, economical, and efficient use of the NASA physical plant. This request continues the necessary rehabilitation and modification program begun in prior years and continues a responsive repair program. The repair program restores 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. The environmental compliance and restoration program ensures that statutory environmental requirements are met and any necessary remedial actions are promptly taken,

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 budget authority requested for FY 1993 is 319,200,000, with estimated outlays of \$491,817,000.

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, ~~[\$525,000,000]~~ ~~\$319,200,000~~ to remain available until September 30, ~~[1994]~~ 1995: Provided. That, notwithstanding the limitation on the availability of funds appropriated under this heading by this appropriations 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: *Provided* further, That no amount appropriated pursuant to this or any other Act may be used for the lease or construction of a new contractor-funded facility for exclusive use in support of a contract or contracts with the National Aeronautics and Space Administration under which the Administration would be required to substantially amortize through payment or reimbursement such contractor investment, unless an appropriations Act specifies the lease or contract pursuant to which such facilities are to be constructed or leased or such facility is otherwise identified in such Act: *Provided* further, That the Administrator may authorize such facility lease or construction, if he determines, in consultation with the Committees on Appropriations, that deferral of such action until the enactment of the next appropriations Act would be inconsistent with the interest of the Nation in aeronautical and space activities: *Provided* further, That of the funds appropriated under this heading, \$6,000,000 shall be available to continue the construction, equipping, and integration of a Classroom of the Future on the campus of Wheeling Jesuit College; \$3,400,000 shall be available for planning and design for facilities in support of the Consortium for International Earth Science Information Networks (CIESIN); \$10,000,000 shall be available to West Virginia University for an independent software validation and verification facility; \$10,000,000 for construction and equipping a new space dynamics lab at Utah State University; \$13,500,000 shall be available for construction of integrated facilities to support the National Technology Transfer Center; and \$20,000,000 shall be available for construction and outfitting of the Christopher Columbus Center of Marine Research and Exploration]. (*Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Act, 1992; additional authorizing legislation to be proposed.*)

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES**

**SUMMARY OF THE BUDGET PLAN BY LOCATION
(Thousands of Dollars)**

<u>LOCATION</u>	Fiscal Year 1991	Fiscal Year 1992	Fiscal Year 1993 Agency Request
Space Station Facilities.....	13,000	35,000	25,800
Space Flight Facilities..	164,500	169,400	28,400
John F. Kennedy Space Center.....	---	5,300	1,500
Lyndon B. Johnson Space Center.....	11,000	7,000	4,000
George C. Marshall Space Flight Center.....	---	5,200	---
John C. Stennis Space Center.....	3,800	---	2,200
Goddard Space Flight Center.....	16,600	22,000	26,800
Jet Propulsion Laboratory.....	29,800	5,500	---
Wallops Flight Facility.....	5,200	3,500	---
Aeronautical Facilities Revitalization.....	32,600	42,300	50,100
Ames Research Center.....	---	---	---
Hugh L. Dryden Flight Research Facility.....	12,800	---	---
Langley Research Center.....	4,600	---	---
Lewis Research Center.....	16,000	---	---
Various -tions.....	20,610	5,700	33,800
Repair.....	28,484	31,700	31,900
Rehabilitation and Modification..	32,900	34,800	34,000
Minor Construction.....	11,000	12,900	14,000
Deferred Rehabilitation and Major Maintenance.....	20,000	11,800	---
Facility Planning and Design.....	28,000	34,000	26,700
Johnson Visitor Center.....	10,000	---	---
Classroom of the Future.....	4,000	6,000	---
Consortium For International Earth Science Information Network (CIRESIN)	1,000	3,400	---
National Technology Transfer Center.....	---	13,500	---
Christopher Columbus Center of Marine Research and Exploration.....	---	20,000	---
Independent Software Validation and Verification Facility.....	---	10,000	---
Space Dynamics Lab.....	---	10,000	---
Environmental Compliance and Restoration.....	32,000	36,000	40,000
Total Plan.....	<u>497,894</u>	<u>525,000</u>	<u>319,200</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

SUMMARY OF THE BUDGET PLAN BY COGNIZANT OFFICE
(Thousands of Dollars)

	Fiscal Year 1991	Fiscal Year 1992	Fiscal Year 1993 Agency Request
Office of Space Systems Development	13,000	45,000	25,800
Office of Space Flight	189,300	181,700	36,100
Office of Space Science and Applications	59,700	49,600	28,800
Office of Commercial Programs..	3,000	13,500	---
Office of Human Resources and Education	4,000	6,000	---
Office of Aeronautics and Space Technology	58,900	42,300	50,100
Office of Space Communications	17,610	5,700	31,800
Office of Management Systems and Facilities	152,384	181,200	146,600
	-----	-----	-----
Total Plan	497,894	525,000	319,200

SUMMARY OF THE BUDGET PLAN BY SUBFUNCTION
(Thousands of Dollars)

Code			
252	Space Flight, Research, and Supporting Activities...'	451,894	482,700
402	Air Transportation	46,000	42,300
		-----	-----
TOTAL		497,894	525,000

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT**

(Thousands of Dollars)

CO BA SF	INSTALLATION AND PROJECT	Fiscal Year 1991	Fiscal Year 1992	Fiscal Year 1993 Agency Request	Page No.
-----	-----	-----	-----	-----	-----
	SPACE STATION FREEDOM FACILITIES AT VARIOUS LOCATIONS:	13,000	35,000	25,800	
	-----	-----	-----	-----	
SSD 1 252	Construction of Space Station Processing Facility (KSC).....	13,000	35,000	24,000	CF 1-1
SSD 1 252	Modifications for Payload Operations Integration Center (MSFC).....	---	---	1,800	CF 1-6
	 SPACE FLIGHT FACILITIES AT VARIOUS LOCATIONS:				
	-----	164,500	169,400	28,400	
	-----	-----	-----	-----	
SF 1 252	Replace Aircraft Operations Support Facilities (JSC).	---	---	1,600	a 2-1
SF 1 252	Modify Electrical and Mechanical Systems, Utility Annex (E.A.).....	---	---	4,400	CF 2-4
SF 1 252	Rehabilitate Explosive Safe Arcs-60 High Bays Support Systems (KSC). .	---	---	2,000	CF 2-9
SF 1 252	Rehabilitate IC-39 Area Fire Alarm Reporting System (KSC)	---	---	4,300	CF 2-13
SF 1 252	Replace Boiler House Components (MAR)	---	---	2,300	CF 2-17
SF 1 252	Modification for Earthquake Protection, Downey/Palmdale, CA (JSC)	---	4,400	---	
SF 1 252	Rehabilitation of Crawlerway (KSC).	---	3,000	2,000	CF 2-20
SF 1 252	Restoration of Shuttle Wing Facility shouldered (KSC)	---	4,000	---	
SF 1 252	Restoration of the High Pressure Gas Facility (SSC)	---	---	6,800	CF 2-24
SF 1 252	Construction of Addition for Flight Training and operations (JSC). ...	12,000	8,000	---	
SF 1 252	Rehabilitation of Mission Control Center Power and Control Systems (JSC)	8,500	---	---	
SF 1 252	Construct Processing Control Center (KSC)	8,850	---	---	
SF 1 252	Construction of Transporter/Canister Facility (KSC)	6,050	---	---	
SF 1 252	Replace Heating, Ventilating and Air Conditioning System Hypergolic Maintenance Facility (KSC)	2,100	---	---	
SF 1 252	Restoration of Heavy Equipment Area (E.A.).....	900	---	---	
SF 1 252	Upgrade Orbiter Processing Facility High Bay Heating Ventilating and Air-Conditioning System (KSC)	3,300	---	---	

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 CONSTRUCTION OF FACILITIES
 FISCAL YEAR 1993 ESTIMATES
 BUDGET PLAN BY LOCATION AND PROJECT

 (Thousands of Dollars)

CO BA SF	INSTALLATION AND PROJECT	Fiscal Year 1991	Fiscal Year 1992	Fiscal Year 1993 Agency Request	Page No.

	SPACE FLIGHT FACILITIES AT VARIOUS LOCATIONS (CONTINUED):				
				
SF 1 252	Upgrade Yundum International Airport to Full Transoceanic Abort landing Site, Banjul, The Gambia (KSC)	3,400	---	---	
SF 1 252	Repair Condensate System, Main Manufacturing Building (MAF)	900	---	---	
SF 1 252	Construct Project Engineering Facility (MSFC)	17,000	---	---	
SF 1 252	Restoration of Information and Electronic Systems Laboratory (MSFC) ..	4,000	---	5,000	a 2-28
SF 1 252	Rehabilitation of Hydrogen Transfer Facility (SSC)	2,700	---	---	
SF 1 252	Restoration of Space Shuttle Main Engine Test Complex "A" (SSC)	2,800	---	---	
SF 1 252	Construction of Advanced Solid Rocket Motor Program Facilities (Various Locations)	92,000	150,000	---	
	JOHN F. KENNEDY SPACE CENTER	---	5,300	1,500	
	-----	-----	-----	
SF 7 252	Rehabilitation and Expansion of Communications Duct Banks	---	---	1,500	CF 3-1
SF 7 252	Modernization of Industrial Area chilled Water System	---	4,000	---	
SF 7 252	Replace 15 KV Load Break Switches	---	1,300	---	
	LYNDON B. JOHNSON SPACE CENTER	11,000	7,000	4,000	
	-----	-----	-----	
SF 7 252	Repair Site Water System, White Sands Test Facility	---	1,300	---	
SF 7 252	Replace Central Plant chilled Water Equipment	---	5,700	4,000	CF 4-1
SF 7 252	Construction of Addition to Site Electrical Substation	11,000	---	---	
	MARSHALL SPACE FLIGHT CENTER	---	5,200	---	
	-----	-----	-----	
SSA 2 252	Modifications to X-Ray Calibration Facility (XRCP)	---	5,200	---	

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 CONSTRUCTION OF FACILITIES
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 BUDGET PLAN BY LOCATION AND PROJECT

 (Thousands of Dollars)

CO BA SF	INSTALLATION AND PROJECT	Fiscal Year 1991	Fiscal Year 1992	Fiscal Year 1993 Agency Request	Page No.

	JOHN C. STENNIS SPACE CENTER	3,800	---	2,200	
	-----	-----	-----	
SF 7 252	Restoration of Underground Communication Distribution System.....	---	---	2,200	a 5-1
SF 7 252	Addition to Administration and Engineering Building	3,800	---	---	
	GO SPACE FLIGHT CENTER	16,600	22,000	26,800	
	-----	-----	-----	
SSA 7 252	Restoration/Modernization of Electrical Distribution System.....	---	---	4,500	a 6-1
SSA 7 252	Restoration and Modernization of High Voltage Distribution System.. ..	---	7,000	---	
SSA 3 252	Construction of Earth Observing System Data Information System Facility.. ..	8,000	15,000	22,300	CF 6-6
!%A 2 252	Construction of Detector Development Laboratory	3,100	---	---	
SSA 7 252	Replace Chillers, Central Heating/Refrigeration Plant	4,000	---	---	
SSA 7 252	Replacement/Modernization Electrical Power Feeders	1,500	---	---	
	JET PROPULSION LABORATORY	29,800	5,500	---	
	-----	-----	-----	
!%A 7 252	Modernization of Kin Electrical Substation.....	---	5,500	---	
SSA 2 252	Construction of Observational Instruments Laboratory.....	14,000	---	---	
SSA 2 252	Refurbishment of 25-Foot Space Simulator	15,800	---	---	
	WALLOPS FLIGHT FACILITY	5,200	3,500	---	
	-----	-----	-----	
SSA 7 252	Restoration of Utilities	5,200	3,500	---	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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 BUDGET PLAN BY LOCATION AND PROJECT

 (Thousands of Dollars)

CO BA SF	INSTALLATION AND PROJECT	Fiscal Year 1991	Fiscal Year 1992	Fiscal Year 1993 Agency Request	Page No.
-----		-----	-----	-----	-----
	AERONAUTICAL FACILITIES REVITALIZATION AT VARIOUS LOCATIONS:	32,600	42,300	50,100	
				
Asp 5 402	Modernization of the Unitary Plan wind Tunnel Complex (ARC)	---	---	8,000	CF 7-1
Asp 5 402	Modernization of 16-Foot Transonic Tunnel (LaRC)	---	---	3,600	CF 7-6
Asp 5 402	Modifications to 14 by 22-Foot Subsonic Wind Tunnel (LaRC)	---	---	2,200	CF 7-10
Asp 5 402	Rehabilitation of Icing Research Tunnel (LeRC)	---	---	2,700	CF 7-14
Asp 5 402	Repair and Modernization of the 12-Foot Pressure Wind Tunnel (ARC)	---	25,000	21,400	CF 7-18
Asp 5 402	Modifications to the High Pressure Air System (LaRC)	12,000	11,700	---	
Asp 5 402	Modifications to Upgrade the 30X60-Foot Wind Tunnel (LaRC)	4,000	---	---	
AST 5 402	Repairs to the Tunnel shell, Unitary Plan Wind Tunnel (LaRC)	2,700	---	---	
Asp 5 402	Rehabilitation of Central Air System (LeRC)	7,900	5,600	12,200	CF 7-23
AST 5 402	Rehabilitation of Propulsion Systems Laboratory (LeRC)	6,000	---	---	
	DRYDEN FLIGHT RESEARCH FACILITY	12,800	---	---	
				
Asp 5 402	Construction of Liquid Hydrogen Structural Test Facility	8,800	---	---	
AST 7 252	Rehabilitation and Modification of the Electrical Distribution System	4,000	---	---	
	LANGLEY RESEARCH CENTER	4,600	---	---	
				
AST 5 402	(Instruction of Addition for Light-Alloy Research Laboratory	4,600	---	---	
	LEWIS RESEARCH CENTER	16,000	---	---	
				
SSA 3 252	Construction of Space Experiments Laboratory	7,100	---	---	
AST 4 252	Refurbishment of Electric Power Laboratory	8,900	---	---	

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 CONSTRUCTION OF FACILITIES
 FISCAL YEAR 1993 ESTIMATES
 BUDGET PLAN BY LOCATION AND PROJECT

 (Thousands of Dollars)

CO BA SF	INSTALLATION AND PROJECT	Fiscal Year 1991	Fiscal Year 1992	Fiscal Year 1993 Agency Request	Page No.
-----		-----	-----	-----	-----
	VARIOUS LOCATIONS	17,610	5,700	33,800	
	-----	-----	-----	-----	
SC 7 252	Construction of 34-Meter Multifrequency Antenna, Canberra, Australia (JPL)	---	---	15,600	CF 8-1
SC 7 252	Construction of 34-Meter Multifrequency Antenna, Madrid, Spain (JPL)	---	---	16,200	CF 8-5
SSA 2 252	Restoration and Modernization of Infrared Telescope Facility Mauna Kea,	---	---	2,000	CF 8-9
SC 7 252	Rehabilitation of Tracking and Data Relay Satellite System (TDRSS) Ground Terminal, White Sands Test Facility, NM.	---	5,700	---	
SC 7 252	Construction of 34-Meter Multifrequency Antenna, Goldstone, CA (JPL).	13,200	---	---	
SC 7 252	Rehabilitation of 70-Meter Antenna Drive Gear Boxes in Australia, Spain, and Goldstone, CA (JPL)	4,400	---	---	
SSA 2 252	Land Acquisition, Scientific Balloon Launch Site, De Baca County, NM.	10	---	---	
MSF 7 252	REPAIR OF FACILITIES AT VARIOUS LOCATIONS, NOT IN EXCESS OF \$1,000,000 PER PROJECT.....	28,484	31,700	31,900	a 9-1
MSF 7 252	REHABILITATION AN) MODIFICATION OF FACILITIES AT VARIOUS LOCATIONS NOT IN EXCESS OF \$1,000,000 PER PROJECT.....	32,900	34,800	34,000	a 10-1
MSF 7 252	MINOR CONSTRUCTION OF NEW FACILITIES AN) ADDITIONS TO EXISTING FACILITIES AT VARIOUS LOCATIONS, NOT IN EXCESS OF \$750,000 PER PROJECT.....	11,000	12,900	14,000	a 11-1
MSF 7 252	FACILITY PLANNING AND DESIGN.....	28,000	34,000	26,700	a 12-1

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES
BUDGET PLAN BY LOCATION AND PROJECT

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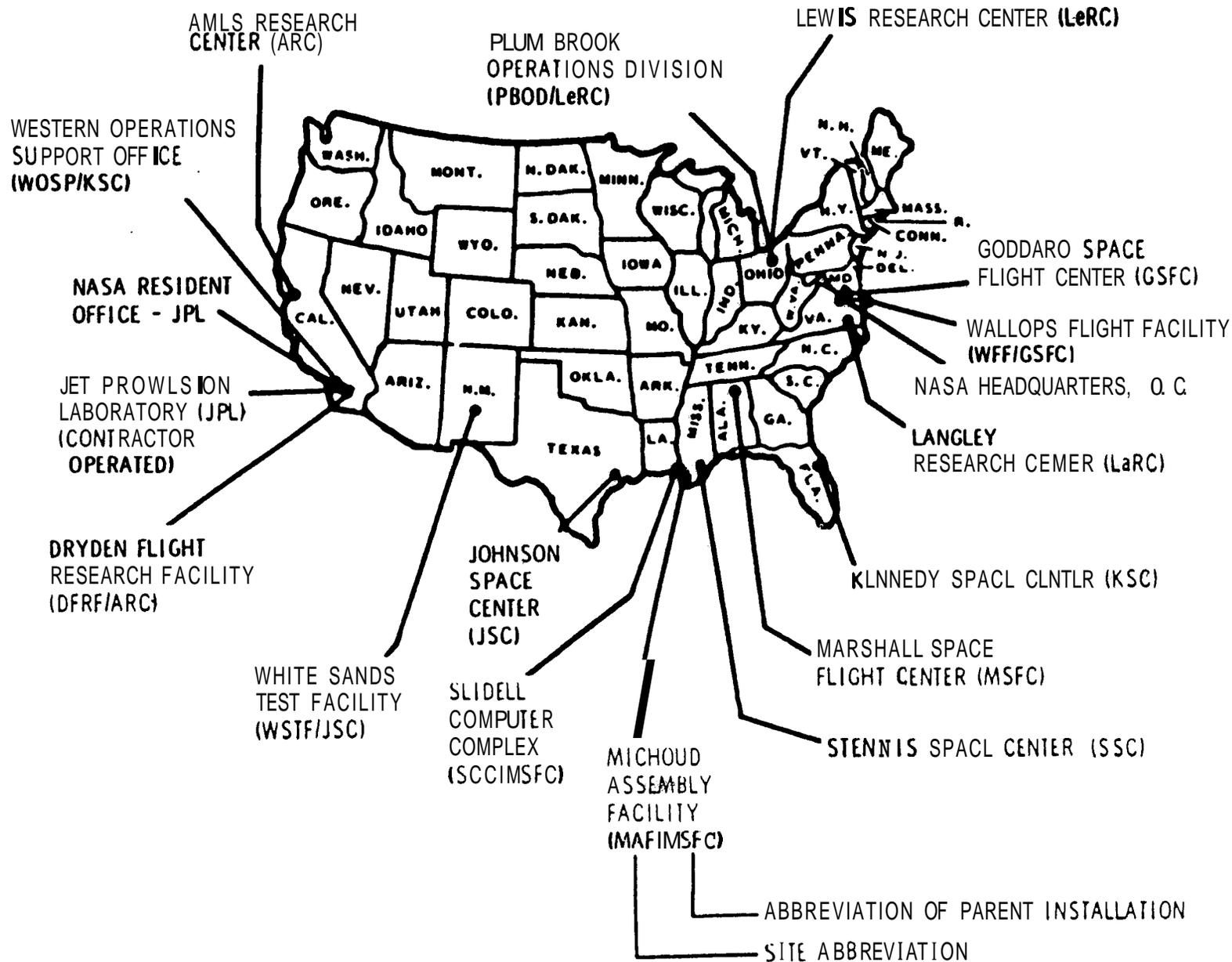
(Thousands of Dollars)

CO BA SF	INSTALLATION AND PROJECT	Fiscal Year 1991	Fiscal Year 1992	Fiscal Year 1993 Agency Request	Page No.

MSF 7 252	DEFERRED REHABILITATION AND MAJOR MAINTENANCE	20,000	11,800	---	
HRE 3 252	CLASSROOM OF THE FUTURE	4,000	6,000	---	
SSA 3 252	CONSORTIUM FOR INTERNATIONAL EARTH SCIENCE INFORMATION NETWORK (CIESIN)	1,000	3,400	---	
CP 3 252	NATIONAL TECHNOLOGY TRANSFER CENTER	---	13,500	---	
MSF 7 252	CHRISTOPHER COLUMBUS CENTER OF MARINE RESEARCH AND EXPLORATION.....	---	20,000	---	
SSD 1 252	INDEPENDENT SOFTWARE VALIDATION AND VERIFICATION FACILITY	---	10,000	---	
SSA 2 252	SPACE DYNAMICS LAB	---	10,000	---	
CP 3 252	WAKE SHIELD FACILITY	3,000	---	---	
SF 7 252	JOHNSON VISITOR CENTER	10,000	---	---	
	S U B T O T A L , CONSTRUCTION.....	465,894	489,000	279,200	
MSF 7 252	ENVIRONMENTAL COMPLIANCE AND RESTORATION PROGRAM	32,000	36,000	40,000	CF 13-1
	T O T A L , CONSTRUCTION OF FACILITIES	<u>497,894</u>	<u>525,000</u>	<u>319,200</u>	

SUM 11

LOCATION OF MAJOR AND COMPONENT INSTALLATIONS



RECORDED VALUE OF CAPITAL TYPE PROPERTY
 IN-HOUSE AND CONTRACTMI-HELD
 AS OF SEPTEMBER 30, 1991
 (DOLLARS IN THOUSANDS)

REPORTING INSTALLATION	REAL PROPERTY					OTHER		GRAND TOTAL
	LAND	BUILDING	OTHER STRUCTURES AND FACILITIES	LEASEHOLD IMPROVEMENTS	SUBTOTAL	EQUIPMENT	FIXED ASSETS IN PROGRESS	
AMES RESEARCH CENTER	2929	521303	85699	0	565931	395191	184860	1146588
ARC HOFFETT FIELD, CA	2928	500059	11017	0	520004	303638	150258	913900
DRYDEN FLIGHT FACILITY EOUAROS, CI.	0	26548	18335	0	44883	81294	34602	166179
VARIOUS LOCATIONS (a)	1	696	341	0	1044	4865	0	5909
GODDARD SPACE FLIGHT CENTER	2880	226332	124679	11	353902	502230	56043	912175
GSFC - GREENBELT, NO.	1361	148281	25121	0	174763	215914	35330	486007
TRACKING STATIONS NETYORK	5	26828	20817	0	41650	99008	14861	161519
YFF - YALLOPS ISLAND, UA.	1514	50761	74965	0	121240	64631	5852	197129
VARIOUS LOCATIONS (a)	0	462	3116	11	4249	62611	0	66920
JET PROPULSION LABORATORY	1188	138088	114641	1095	255012	465007	143501	863520
JPL - PASADENA, CA.	1188	124883	24343	1095	151509	383194	143501	618804
DEEP SPACE NETYORV	0	13205	90298	0	103505	81213	0	184716
JOHNSON SPACE CENTER	11324	259147	99364	105	310540	588985	35148	994613
JSC - HOUSTON, TX.	1371	212389	65868	0	285634	318441	35148	699229
YHITE SANDS TEST FACILITY LOS CRUCES, NM.	311	13518	27683	105	41683	26960	0	60643
VARIOUS LOCATIONS (a)	3510	33840	5813	0	43223	183518	0	226801
KENNEDY SPACE CENTER	11345	581948	523547	0	1176840	840991	58549	2016386
KSC - CAPE CANAUERAL, FL.	11345	581948	523547	0	1176840	90102	58549	1325491
WESTERN TEST RANGE, LOMPAC, CA.	0	0	0	0	0	2460	0	2460
VARIOUS LOCATIONS (a)	0	0	0	0	0	748435	0	148435
LANGLEY RESEARCH CENTER	156	211354	420093	0	631603	258311	31551	921531
LARC - HAMPTON, VA.	156	211354	420093	0	631603	243352	31551	912506
VARIOUS LOCATIONS (a)	0	0	0	0	0	15025	0	15025
LEWIS RESEARCH CENTER	2621	211420	105141	136	385918	222056	65132	673106
LERC - CLEVELINO, OH	316	201013	86619	136	288144	129196	65132	482412
PLUMBROOK, SANDUSKY, OH.	2305	76407	19062	0	97774	19693	0	177467
VARIOUS LOCATIONS (a)	0	0	0	0	0	13167	0	13167
MARSHALL SPACE FLIGHT CENTER	10942	331019	111141	0	519168	701871	5606	1227245
HSFC - HUNTSVILLE, AL.	0	159152	19120	0	238272	315266	5606	619144
NICHOUU ASSEMBLY FACILITY, LA.	1102	160641	84911	0	252714	72081	0	324195
SLIOELL COMPUTER COMPLEX, LA.	69	5253	2958	0	8280	13549	0	21829
VARIOUS LOCATIONS (a)	3711	6033	10698	0	20502	240915	0	261477
STENNIS SPACE CENTER	18061	113632	231111	0	363404	31144	18883	419431
STENNIS SPACE CENTER	18061	119632	231711	0	363404	37144	18883	419431
VARIOUS LOCATIONS (a)	0	0	0	0	0	0	0	0
NASA HEADQUARTERS	0	0	0	0	0	69201	0	69201
NASA - HPS., WASH., O.C.	0	0	0	0	0	46095	0	46095
VARIOUS LOCATIONS (a)	0	0	0	0	0	23106	0	23106
AGENCY TOTAL	121446	2672903	1893222	1347	4628918	4081665	599213	9309856

PROJECT
JUSTIFICATION
BY LOCATION

SPACE STATION
FREEDOM FACILITIES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 CONSTRUCTION OF FACILITIES
 FISCAL YEAR 1993 ESTIMATES

SUMMARY

SPACE STATION FREEDOM ██████████

	Amount ----- (Dollars)	Page No. ----
Office of Space Systems Development: -----		
Construction of Space Station Processing Facility, Kennedy Space Center.....	24,000,000	CF 1-1
Modifications for Payload Operations Integration Center, Marshall Space Flight Center.....	1,800,000 -----	CF 1-6
 Total.....	 25,800,000 =====	

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Construction of Space Station Processing Facility (SSPF)

INSTALLATION: John F. Kennedy Space Center

FY 1993 CoF Estimate: \$24,000,000

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

COGNIZANT HEADQUARTERS OFFICE: Office of Space Systems Development

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$5,067,539	\$47,770,000	\$52,837,539
Capitalized Investment	<u>---</u>	<u>---</u>	<u>---</u>
 Total	 <u>\$5,067,539</u>	 <u>\$47,770,000</u>	 <u>\$52,837,539</u>

SUMMARY PURPOSE AND SCOPE :

This project completes the Space Station Processing Facility (SSPF) for the prelaunch and post-landing nonhazardous processing of the various Space Station program elements. This final increment of work will complete the facility and tie-ins to the industrial area chilled water system.

PROJECT JUSTIFICATION:

Prelaunch processing is necessary to accomplish postshipment inspection and verification of Space Station elements; ensure elements are properly configured for launch; verify element interfaces; perform final prelaunch servicing; and verify, to the extent practicable, the capability of the elements and systems to function as planned in orbit. Space Station elements will be in orbit for extended periods and cannot be easily or inexpensively returned to Earth for correction of

system problems or malfunctions. Ground processing of Space Station elements, therefore, is critical to achieving the program objectives.

The need for processing will continue during the operational phase of the Space Station, as certain elements will be regularly returned from orbit for refurbishment, retrofitting, and resupply, such as the U.S. and international logistic modules.

IMPACT OF DELAY:

Processing activities will be "first time" events which have historically resisted timeline compression. Delay of this project will result in subsequent slippage of Space Station operation and launch schedules. This increment is required to provide a complete and usable facility that is presently under construction.

PROJECT:

The completed Space Station Processing Facility will enclose a total gross area of approximately 456,000 square feet and house a permanent staff of over 1,100 civil service, contractor, and user personnel. Highly specialized areas will include approximately 63,000 square feet of high bay and intermediate bay for parallel processing of eight Space Station elements in a class 100K clean, controlled environment. Two facility overhead cranes (30-ton, 50-foot maximum hook height) will be provided in the high bay, two overhead cranes (5-ton) will be provided in the intermediate bay, and one crane (4-ton) will be provided in the hardware inspection area. A 5,000-square-foot airlock (100K clean) will provide high bay access. One 15-ton bridge crane with 50-foot hook height will span the width of the airlock.

The high bay will support module/element processing and canister/strongback operations and the intermediate bay will provide rack test and rack and experiment processing areas. The processing areas will be provided with compressed air and vacuum systems, gaseous storage and distribution systems (gaseous nitrogen and gaseous helium), gaseous vent systems for ammonia and an ultraviolet/infrared (UV/IR) fire detection system. Chilled water serving the mechanical utility HVAC system will be sited in a separate structure to permit maximum utilization of existing chilled water sources in the industrial area. This will allow shared redundancy for the SSPF.

The support area will contain approximately 263,000 square feet of operational area. Some of the key areas within the support area include customer support; an area for off-line labs; and areas for control of experiments, payload, and rack testing. Also included are the operations support areas for scheduling and quality control, shop supervision, documentation, logistics, and office space. The remaining space includes various common support areas such as mechanical/electrical equipment rooms, electrical communication rooms, cafeteria, rest rooms, elevators, stairwells, and corridors.

Included in this project are the relocation and addition of ancillary facilities as follows. Replacement of the antenna tower for the Payload Hazardous Servicing Facility, to increase tower height and provide an acceptable line-of-sight over the Space Station Processing Facility to Launch Complex-39 Pad B. A new cooling tower to provide chilled water for the building needs. The heating, ventilating, and air-conditioning control building will be expanded to include a control room to effectively operate and maintain the heating, ventilating, and air-conditioning, the chilled water and the compressed air systems. This increment will add lanes to Avenue "H" to provide access from NASA Causeway to the Space Station Processing Facility and increase the number of parking spaces. This final increment of funding will complete the facility and tie-ins to the industrial area chilled water system.

PROJECT COST ESTIMATE: This cost estimate is based on final design estimates and contractor bids.

	Unit of Measure	Quantity	Unit Cost	Cost
<u>Construction:</u>	---	---	---	<u>\$24,000,000</u>
Architectural/Structural . .	SF	456,000	\$26.97	12,300,000
Sitework	LS	---	---	1,610,000
Mechanical	SF	456,000	16.16	7,370,000
Electrical	SF	456,000	5.96	2,720,000
Total				<u>\$24,000,000</u>

The initial increment in FY 1991 was estimated at \$25 million, but was reduced to \$13 million. A second increment in FY 1992 was estimated at \$35 million. As a result of favorable construction bids, the total estimated cost of this project has been reduced from \$89.5 million to \$72 million.

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Perspective

OTHER EQUIPMENT SUMMARY: Noncollateral equipment will be funded from Research and Development resources at an estimated cost of \$350 million.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1993 ESTIMATES
CONSTRUCTION OF SPACE STATION PROCESSING FACILITY

SITE PLAN
KSC INDUSTRIAL AREA

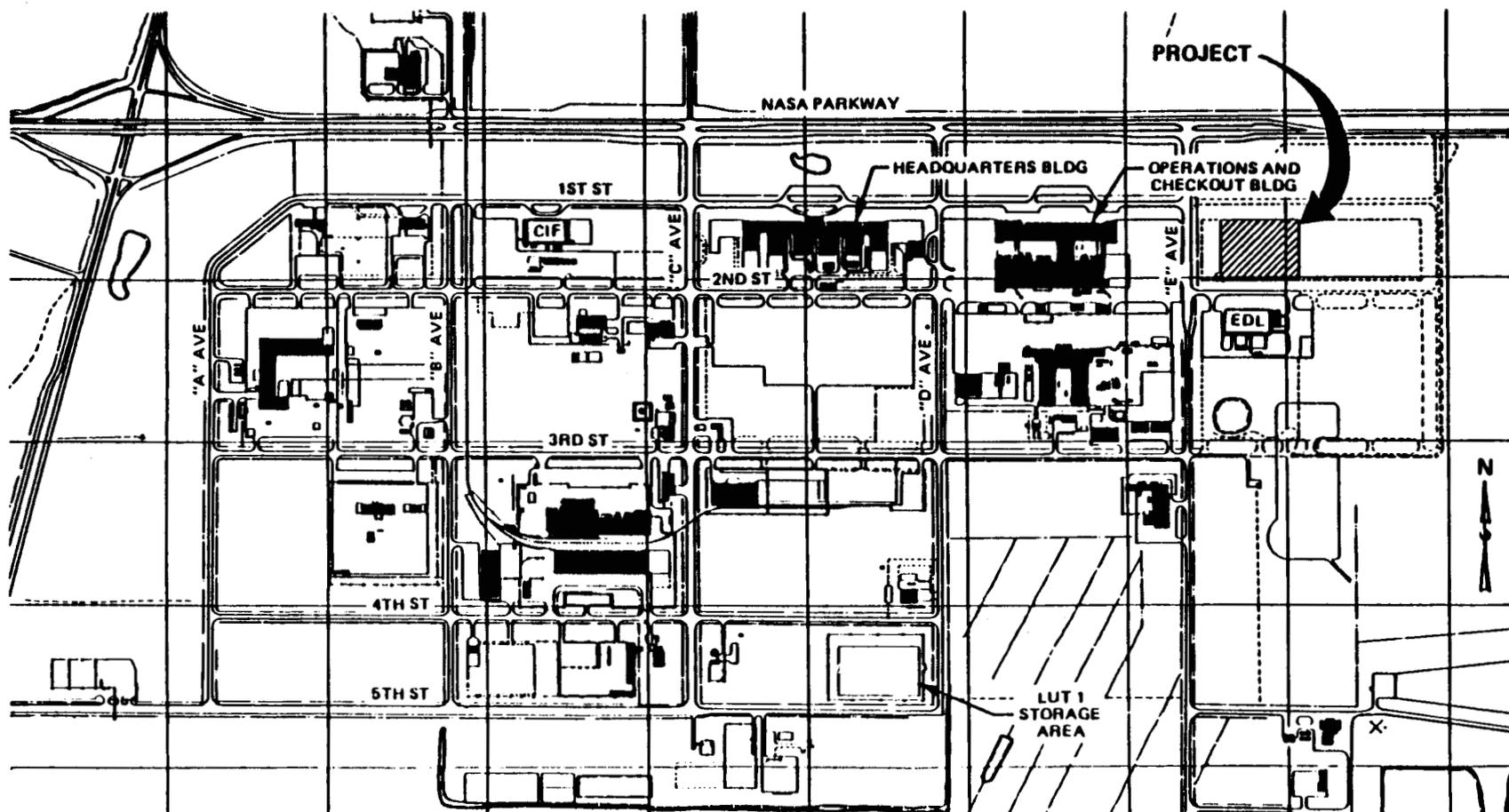


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1993 ESTIMATES
CONSTRUCTION OF SPACE STATION PROCESSING FACILITY

PERSPECTIVE

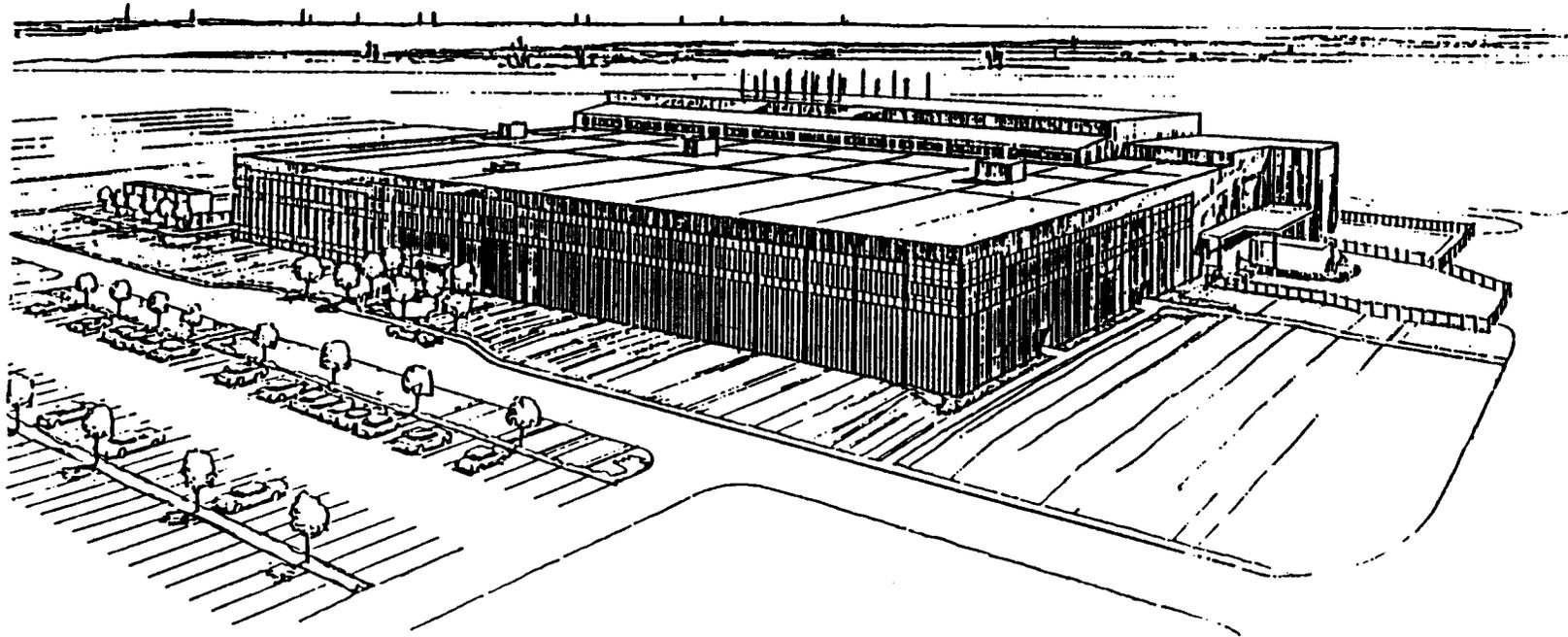


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Modifications for Payload Operations Integration Center

INSTALLATION: Georae C. Marshall Space Flight Center

FY 1993 CoF Estimate: \$1,800,000

LOCATION OF PROJECT: Marshall Space Flight Center, Madison County, Alabama

COGNIZANT HEADQUARTERS OFFICE: Office of Space Systems Development

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$128,000	---	\$ 128,000
Capitalized Investment	---	\$7,887,861	<u>\$7,887,861</u>
Total	<u>\$128,000</u>	<u>\$7,887,861</u>	<u>\$8,015,861</u>

SUMMARY PURPOSE AND SCOPE

The purpose of this project is to modify Building 4663 to house the Payload Operations Integration Center (POIC), the associated Science Operations (SO) functions, and the Engineering Support Center (ESC) in support of the Space Station Freedom program. The modifications to this facility will provide the user operational areas, communications and data equipment areas, and supporting office space.

PROJECT JUSTIFICATION:

Marshall Space Flight Center has the operational responsibility to provide for planning and management of the integrated operation, including Science Operations of all Space Station Freedom payloads. The POIC will coordinate all payload operations, such as pre-mission planning for the

operation of the payloads; it will provide an integrated payload interface to the Space Station Control Center (SSCC) at Johnson Space Center; and it will manage the payload operations interface with Space Station Freedom on-orbit. The ESC function will provide the means for the flight controllers at the SSCC to obtain accurate and timely engineering information in response to questions and problems involving the Space Station Freedom systems, will allow the sustaining engineering personnel involved in maintaining the Space Station Freedom to stay abreast of systems performance, and will enable the program to react in an effective manner to unforeseen in-flight contingencies.

IMPACT OF DELAY:

The Space Station Freedom ESC is required to be operational one year prior to first mode launch. The POIC is required to be operational one year prior to first U.S. lab launch. This modification must be provided now to allow development, outfitting, integration, and testing prior to the required operational date. If the facility is not provided, MSFC cannot perform the POIC and ESC functions.

PROJECT:

This project provides for the modification of approximately 14,200 square feet on the first and second floor of Building 4663. Work to be performed includes the relocation of existing walls and addition of new walls; installation of raised flooring system; installation of power distribution and air conditioning systems; and modification of existing ceiling light grid for dimmer capability. Utilities will be upgraded to ensure very high-quality, highly-reliable services due to the requirement for uninterrupted operations over a period of 15 to 30 years.

PROJECT COST ESTIMATE:

	Unit of Measure	<u>Quantity</u>	Unit Cost	<i>Cost</i>
<u>Construction</u>	---	---	---	<u>\$1,800,000</u>
Architectural/Structural . . .	LS	---	---	514,000
Mechanical	LS	---	---	471,000
Electrical	LS	---	---	<u>815,000</u>
Total				<u>\$1,800,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Floor Plan

OTHER EQUIPMENT SUMMARY: R&D funding in the amount of \$69,000,000 (FY 1993 through FY 1998) will be required to outfit the facility with the necessary communications, data system, and related equipment.

FUTURE CoE ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: As the Space Station Freedom program matures, additional modifications or additions may be required.

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1993 ESTIMATES
MODIFICATIONS FOR PAYLOAD OPERATIONS INTEGRATION CENTER

FLOOR PLAN OF BUILDING 4663

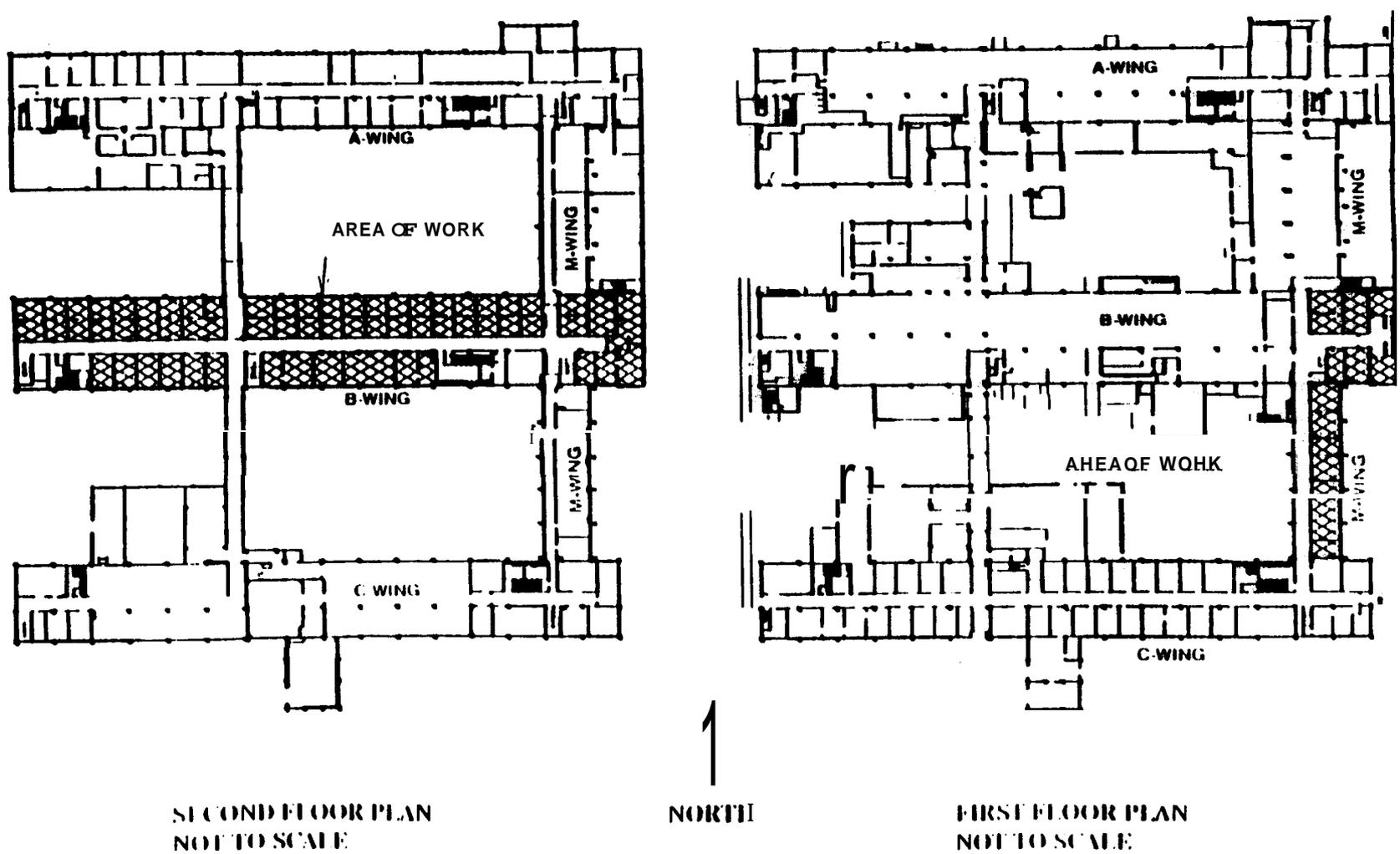


FIGURE 1

OTHER
SPACE FLIGHT
FACILITIES

/



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 CONSTRUCTION OF FACILITIES
 FISCAL YEAR 1993 ESTIMATES

SUMMARY

SPACE FLIGHT FACILITIES

	Amount ----- (Dollars)	Page No. ----
Office of Space Flight:		
Replace Aircraft Operations Support Facilities, Johnson Space Center..	1,600,000	CF 2-1
Modify Electrical and Mechanical Systems, Utility Annex, Kennedy Space Center.	4,400,000	CF 2-4
Rehabilitate Explosive Safe Area-60 High Bays Support Systems, Kennedy Space Center	2,000,000	CF 2-9
Rehabilitate LC-39 Area Fire Alarm Reporting System, Kennedy Space Center	4,300,000	CF 2-13
Replace Boiler House Components, Michoud Assembly Facility	2,300,000	CF 2-17
Rehabilitation of Crawlerway, Kennedy Space Center	2,000,000	CF 2-20
Restoration of High Pressure Gas Storage Facility, Stennis Space Center	6,800,000	CF 2-24
Restoration of Information and Electronic Systems Laboratory, Marshall Space Flight Center	5,000,000	CF 2-28

Total.	28,400,000	
	=====	

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Replace Aircraft Operations Support Facilities

INSTALLATION: Lyndon R. Johnson Space Center

FY 1993 CoF Estimate: \$1,600,000

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1997 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	Total
Specific CoF Funding	\$133,000	---	\$ 133,000
Capitalized Investment	---	<u>\$1,567,096</u>	<u>1,567,096</u>
Total	<u>\$133,000</u>	<u>\$1,567,096</u>	<u>\$1,700,096</u>

SUMMARY PURPOSE AND SCOPE:

This project restores the substandard aircraft operations support facilities at Ellington Field by replacement and provides additional space for increased operational staff required for ongoing Space Shuttle missions and expanding Space Station Freedom functions. Additional space will be provided for dressing/locker rooms, parachute and flight equipment storage, flight planning room, maintenance control, fitness support, and an aircraft operations library/data archives.

PROJECT:

This project is required to replace substandard support areas and improve work environments, and provide additional space for increased numbers of astronaut specialists and aircraft operations personnel associated with the Space Station Freedom Program. There are presently 109 astronauts, 19 aircraft operations pilots, and eight flight surgeons fully utilizing the existing facility at Ellington Field. In 1992, there will be 132 astronauts/specialists and 33 aircraft operations pilots/surgeons. The existing parachute/personal flight equipment storage space is fully

utilized, and there is no space for expansion. The replaced facility and expanded area will provide the required aircraft operations support on the flightline and thereby improve flight operations and safety. The existing astronauts' and pilots' locker rooms are all fully occupied.

IMPACT OF DELAY:

If this project is not approved, critical aircraft operations schedules could be delayed by the lack of an adequate facility.

PROJECT:

This project provides for the replacement of a two-story, steel-framed addition on the east side of the existing maintenance hangar, Building 276. The existing facility will undergo extensive demolition. Underground storm and sanitary sewer lines and other minor equipment will be relocated. The existing east wall, doors, and windows will be modified and incorporated into the expanded space. The entire existing hangar building siding will be replaced with low-maintenance aluminum siding. A freight elevator will be installed and a new sidewalk will be provided. About 300 square yards of concrete mooring apron will also be replaced.

PROJECT COST ESTIMATE

This cost estimate is based on criteria and concepts only.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Cost</u>
<u>Construction</u>	---	---	---	<u>\$1,600,000</u>
Site Development and Utilities	LS	---	---	60,000
Modifications to Existing Structure	LS	---	---	205,000
Demolition and New Construction	SF	8,960	\$141.85	1,271,000
Elevator	LS	---	---	64,000
Total				<u>\$1,600,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan

OTHER EQUIPMENT SUMMARY: None

FUTURE CoE ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

Lyndon B. Johnson Space Center
Fiscal Year 1993 Estimates
Replace Aircraft Operations Support Facilities

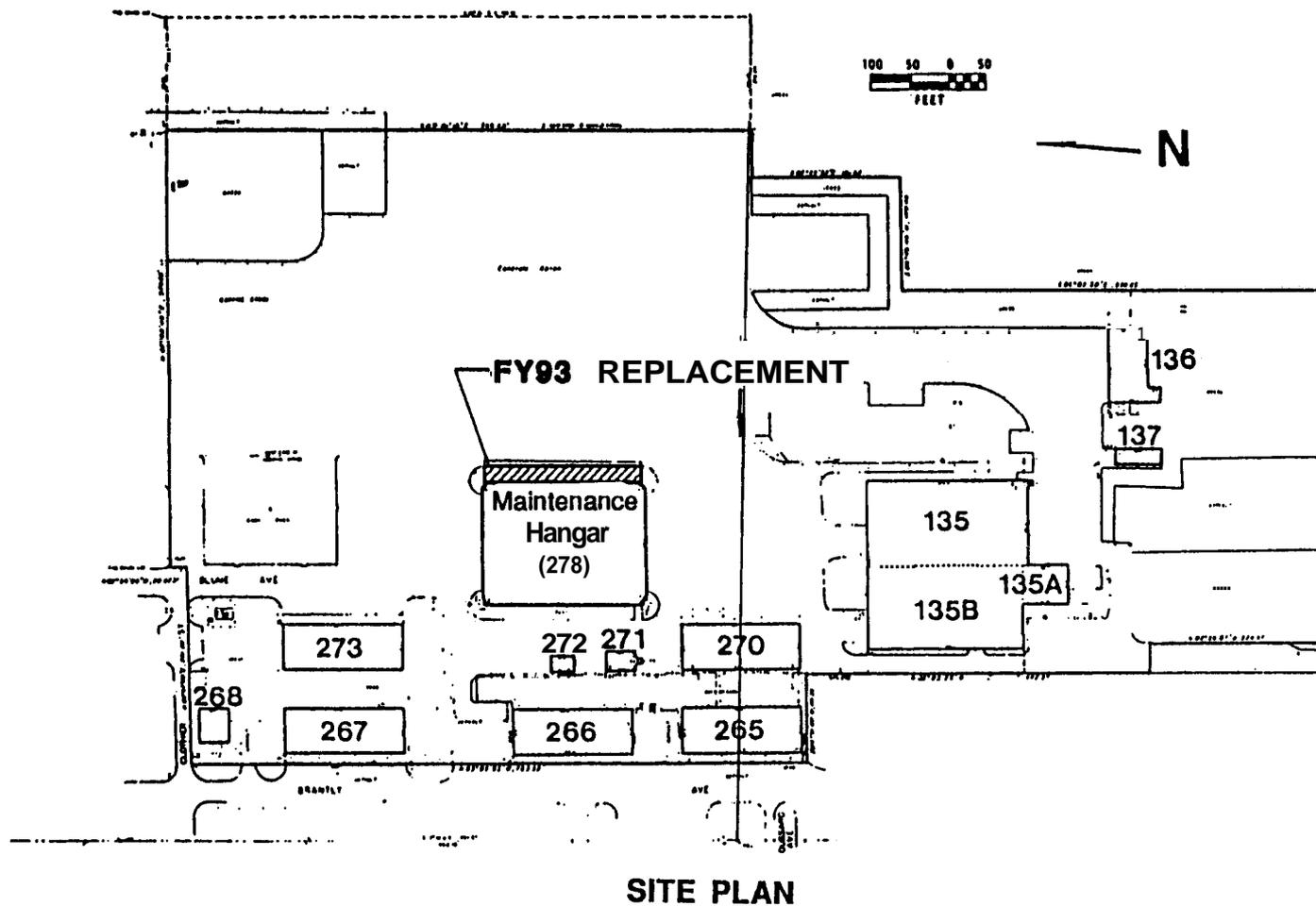


FIGURE 1

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Modify Electrical and Mechanical Systems, Utility Annex

INSTALLATION: John F. Kennedy Space Center, Florida

FY 1993 CoF Estimate: \$4,400,000

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

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$418,000	---	\$ 418,009
Capitalized Investment	<u>---</u>	<u>\$4,020,269</u>	<u>4,020,269</u>
Total	<u>\$418,000</u>	<u>\$4,020,269</u>	<u>\$4,438,269</u>

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to modify the electric motor control system and the chilled water system in the Utility Annex by replacing obsolete motor control centers and upgrading the chilled water pumping system. This work is necessary to improve the operational efficiencies of the chilled water system and correct safety hazards in the Utility Annex.

PROJECT:

The present Motor Control Center equipment has become deteriorated and unreliable and requires frequent extensive maintenance. It supplies power to the heating, ventilating, and air conditioning equipment that services the Launch Control Center, the Vehicle Assembly Building, and the Orbiter Processing Facilities. In addition to its obsolescence, the motor control centers require relocation to an adjacent new area to eliminate safety hazards to personnel and

equipment. A near-catastrophic incident occurred early in 1991 when a water-line burst dousing the equipment and causing an expensive and lengthy power outage. Also, the present equipment must be retained and kept energized while the new equipment is installed and tested, to preclude an unacceptable and extremely lengthy power outage. The existing chilled water distribution system is too small to handle increased loads and cannot properly pump sufficient cooling water as additional heating is added. The new system will correct this situation by maximizing pumping efficiencies and providing sufficient pumping capacity to deliver the required chilled water to the various facilities as needed.

IMPACT OF DELAY:

If this project is not approved reliability risks will continue and inefficient operation of the existing systems will result in undue energy expenditures and inability to meet all user needs.

PROJECT:

This project provides for construction of a 2,500 square foot addition to the Utility Annex to house two new 4,160 volt Motor Control Centers, a workshop area, and new restroom facilities. The existing 4,160 volt Motor Control Centers and protective relays for the 7,500 kVA double-ended substation will be replaced with new state of the art equipment. The mains and tie breakers will be refurbished. Bus ducts, cable trays, and conduits will be provided.

The existing single-pump chilled water distribution system will be modified to a three-pump system. A constant flow primary system and a variable flow secondary system will be installed. Also, building distribution pumps with redundancy will be installed at the Launch Control Center, the Orbiter Processing Facility, the Thermal Protection System Facility, and the Vehicle Assembly Building.

PROJECT COST ESTIMATE

	Unit of Measure	<u>Quantity</u>	Unit (lost)	Cost
<u>Construction:</u>	---	---	---	<u>\$4,400,000</u>
Arch/Structural	LS	---	---	276,000
Chilled Water Distribution System	LS	---	---	1,634,000
Motor Control Centers	LS	---	---	2,490,000
Total				<u>\$4,400,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Plan Detail Figure 2 - Utility Annex Plan

OTHER EQUIPMENT SUMMARY: None

FUTURE ESTIMATED CoF FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1993 ESTIMATES
MODIFY ELECTRICAL AND MECHANICAL SYSTEMS, UTILITY ANNEX

PLAN DETAIL

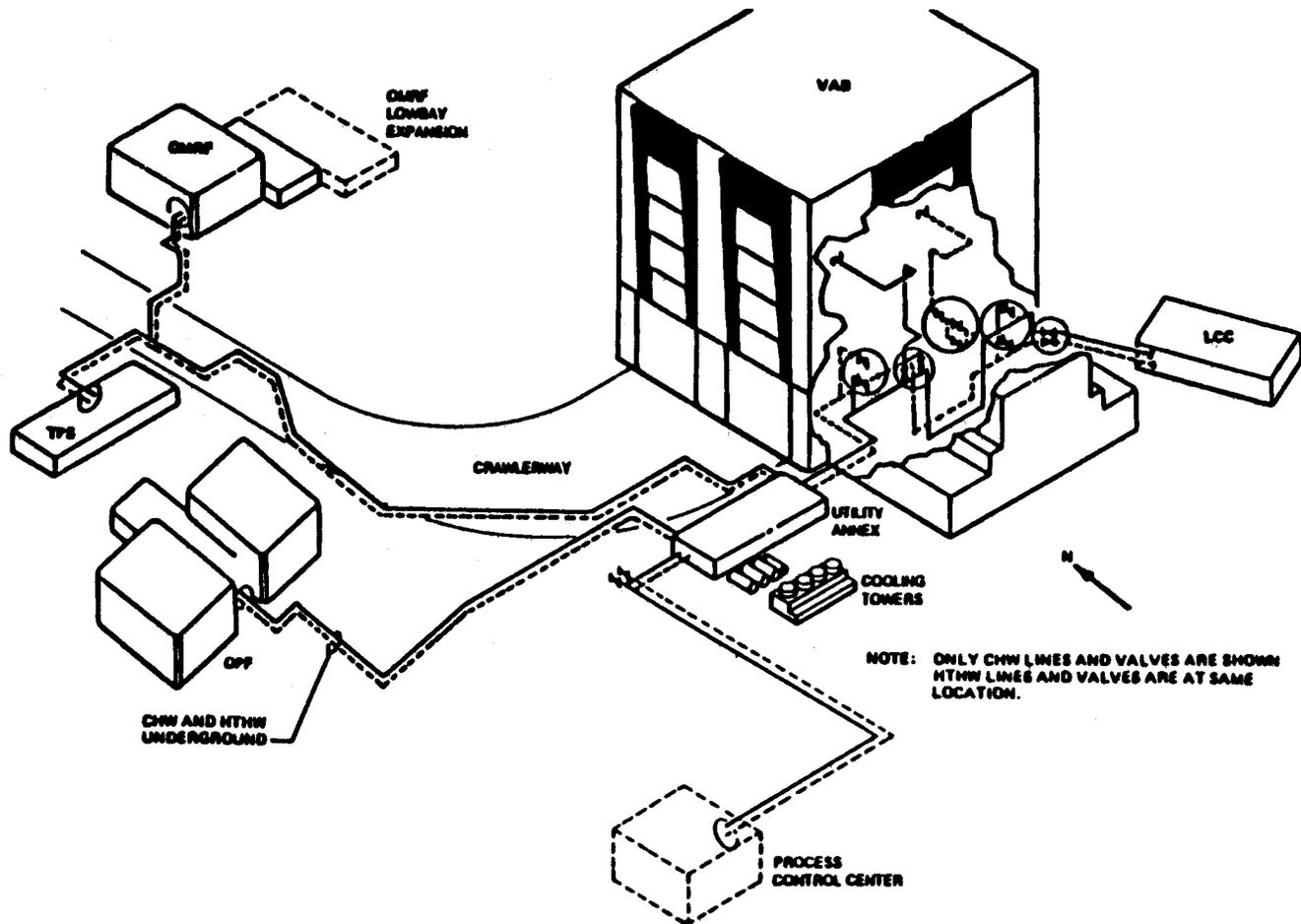


FIGURE 1

**JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1993 ESTIMATES
MODIFY ELECTRICAL AND MECHANICAL SYSTEMS, UTILITY ANNEX**

UTILITY ANNEX PLAN

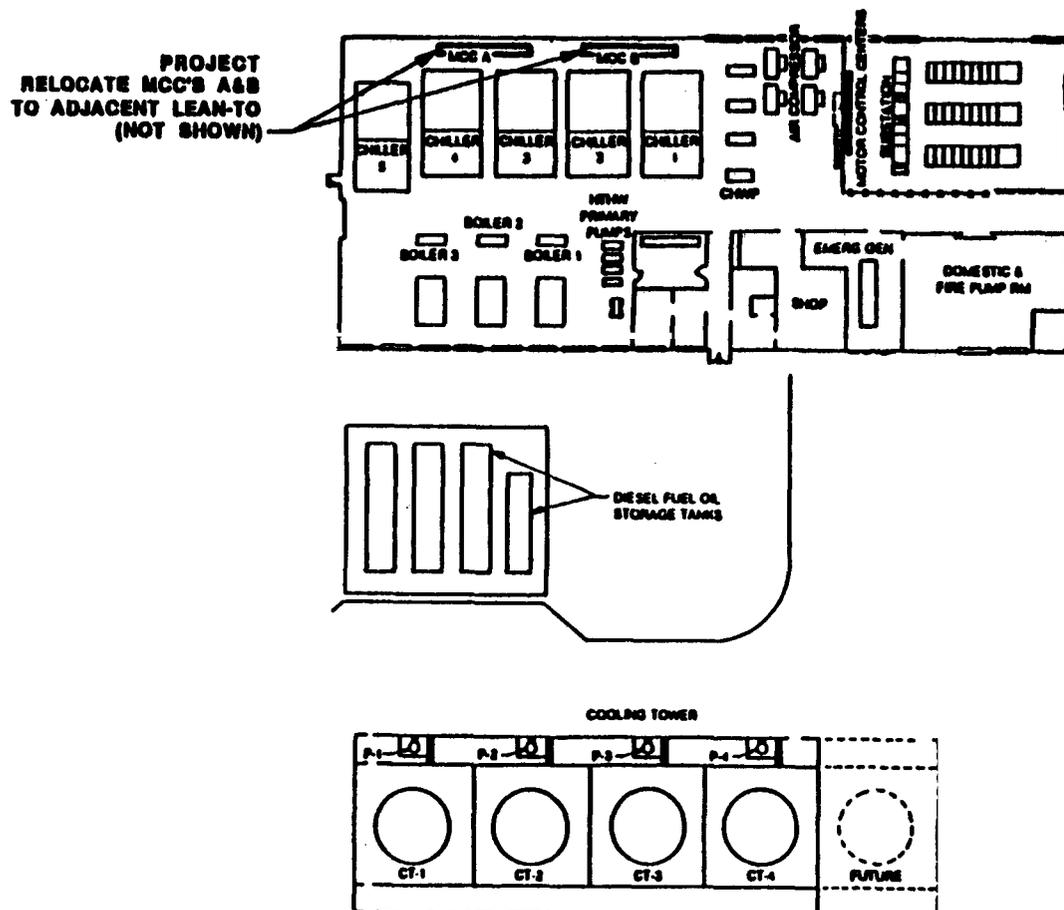


FIGURE 2

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Rehabilitate Explosive Safe Area-60 High Bays Support Svstems

INSTALLATION: John F. Kennedy Space Center

FY 1993 CoF Estimate: \$2,000,000

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

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$185,000	---	\$ 185,000
Capitalized Investment	<u>---</u>	<u>\$3,012,059</u>	<u>3,012,059</u>
Total	<u>\$185,000</u>	<u>\$3,012,059</u>	<u>\$3,197,059</u>

SUMMARY PURPOSE AND SCOPE:

The purpose of the project is to correct safety and unreliable support systems required for payload processing operations. This project will refurbish or replace one 10-ton bridge crane and three 5-ton cranes, remove asbestos, install a new fire extinguishing system, modify the heating, ventilating, and air-conditioning (HVAC) system, and install conductive flooring.

PROJECT JUSTIFICATION:

Modifications to the cranes are necessary to bring them into compliance with NASA Safety Standard for lifting devices and equipment, and to assure that the cleanliness of the facility is not compromised by contamination from leaking crane lubricants. The water deluge system dumped five to eight inches of water into the south high bay due to inadvertent activation of the fire pump. The conductive flooring in the facility has worn out because of the many years of continuous use. The HVAC systems in the Dynamic Balance Laboratory, as well as the Sterilization and Assembly Laboratory, are not capable of keeping stable controlled environmental conditions without extensive continuous maintenance and operations work.

IMPACT OF DELAY:

Deferral of this project will result in this facility becoming unacceptable for future payload processing due to safety and cleanliness deficiencies.

PROJECT:

The work includes replacement or refurbishment of three 5-ton cranes and one 10-ton crane to meet current NASA standards for lifting devices and equipment. The fire extinguishing systems will need complete replacement to bring them into compliance with current standards. The existing floor tile will be removed and replaced with new conductive tile. The existing HVAC system will be modified through its incorporation into a central chilled water plant. The new central chilled water system will tie both laboratory buildings to the central chilled water plant via a chilled water system loop. Asbestos will be removed from piping and floor systems.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Cost
<u>Construction</u>	---	---	---	<u>\$2,000,000</u>
Crane Refurb/ Replacement . .	LS	---	---	800,000
Fire Extinguishing Systems .	LS	---	---	200,000
Floor Tile Replacement . . .	LS	---	---	90,000
HVAC System	LS	---	---	800,000
Asbestos Abatement	LS	---	---	110,000
Total				<u>\$2,000,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Location Plan

OTHER EQUIPMENT SUMMARY: None

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Rehabilitate LC-39 Area Fire Alarm Reporting System

INSTALLATION: John F. Kennedy Space Center

FY 1993 CoF Estimate: \$4,300,000

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

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1997 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$519,000	---	\$ 519,000
Capitalized Investment	---	<u>\$181,332,374</u>	<u>181,332,374</u>
Total	<u>\$519,000</u>	<u>\$181,332,374</u>	<u>\$181,851,374</u>

SUMMARY PURPOSE AND SCOPE

This project will replace existing unreliable and outdated fire alarm control and monitoring systems in the Launch Complex-39 area with microprocessor-based panels to be monitored and controlled through the existing central fire reporting and monitoring station, located in the Launch Control Center.

PROJECT JUSTIFICATION:

The existing nonrecording, annunciator type fire alarm reporting and monitoring systems are unreliable, have no expansion capability, and no longer meet the revised recommendations of the National Fire Code. The existing monitoring systems are highly dependent on operator vigilance, proficiency, interpretation, and recording, and are incapable of monitoring individual fire alarm zones in large buildings. Repair parts are very difficult and costly to obtain for these obsolete systems. The increased frequency of hazardous operations makes the need for better control and monitoring of fire alarm and suppression systems essential.

IMPACT OF DELAY:

Deferral of this project will result in poor evaluations of fire signals received by the central fire alarm reporting and monitoring system, and continued manual control of 72 Halon fire suppression systems. Without this project, there would be an increase in the risk of misdirecting the fire department which adds delays to the critical response time.

PROJECT:

This project will replace existing critical safety system fire alarm control and monitoring systems with microprocessor-based panels. Each facility's heat/smoke detection/signaling zones will be modified to be compatible with the new fire alarm panel, which will be compatible with the central station equipment, graphics, archiving and control functions. After the fire alarm systems are integrated with the central station, including graphics and base central processing unit, the system will provide reporting and control of approximately 7,000 alarm points.

PROJECT COST ESTIMATE: Based on an in-house estimate.

	Unit of Measure	Quantity	Unit Cost	Cost
Construction:	---	---	---	<u>\$4,300,000</u>
Demolition	EA	40	\$ 1,400	56,000
Fire Alarm Panels	EA	32	35,000	1,120,000
Modem Packages	EA	64	9,100	582,400
Detectors	EA	550	150	82,500
Bell Units	EA	700	140	98,000
Wire and Conduit.	LF	125,600	15	1,861,100
Asbestos Abatement	LS	---	---	500,000
Total				<u>\$4,300,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Proposed Configuration Plan

OTHER EQUIPMENT SUMMARY: None

FUTURE COF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

**JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1993 ESTIMATES
REHABILITATE LC-39 AREA FIRE ALARM REPORTING SYSTEM**

**SITE PLAN
VAB AREA**

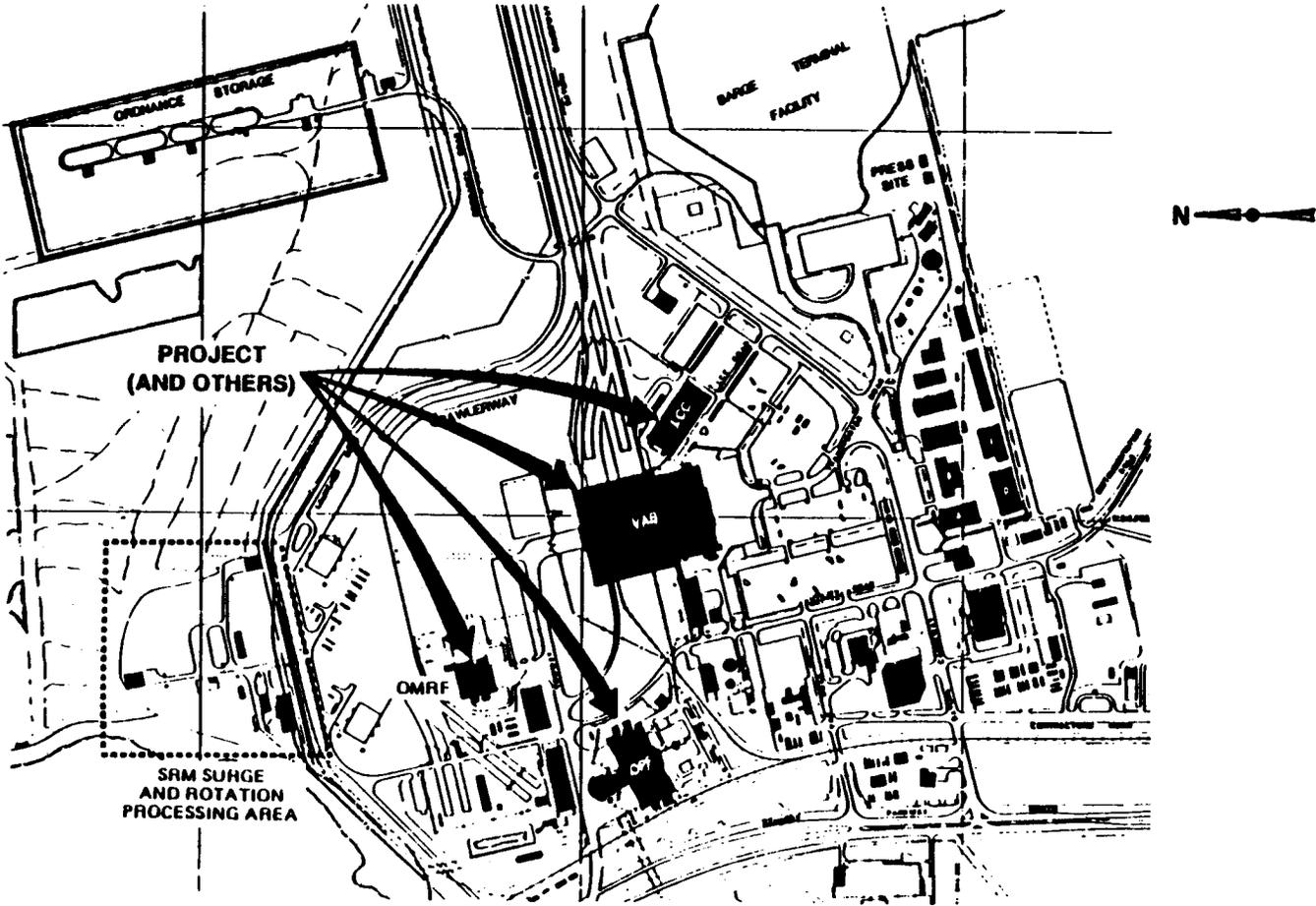


FIGURE 1

**JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1993 ESTIMATES
REHABILITATE LC-39 AREA FIRE ALARM REPORTING SYSTEM**

PROPOSED CONFIGURATION

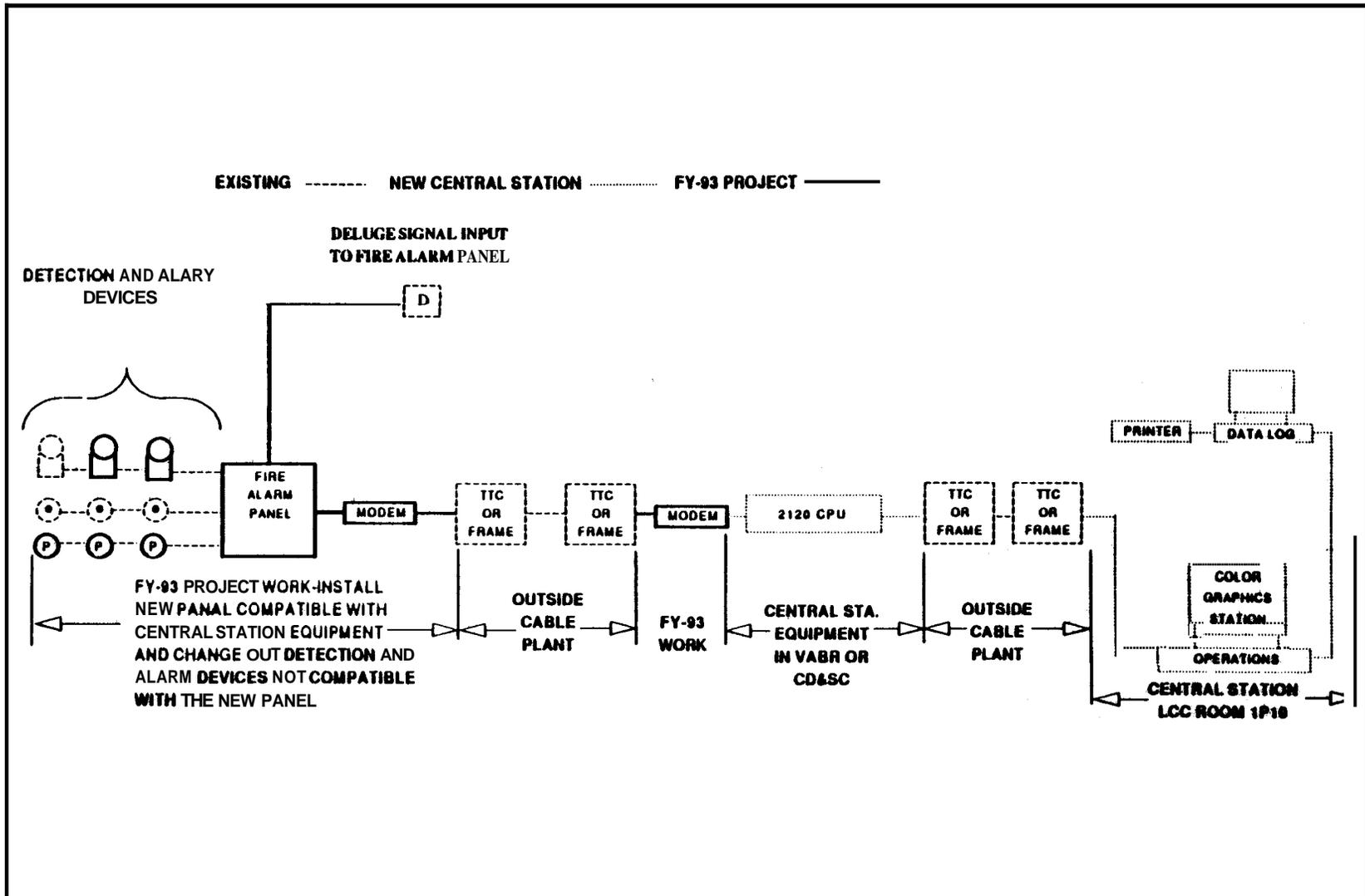


FIGURE 2

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Replace Boiler House Components

INSTALLATION: Michoud Assembly Facility

FY 1993 CoF Estimate: \$2,300,000

LOCATION OF PROJECT: New Orleans, Orleans Parish, Louisiana

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	Construction	Total
Specific CoF Funding	\$184,000		\$ 184,000
Capitalized Investment	<u>-----</u>	<u>\$4,976,651</u>	<u>4,976,651</u>
Total	<u>\$184,000</u>	<u>\$4,976,651</u>	<u>\$5,160,651</u>

SUMMARY PURPOSE AND SCOPE:

The purpose of this project is to initiate the replacement of major equipment components at the central heating and cooling plant in Building 207. This phase replaces two 25 year old steam boilers and associated piping and components.

PROJECT JUSTIFICATION:

Four of the five boilers in Boilerhouse 207 are over 25 years old and two have extensive corrosion throughout. The boiler tube headers have numerous air leaks and the brickwork baffles between tube rows are deteriorated. Boilers #3 and #4 are no longer capable of generating the minimum 225 psi steam required in the headers. The steam header piping was installed in 1943 and is severely deteriorated due to corrosion from oxygen pitting. The 350,000 pounds per hour deaerator installed in 1966 to preheat and remove dissolved gases (deaerating) from the boiler feedwater has corroded. Spares are no longer available.

IMPACT OF DELAY:

Continued deterioration of heating components will result in external tank production disruptions. Critical production activities such as Spray on Foam Insulation spray and curing, component cleaning, Liquid Hydrogen and Oxygen Tank cleaning, Liquid Oxygen Tank priming, and tank welding will be adversely impacted.

PROJECT:

This project replaces Boilers #3 and #4 with two 75,000 pounds per hour steam boilers with a rated working pressure of approximately 250 psi. The boiler exhaust stacks will be replaced, as will the associated feedwater and steam piping between the boilers and the respective headers. The 350,000 pounds per hour feedwater deaerator will be replaced. Approximately 450 linear feet of high pressure steam header (225 psi) and low pressure steam header (15 psi) piping will be removed. Replacement piping will be installed as required. Five steam reducing stations associated with the steam headers will be relocated. Asbestos materials in the steam header piping insulation and the outer casing of Boiler #3 will be removed.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Cast
<u>Construction</u>	---	---	---	<u>\$2,300,000</u>
Mechanical	LS	---	---	1,955,000
Structural	LS	---	---	230,000
Electrical	LS	---	---	115,000
T o t a l				<u>\$2,300,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan with Schematic

OTHER EQUIPMENT SUMMARY: None

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Future funding to complete the replacement of all major heating and cooling equipment is approximately \$3,000,000 in FY 1994 and \$2,000,000 in FY 1996.

**MICHOUD ASSEMBLY FACILITY
FISCAL YEAR 1993 ESTIMATES
REPLACE BOILER HOUSE COMPONENTS**

SITE PLAN WITH SCHEMATIC

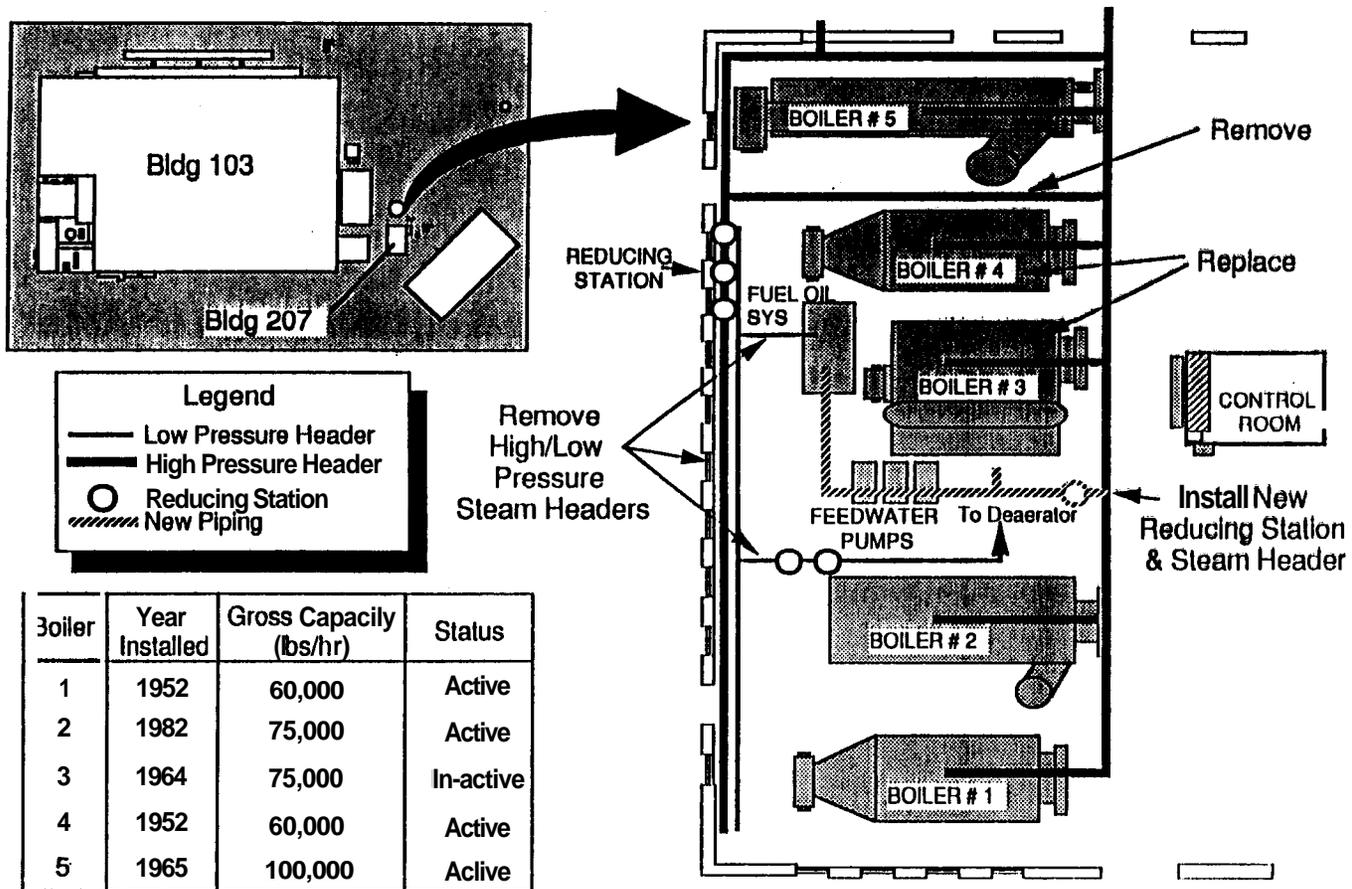


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Rehabilitation of Crawlerway

INSTALLATION: John F. Kennedy Space Center

FY 1993 CoF Estimate: \$2,000,000

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

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$160,000	\$3,000,000	\$3,160,008
Capitalized Investment	---	<u>5,668,419</u>	<u>5,668,419</u>
Total	<u>\$160,000</u>	<u>\$8,668,419</u>	<u>\$8,828,419</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the continued rehabilitation of additional designated sections of the crawlerway between the Vehicle Assembly Building and Launch Pads A and B. The surface and base course of the crawlerway will be brought back to specification so that proper support will be provided for a fully loaded Shuttle crawler transporter.

PROJECT JUSTIFICATION:

Testing of the present base course and surface course of the crawlerway indicates unsatisfactory bed integrity. Straightaway sections between the Vehicle Assembly Building and the Pad A/B fork have settled, resulting in premature failure of the crawlerway surface. The crushing of surface aggregate into small aggregate and sand by the transporter tracks obstructs rainwater drainage

and causes ponding of water on the crawlerway surface, followed by additional water infiltration into the base course. Intrusion of fine sand particles during wet conditions also causes damage to crawler transporter tracks.

IMPACT OF DELAY:

If this project is not approved, premature failure of the crawlerway surface is highly probable, which could result in an inability to use the crawlerway to move the Space Shuttles to the launch pads.

PROJECT:

This project provides for the continued restoration of straightaway areas between the Vehicle Assembly Building and Pad B to original specification. Two straightaway sections north of the Park Site toward Pad B will also be restored. Existing rock will be removed and the base and surface courses will be restored. Eight inches of new rock will be installed to bring the surface back to specification.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Cost
Construction:	---	---	---	\$2,000,000
Rehabilitate Crawlerway	LS	---	---	2,000,000
Total				<u>\$2,000,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Site Layout

OTHER EQUIPMENT SUMMARY: None

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: Additional wear and tear on the crawlerway surface will require additional rehabilitation in subsequent years.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1993 ESTIMATES
REHABILITATION OF CRAWLERWAY

SITE PLAN
VAB AREA

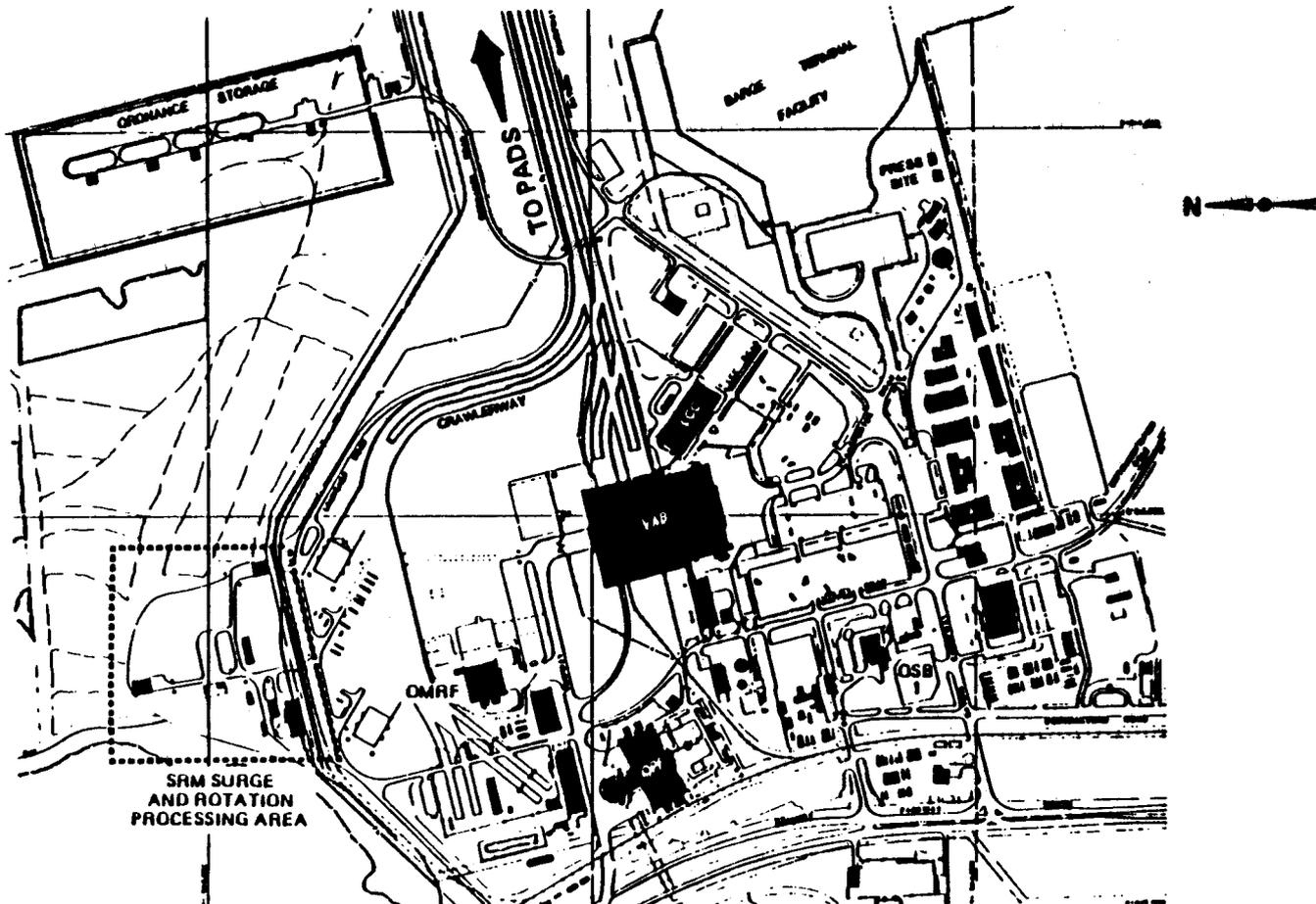


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1993 ESTIMATES
REHABILITATION OF CRAWLERWAY

SITE LAYOUT

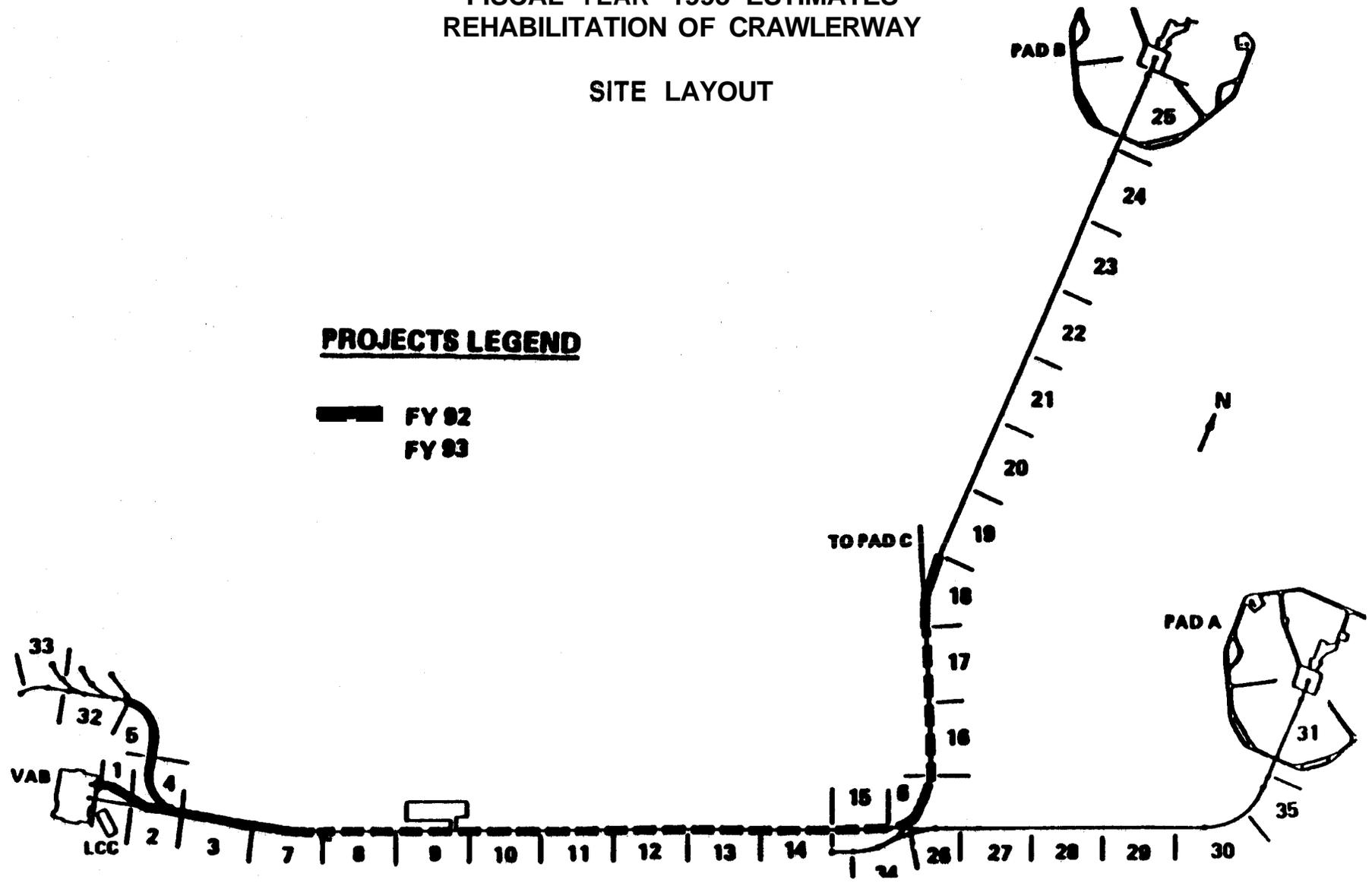


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Restoration of the High Pressure Gas Facility

INSTALLATION: John C. Stennis Space Center

FY 1993 CoF Estimate: \$6,800,000

LOCATION OF PROJECT: Stennis Space Center (SSC), Hancock County, Mississippi

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project.

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$620,000	---	\$ 620,000
Capitalized Investment.....	<u>-0-</u>	<u>\$4,938,300</u>	<u>4,938,300</u>
Total.....	<u>\$620,000</u>	<u>\$4,938,300</u>	<u>\$5,558,300</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the restoration and automation of the high pressure air and helium gas systems in the High Pressure Gas Facility (3304 and 3305). The project also modifies the building and upgrades the utility systems to support new equipment. The rehabilitation and/or replacement of obsolete components is required to improve the reliability and maintainability of these critical high pressure gas systems.

PROJECT JUSTIFICATION:

The High Pressure Gas Facility (HPGF) is operated with 25-year-old equipment and obsolete components. Replacement parts are procured by special order only and are very expensive. The long delivery times result in extended down-time during the parts procurement process. In addition, increased high pressure gas requirements for the Space Shuttle Main Engine (SSME) test program have reduced the available down-time for facility maintenance activities. Restoration of the HPGF will improve the reliability of these critical high pressure gas systems and ensure maintainability of the facility.

IMPACT OF DELAY:

The HPGF will continue to deteriorate and associated maintenance costs will continue to rise. Risk of extended delays due to the difficulty in obtaining replacement parts will also increase, thereby jeopardizing reliable SSME test program support.

PROJECT DESCRIPTION:

This project provides for the restoration or replacement of various components of the high pressure air and helium gas systems. Project scope includes replacement of two air compressors, two helium compressors, two air dryers, ancillary equipment, and an expansion of the existing electrical substation. Upgrades will be made to the motor control centers, the cooling tower cells, the fire detection/protection system, and the blowdown pit. A 4,400 square foot facility expansion is required to permit the restoration of the facility concurrent with the continuous operation of the high pressure gas systems.

PROJECT COST ESTIMATE: Based on a Preliminary Engineering Report.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction</u>	---	---	---	<u>\$6,800,000</u>
Air Compressors	EA	2	1,046,000	2,092,000
Air Dryers	EA	2	340,000	680,000
Helium Compressors	EA	2	1,046,000	2,092,000
Civil/Structural	LS	---	---	732,000
Mechanical	LS	---	---	472,000
Electrical	LS	---	---	732,000
Total				<u>\$6,800,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Schematic

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Approximately \$9.0M will be required in FY 1995 for additional restoration and modernization of gas systems.

STENNIS SPACE CENTER
FISCAL YEAR 1993 ESTIMATES
RESTORATION OF HIGH PRESSURE GAS FACILITY

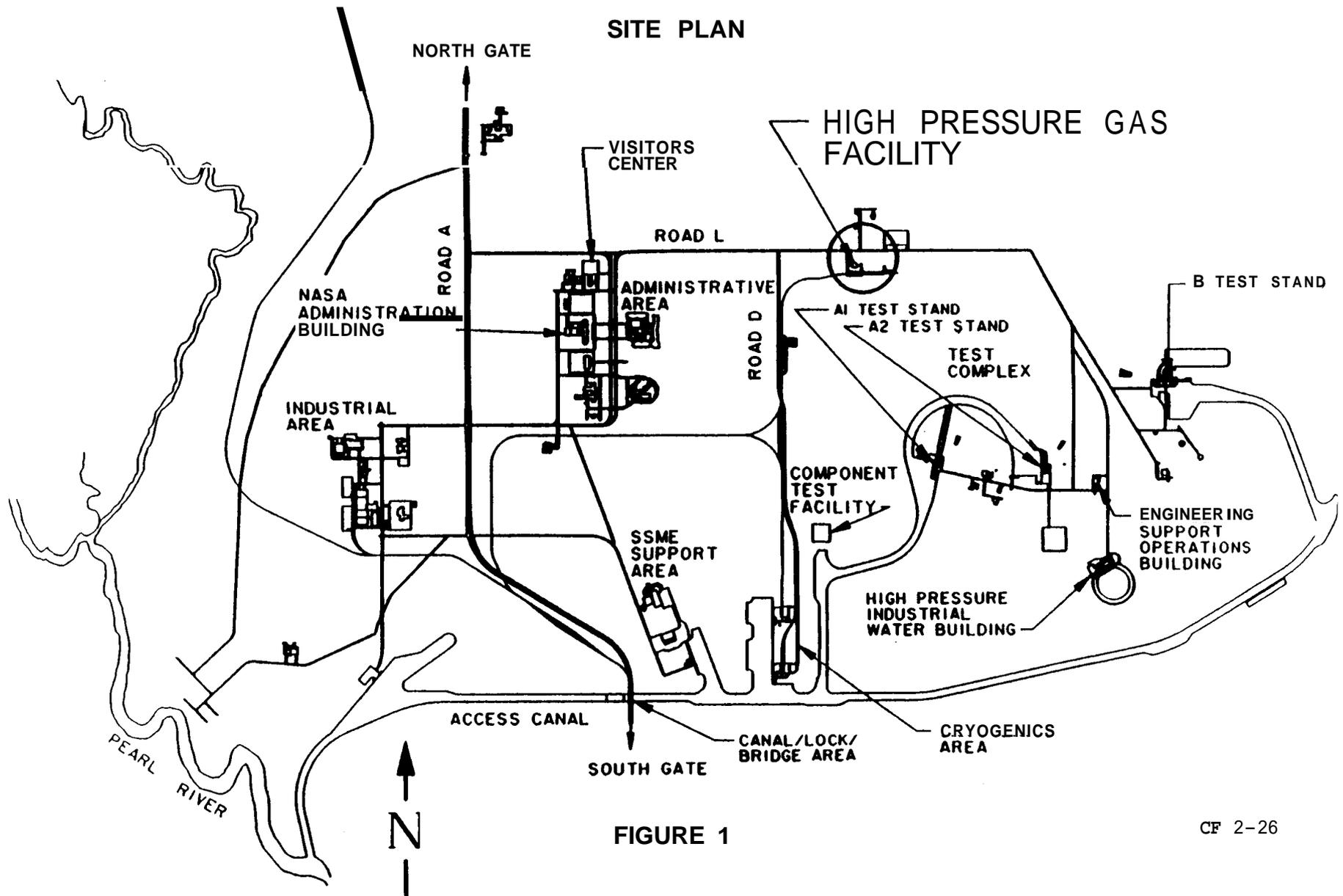


FIGURE 1

**STENNIS SPACE CENTER
FISCAL YEAR 1993 ESTIMATES
RESTORATION OF HIGH PRESSURE GAS FACILITY**

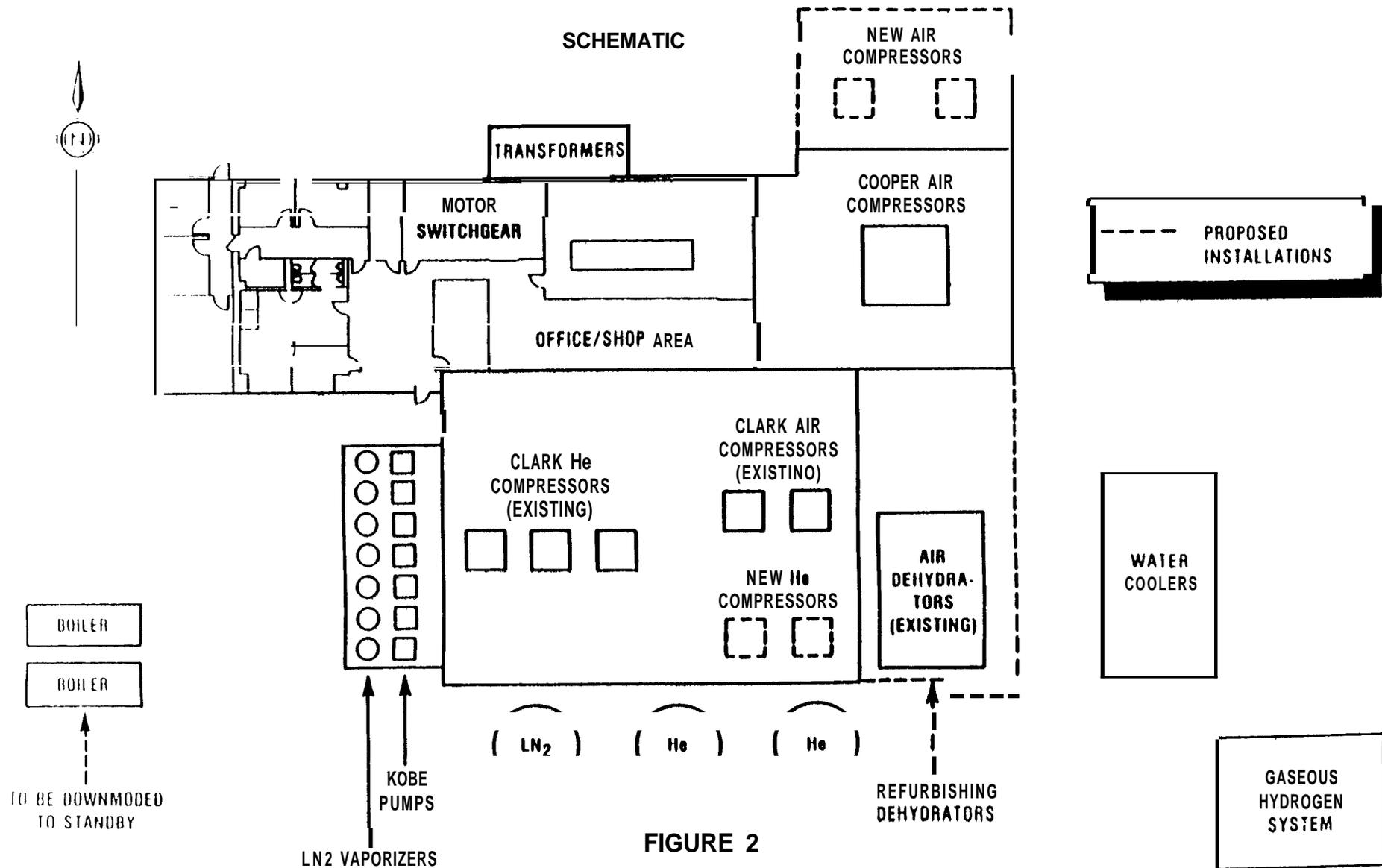


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Restoration of Information and Electronic Svstems Laboratorv

INSTALLATION: George C. Marshall Space Flight Center

FY 1993 CoF Estimate: \$5,000,000

LOCATION OF PROJECT: Marshall Space Flight Center, Madison County, Alabama

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1997 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	Total
Specific CoF Funding	\$997,000	\$ 6,175,000	\$ 7,172,000
Capitalized Investment	---	<u>10,741,394</u>	<u>10,741,394</u>
Total	<u>\$997,000</u>	<u>\$16,916,394</u>	<u>\$17,913,394</u>

SUMMARY PURPOSE AND SCOPE:

This project will completely restore and modernize the "B" Wing of Building 4487 to create an efficient office laboratory/computer complex environment.

PROJECT JUSTIFICATION:

Building 4487, totaling 278,385 square feet, was built in phases beginning in 1957 and has transitioned in use from a laboratory building to an office/laboratory/computer complex. Building 4487 is Marshall Space Flight Center's primary electronics laboratory, supporting current NASA programs as well as research and development for future programs. Installation of laboratory and computer equipment has overloaded both power supply/distribution and HVAC systems, resulting in frequent system failures. The large number of structural modifications accomplished over the years has resulted in a low quality environment in terms of space allocation/

configuration and supporting utility systems. Widespread use of asbestos in interior building systems complicates any further piecemeal building modifications. Non-insulated masonry exterior walls and casement windows are not energy efficient.

IMPACT OF DELAY:

An increase in laboratory and computer equipment failures will be experienced due to deteriorating power distribution and HVAC overloads. Operation and maintenance expenses will continue to increase to support piecemeal repairs. Worker productivity and morale will decrease as more staff are added to what is already a poorly configured, overloaded, and low quality workspace.

PROJECT DESCRIPTION:

This project provides a complete restoration of the "B" Wing of Building 4487. The building exterior will be insulated and will receive a new facade, including windows. Asbestos laden interior walls will be removed. Floor, wall, and ceiling surfaces will be upgraded. The heating, ventilating, and air conditioning (HVAC) system; the plumbing system; the power supply and distribution system; and the lighting system will also be replaced.

PROJECT COST ESTIMATE: Based upon a Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit Cost	Cost
<u>Construction</u>	---	---	---	<u>\$5,000,000</u>
Site Work	LS	---	---	---
Architectural/Structural	LS	---	---	2,750,000
Mechanical	LS	---	---	1,250,000
Electrical	LS	---	---	600,000
Asbestos Abatement	LS	---	---	<u>400,000</u>
Total				<u>\$5,000,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Perspective

OTHER EQUIPMENT SUMMARY: None

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: Future CoF funding will be requested to restore and modernize other portions of the building.

**MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1993 ESTIMATES
RESTORATION OF INFORMATION AND ELECTRONIC SYSTEMS LABORATORY**

PERSPECTIVE

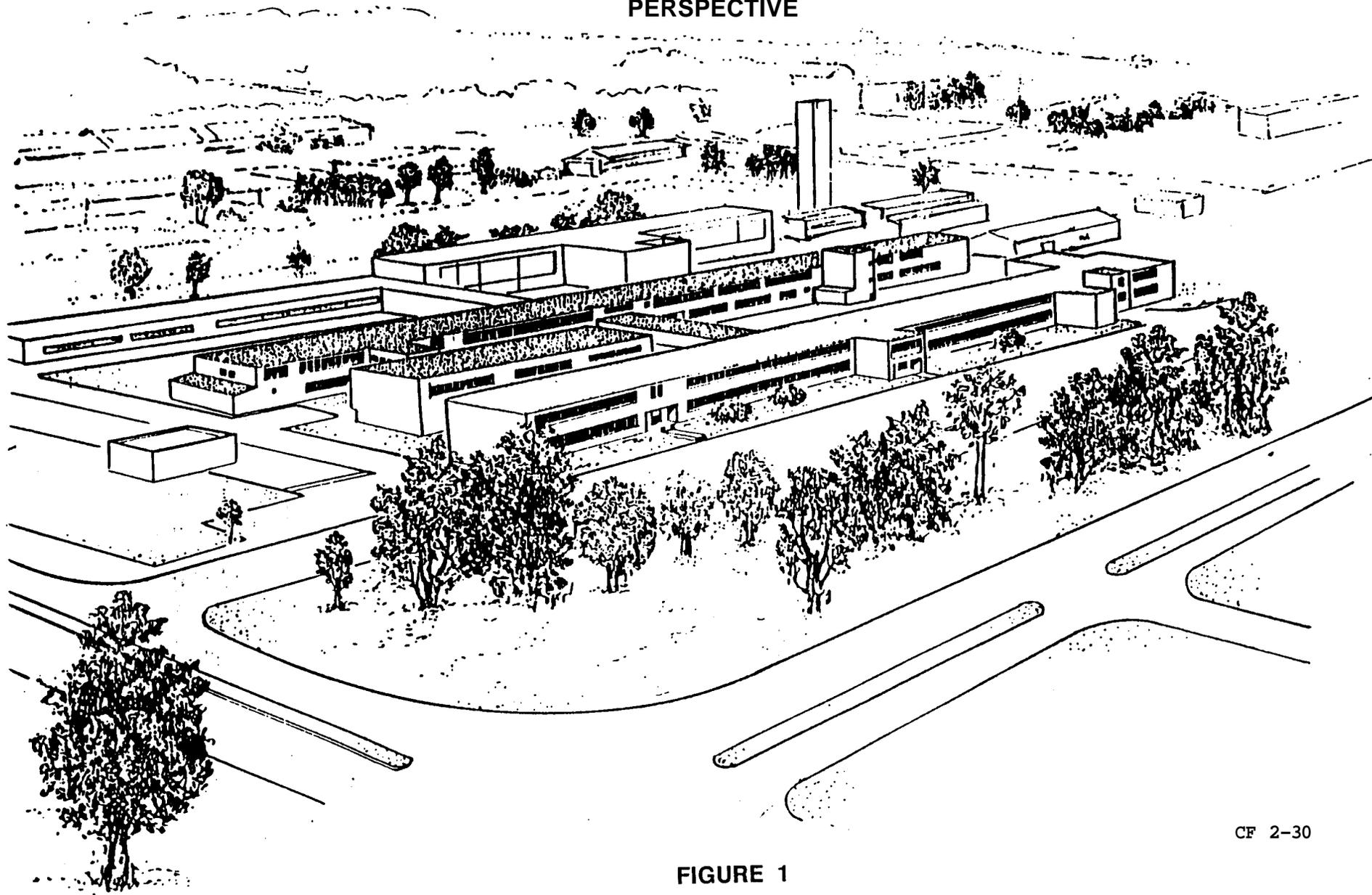


FIGURE 1

KENNEDY
SPACECENTER

/



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

SUMMARY

KENNEDY SPACE CENTER

	Amount	Page
	-----	No.
	(Dollars)	----
Office of Space Flight: -----		
Rehabilitation and Expansion of Communications Duct Banks.....	1,500,000	CF 3-1

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Rehabilitation and Expansion of Communications Duct Banks

INSTALLATION: John F. Kennedy Space Center

FY 1993 CoF Estimate: \$1,500,000

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

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$ 96,800	---	\$96,800
Capitalized Investment.....	---	\$26,928,050	26,928,050
Total... ..	<u>\$ 96,800</u>	<u>\$26,928,050</u>	<u>\$27,024,850</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the installation of cable duct banks to meet current and future communications and data circuit requirements. Adequate duct space will be made available to install new cables to the industrial area, Hypergol Maintenance Facility area, and Launch Complex 39 area.

PROJECT JUSTIFICATION:

The existing underground duct bank system was installed approximately 20 years ago. Numerous problems have been encountered during the installation of new communications cables into the existing spare ducts. Deterioration of the existing fibrous ducts has partially or completely blocked the ducts. Spare ducts to existing facilities are not available to meet future needs.

IMPACT OF DELAY:

There is insufficient duct bank space to meet future construction projects needs and existing ducts are full or damaged. Communication lines, data systems and control cables will become dangerously overloaded if additional ducts are not provided.

PROJECT DESCRIPTION:

This project will construct approximately 22,100 linear feet of new duct banks in the Industrial area, Hypergol Maintenance Facility area, and Launch Complex 39 area. Manholes with damaged necks in Launch Complex 39 area will be reconditioned and excess cables will be removed from ducts to create space in the ducts for the Industrial Area.

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Construction</u>	---	---	---	<u>\$1,500,000</u>
Manholes.....	EA	70	5,285.71	370,000
Duct Banks.....	LF	22,100	41.18	910,000
Cable Pulls.....	LS	---	---	145,000
Road Crossing.....	LS	---	---	55,000
Comm Room.....	LS	---	---	20,000
Total... ..				<u>\$1,500,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Industrial Area Site Plan Figure 2 - Launch Complex-39 Area Site Plan.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

JOHN F. KENNEDY SPACE CENTER
 FISCAL YEAR 1993 ESTIMATES
 REHABILITATION AND EXPANSION OF COMMUNICATIONS DUCT BANKS

INDUSTRIAL AREA SITE PLAN

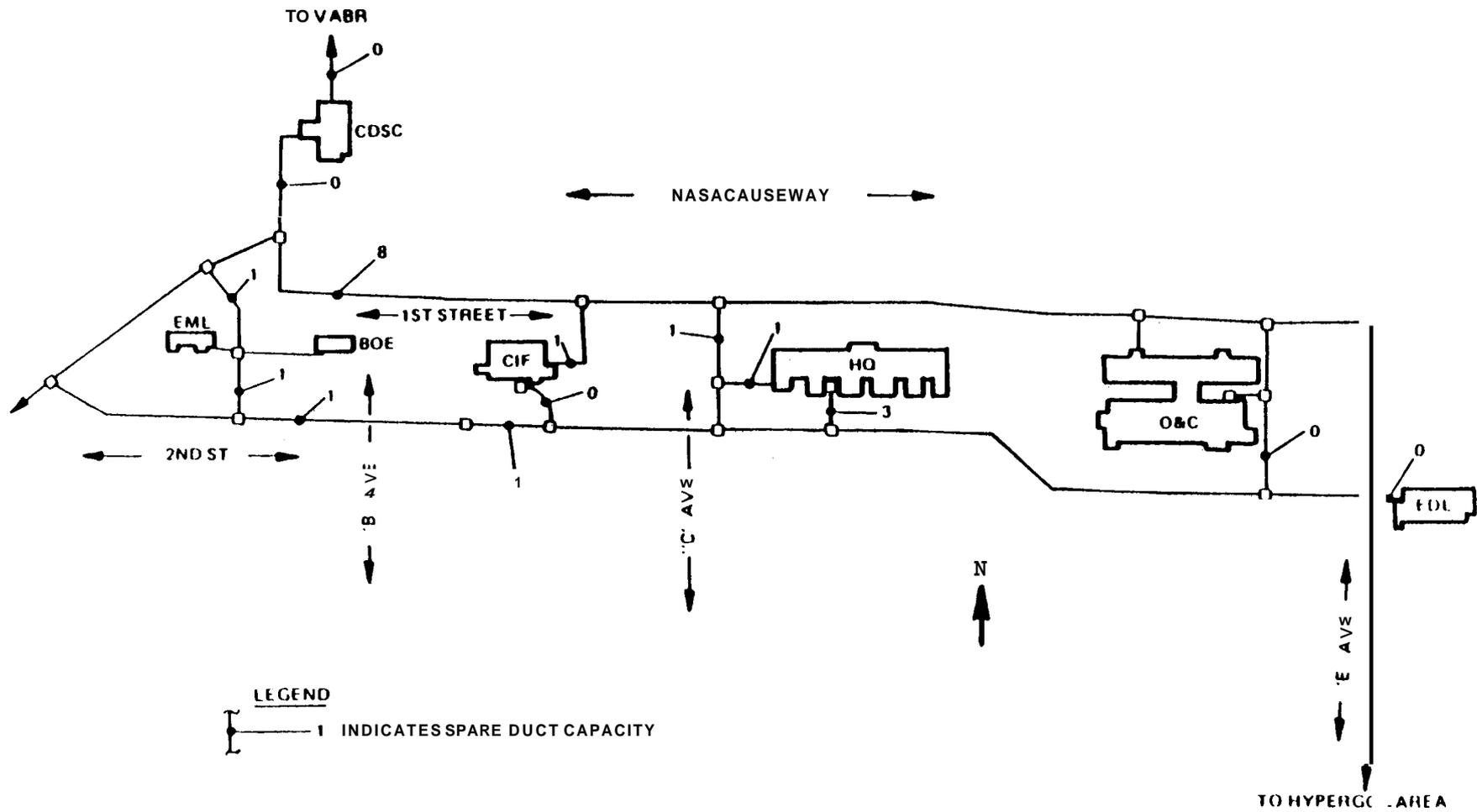


FIGURE 1

JOHN F. KENNEDY SPACE CENTER
 FISCAL YEAR 1993 ESTIMATES
 REHABILITATION AND EXPANSION OF COMMUNICATIONS DUCT BANKS

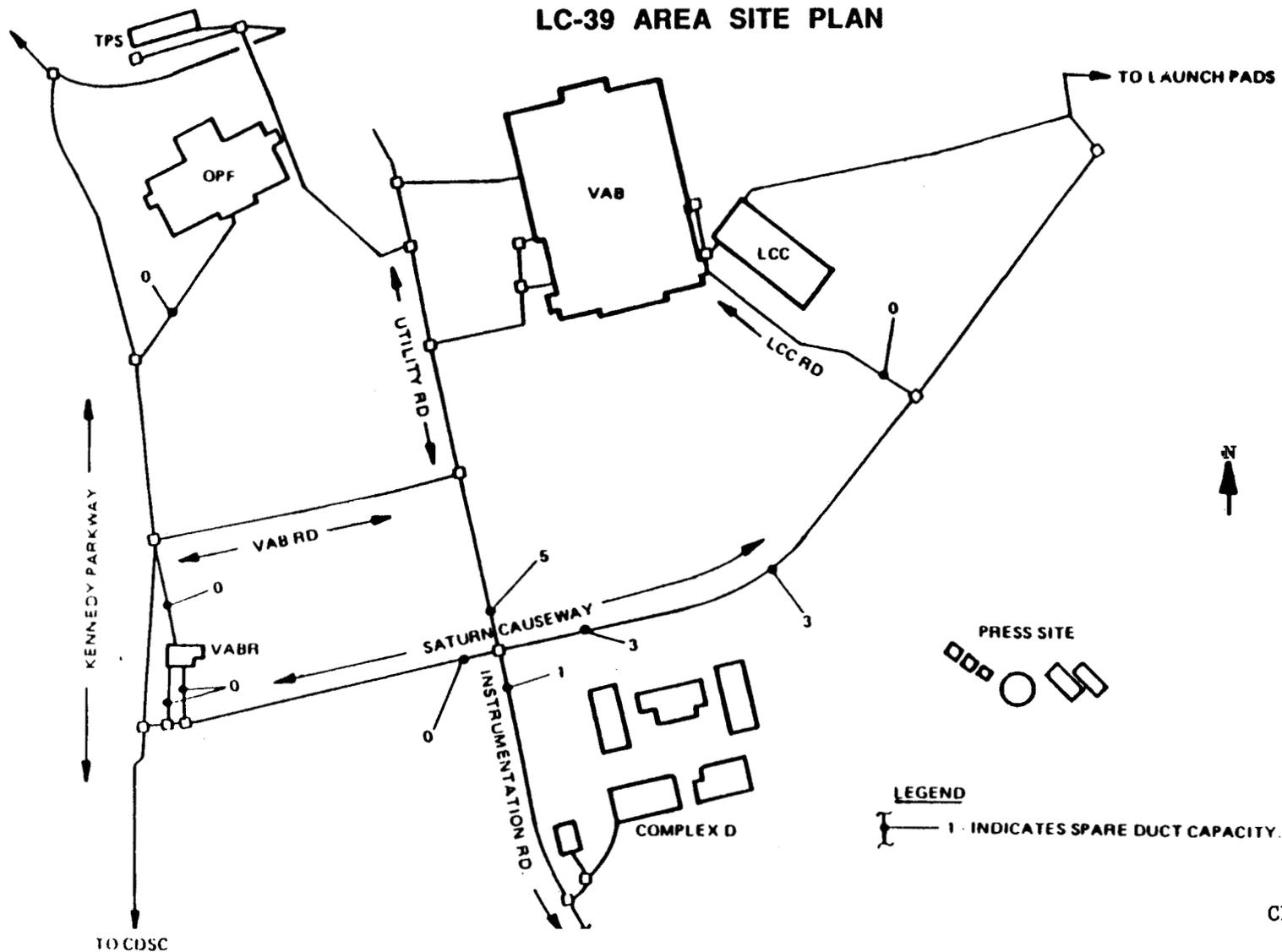


FIGURE 2

JOHNSON
SPACE CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

SUMMARY

JOHNSON SPACE CENTER

	Amount	Page
	-----	No.
	(Dollars)	----
Office of Space Flight: -----		
Replace Central Plant Chilled Water Equipment.....	4,000,000	CF 4-1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Replace Central Plant Chilled Water Equipment

INSTALLATION: Lyndon B. Johnson Space Center

FY 1993 CoF Estimate: \$4,000,000

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	Planning and Design	Construction	Total
Specific CoF Funding	\$824,219	\$ 8,460,000	\$ 9,284,219
Capitalized Investment	<u>---</u>	<u>9,295,330</u>	<u>9,295,330</u>
Total	<u>\$824,219</u>	<u>\$17,755,330</u>	<u>\$18,579,549</u>

SUMMARY PURPOSE AND SCOPE:

This project is part of a phased replacement of major equipment components of the water chilling system in the Central Heating and Cooling Plant, Building 24, at the Johnson Space Center. This project replaces one 2,000-ton steam turbine chiller and two cooling tower cells. The existing equipment is 30 years old, has exceeded its economical and useful life expectancy, and is unreliable and excessively costly to maintain.

PROJECT JUSTIFICATION:

Rehabilitation of the Central Heating and Cooling Plant's chilled water system is necessary due to extensive deterioration of existing chillers and cooling tower cells which are near the end of their 30-year life expectancy. The existing equipment is becoming increasingly unreliable and very expensive to maintain. A reliable chilled water system is critical to the Center's ongoing air-conditioning requirements and process cooling operations. The chilled water produced by this system supports all major mission support buildings and institutional buildings. A phased replacement of major system components to assure reliability and prepare for the next 20 to 30 years of JSC operation is required.

IMPACT OF DELAY:

If this project is not approved, JSC's ability to provide needed cooling for critical operations, key equipment, and people will be jeopardized. If timely equipment replacement is not accomplished, critical and costly emergency repairs will be necessary.

PROJECT:

This project will replace one 2,000-ton steam turbine water chilling unit (WCU-1) and two cooling tower cells. The new equipment will be of like capacity and capability, but will incorporate current technology and microprocessor controls. Major work items include dismantling and removing the existing chiller and cooling tower cells, abating asbestos insulation of pipes and turbin modifying piping, and purchasing and installing the new equipment and controls.

PROJECT COST ESTIMATE: Based on the Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit Cost	Cost
<u>Construction</u> :	---	---	---	<u>\$4,000,000</u>
Replace Chiller	EA	1	---	1,274,800
Replace Cooling Tower Cells	EA	2	561,600	1,123,200
Replace Controls/Piping	LS	---	---	1,031,000
Electrical Modifications	LS	---	---	571,000
Total				<u>\$4,000,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Project Location

OTHER EQUIPMENT SUMMARY: None

FUTURE COF ESTIMATED FUNDING REOUURED ,TO COMPLETE THIS PROJECT:

Future funding for completion of the replacement of major cooling equipment consists of approximately \$5,700,000 in FY 1995 and \$7,500,000 in FY 1997.

Lyndon B. Johnson Space Center
Fiscal Year 1993 Estimates
Replace Central Plant Chilled Water Equipment

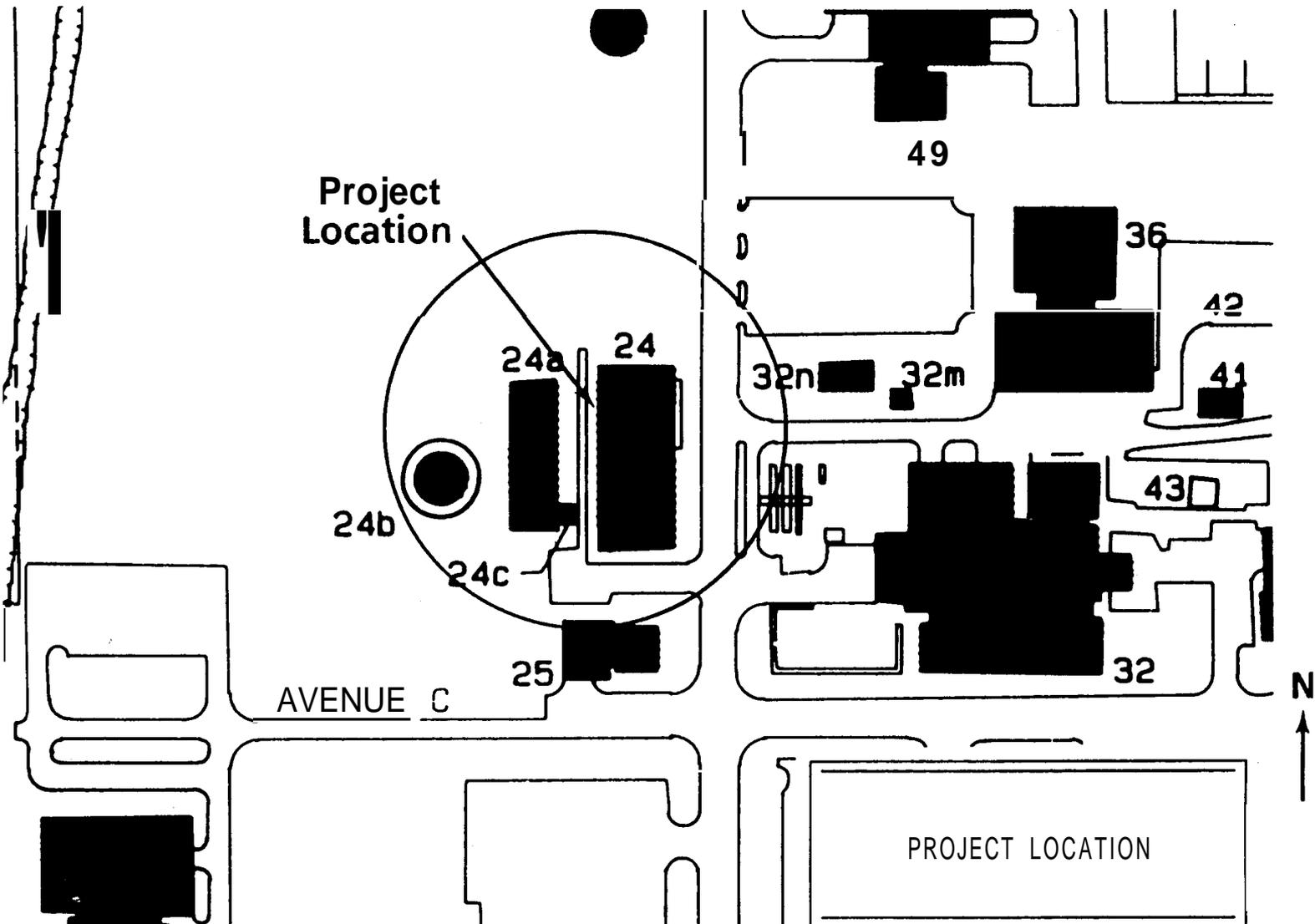


FIGURE 1

STENNIS
SPACE CENTER

1



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

SUMMARY

STENNIS SPACE CENTER

	Amount	Page
	-----	No.
	(Dollars)	----
Office of Space Flight: -----		
Restoration of Underground Communication Distribution System.....	2,200,000	CF 5-1

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Restoration of Underground Communication Distribution System

INSTALLATION: John C. Stennis Space Center

FY 1993 CoF Estimate: \$2,200,000

LOCATION OF PROJECT: Stennis Space Center, Hancock County, Mississippi

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	Total
Specific CoF Funding	\$193,000	\$ 960,000	\$1,153,000
Capitalized Investment	<u>---</u>	<u>4,431,471</u>	<u>4,431,471</u>
Total	<u>\$193,000</u>	<u>\$5,391,471</u>	<u>\$5,584,471</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the restoration of the existing underground communication distribution system which is severely deteriorated and at maximum capacity. This system provides critical support for current and projected programmatic activity. This project includes installation of approximately 16,308 linear feet of underground communications ductbank.

PROJECT JUSTIFICATION

This segment of the existing underground communication ductbank system is at maximum capacity and has no spare ducts. The "Orangeburg" (tar-impregnated paper) ducts that comprise this old system are swelled shut in many locations due to water penetration. Additional duct capacity is

critically needed for providing communication services to existing and proposed facilities which include the Space Shuttle Main Engine (SSME) Test Complex. Due to the size of the communication cables required, installing the cable in underground ducts is the most cost effective method of distribution. Direct burial of this size cable would reduce system flexibility and subject it to unnecessary risk of damage. Overhead suspension would expose the system to the risk of damage and would place an excessive load on the existing distribution poles.

IMPACT OF DELAY:

Delay in the implementation of this project will result in decreased reliability of the existing communication system and the inability to meet future communication requirements along this critical route into the SSME Test Complex.

PROJECT:

This project provides for the modification of the existing underground communication distribution system from the Communications Building on "L" Road to the Data Acquisition Facility in the Space Shuttle Main Engine Test Complex. Work includes the construction of double bay manholes, eight feet deep by twelve feet long by six feet wide, placed a maximum of 600 feet apart, and the addition of approximately 10,300 linear feet of twenty four-inch conduits, some with pre-installed innerduct. All manholes and conduits will be sealed to prevent flooding.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit Cost	Cost
<u>Construction</u>	---	---	---	<u>\$2,200,000</u>
Excavation & Backfill	LS	---	---	150,000
PVC Conduit	LS	---	---	760,000
Concrete, Cast-in-Place	LS	---	---	1,100,000
Manholes	EA	25	\$7,000	175,000
Bore & Casing (30") for RR Cross	LS	---	---	15,000
Total				<u>\$2,200,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Location Map

OTHER EQUIPMENT SUMMARY: None

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Future funding for restoration of other portions of the underground communications distribution system is anticipated on an "as required" basis. Next phase is planned for FY 1994 and estimated at \$2,000,000.

STENNIS SPACE CENTER
FISCAL YEAR 1993 ESTIMATES
RESTORATION OF UNDERGROUND COMMUNICATION DISTRIBUTION SYSTEM

LOCATION MAP

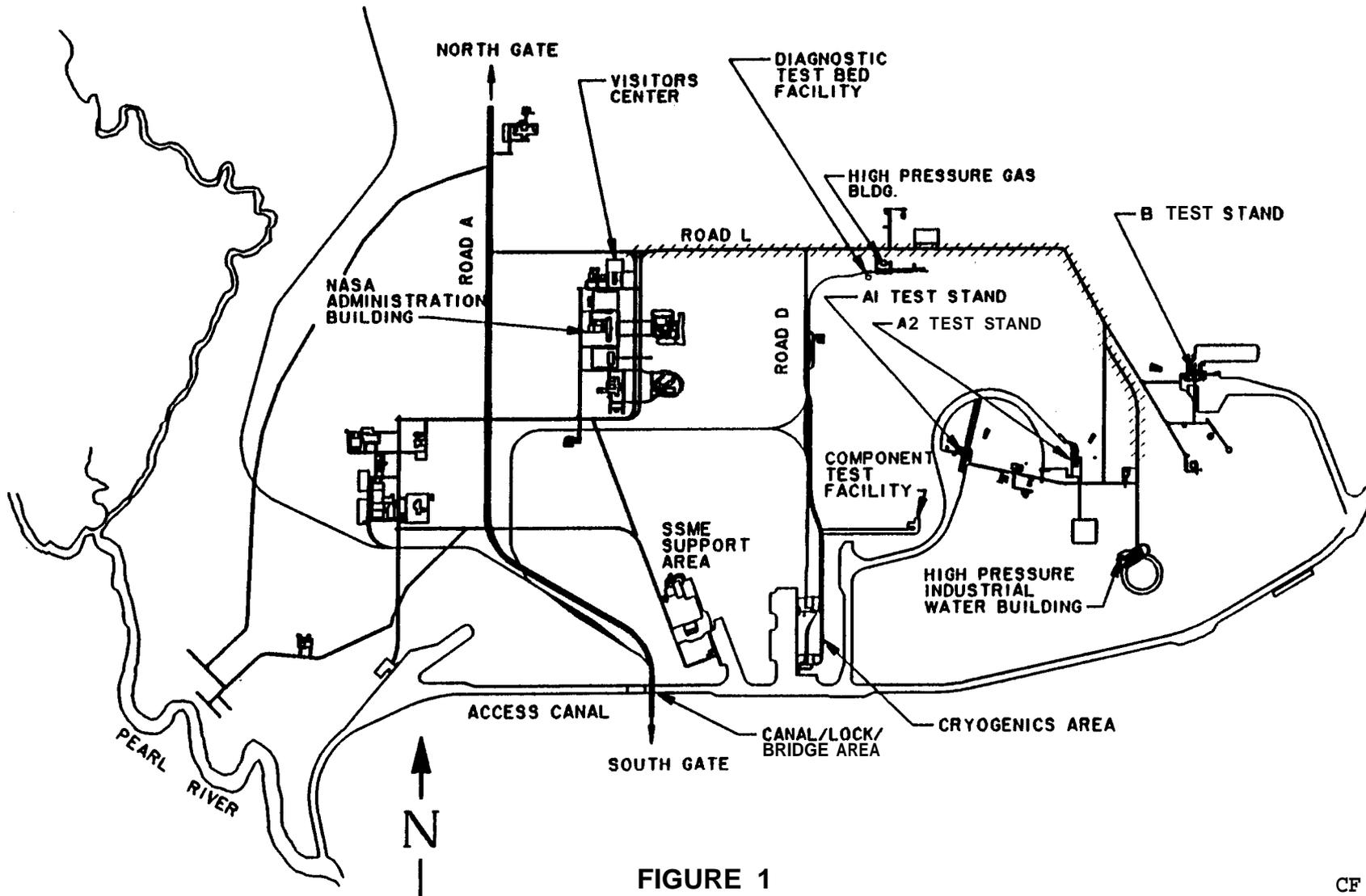


FIGURE 1

GODDARD
SPACE FLIGHT CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 CONSTRUCTION OF FACILITIES
 FISCAL YEAR 1993 ESTIMATES

SUMMARY

GODDARD SPACE FLIGHT CENTER

	Amount ----- (Dollars)	Page No. -----
Office of Space Science and Applications: -----		
Restoration/Modernization of Electrical Distribution System.. .. .	4,500,000	CF 6-1
Construction of Earth Observing system Data Information System Facility.....	22,300,000	CF 6-6

Tal.....	26,800,000	
	=====	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Restoration/Modernization of Electrical Distribution System

INSTALLATION: Goddard Space Flight Center

FY 1993 CoF Estimate: \$4,500,000

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

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$1,226,492	\$8,500,000	\$9,726,492
Capitalized Investment	<u> </u>	<u>2,998,353</u>	<u>2,998,353</u>
Total	<u>\$1,226,492</u>	<u>\$11,498,353</u>	<u>\$12,724,845'</u>

SUMMARY PURPOSE AND SCOPE:

This project will replace aging electrical feeders and obsolete electrical equipment, reduce operation and maintenance costs, and enhance the reliability and maintainability of the exterior electrical distribution system that serves several major buildings at the Goddard Space Flight Center (GSFC).

P R O S E C T :

This project is a critical element in the overall GSFC exterior electrical distribution restoration plan. It continues modernization efforts to provide a reliable and maintainable high voltage electrical distribution system. The existing electrical distribution system is approximately 30 years old and can no longer effectively support current operations and programmed increased demands. Growth in the Center electrical power requirements, degradation of

existing cables and equipment due to age, and unavailability of spare parts have rendered the existing electrical distribution system unreliable. To correct this situation, this project will replace the existing 13.8 KV switchgear at the Central Substation thereby enhancing reliability, maintainability and operational flexibility; convert Building 16/16W to 13.8 KV, which will off-load the 4160 volt system and provide for improved mission critical operations; and replace the overhead distribution system to the Antenna Test Range (Area 100) and the Goddard Optical Research Facility (Area 200) with insulated overhead feeders, which will improve reliability to these remote sites. In addition, a loop tie feeder that interconnects Areas 100/200 to the Magnetic Test Site (Area 300) and the Propulsion Research Facility (Area 400) will be installed to significantly improve the reliability and maintainability of electric power to these areas. Replacement of the 13.8 KV primary switches and transformers, which serve chillers 7 and 8 in the central refrigeration plant will upgrade the reliability of this critical activity.

IMPACT OF DELAY:

Delay of this project will seriously jeopardize the reliability and severely limit the high voltage electrical distribution system's ability to provide adequate electric power for major operational areas of the GSFC. A failure of any of the above mentioned electrical system components would adversely impact Center operations.

PROJECT:

This project provides for the replacement of existing 13.8 KV feeders that serve Buildings 6, 11, 12, 16, 17, 22, 23, 25, 26, and 27. Existing feeders will be reconfigured, as required, to balance the loads on each feeder. Buildings 25 and 27 will be served from the east substation. The construction of a new ductbank from the east substation to Power Manhole 57, located adjacent to Building 27, is required to route feeders to Buildings 25 and 27. This project also includes replacement of the existing 13.8 KV switchgear line-ups at the central substation; replacement of the existing 13.8 KV overhead distribution system to Areas 100 and 200; installation of a 13.8 KV underground loop tie feeder between Areas 100/200 and Areas 300/400; conversion of Building 16/16W from 4160 volts to 13,800 volts; installation of redundant feeder capability to Buildings 17, 27 and 88; replacement of existing 35 KV equipment at the central substation including air switches, lightning arresters, and insulators; and replacement of existing 13.8 KV primary switches and transformers that serve chillers 7 and 8.

PROJECT COST ESTIMATE

This cost estimate is based on a Preliminary Engineering Report.

	Unit of Measure	<u>Quantity</u>	Unit Cost	<i>Cost</i>
<u>Construction</u>	---	---	---	<u>\$4,500,000</u>
Replace 13.8 KV feeders	LS	---	---	1,500,000
Replace 13.8 KV switchgear	LS	---	---	1,275,000
Replace Area 100/200 13.8 KV overhead feeders	LS	---	---	600,000
Install 13.8 KV loop tie feeder	LS	---	---	300,000
Building 16/16 W conversion to 13.8 KV	LS	---	---	300,000
Building 17, 27 & 88 Redundant 13.8 KV feeders	LS	---	---	75,000
Replace 35 KV equipment	LS	---	---	200,000
Replace transformers/switches for chillers 7 and 8	LS	---	---	<u>250,000</u>
Total				<u>\$4,500,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Location Plan, Main Complex
 Figure 2 - Location Plan, Remote Sites

OTHER EQUIPMENT SUMMARY: None

FUTURE CoF ESTIMATED FUNDING RSQUIRED TO COMPLETE THIS PROJECT: None

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1993 ESTIMATES
RESTORATION & MODERNIZATION OF ELECTRICAL DISTRIBUTION SYSTEM

LOCATION PLAN, MAIN COMPLEX

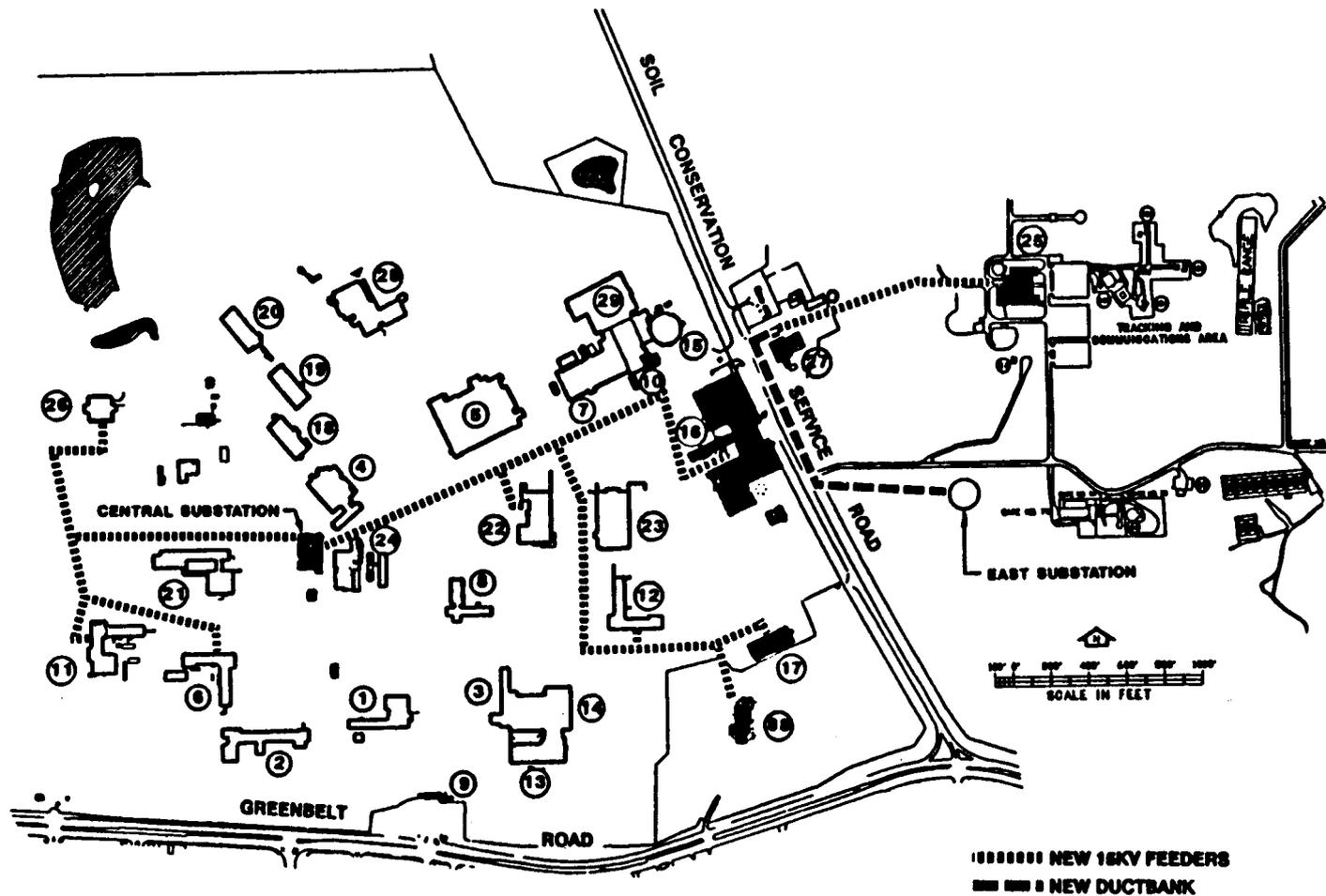


FIGURE 1

**GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1993 ESTIMATES
RESTORATION & MODERNIZATION OF ELECTRICAL DISTRIBUTION SYSTEM**

LOCATION PLAN, REMOTE SITES

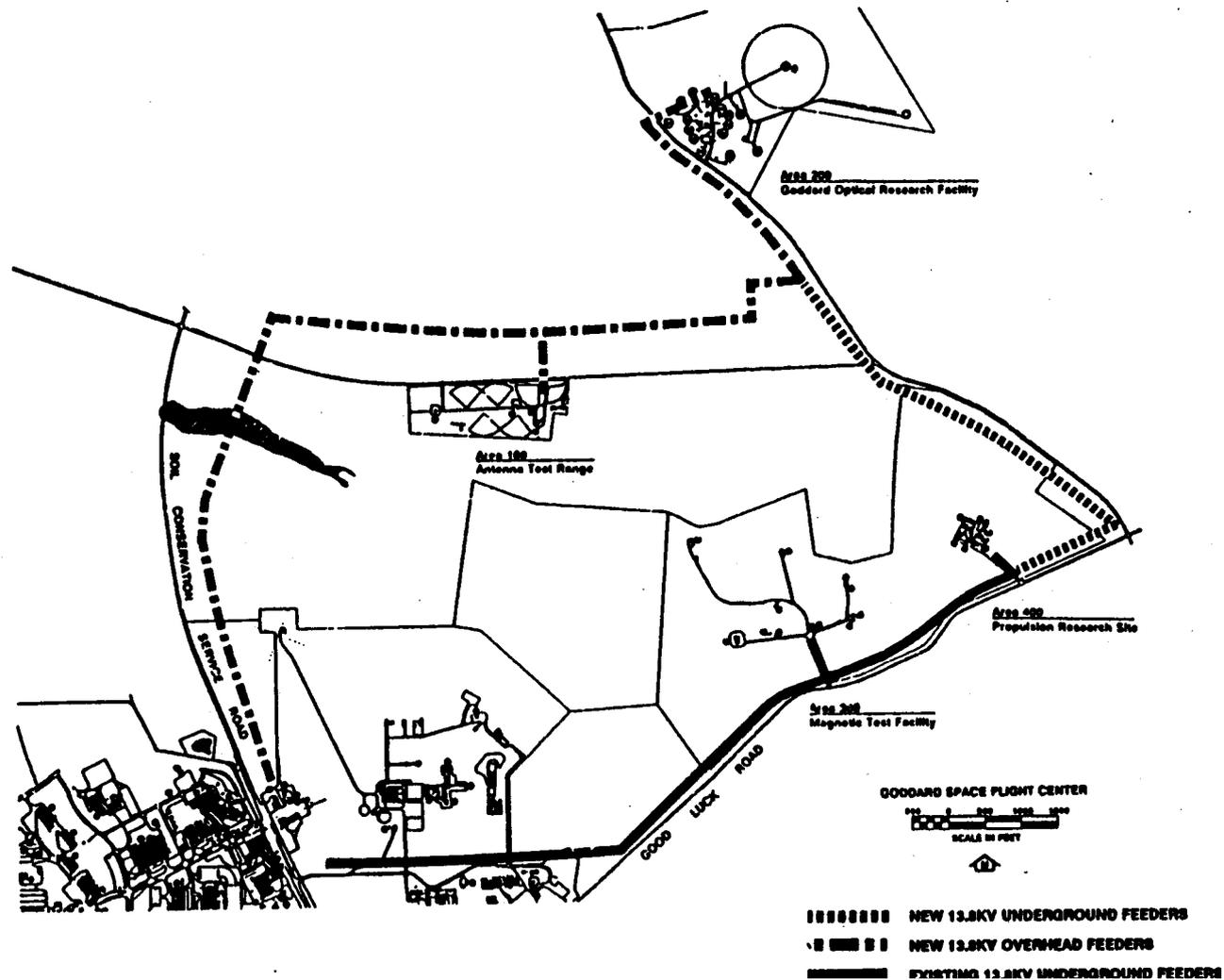


FIGURE 2

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Construction of Earth Observing System Data Information System Facility

INSTALLATION: Goddard Space Flight Center

FY 1993 CoF Estimate: \$22,300,000

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

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$3,785,000	\$23,000,000	\$26,785,000
Capitalized Investment.....	---	---	---
Total.....	<u>\$3,785,000</u>	<u>~23,000,000</u>	<u>\$26,785,000</u>

SUMMARY PURPOSE AND SCOPE:

This increment will complete the construction of the Earth Observing System Data Information System (EOSDIS) facility. The facility will provide approximately 190,000 square feet of space to house automatic data processing equipment (ADPE) and scientific, administrative, and support personnel required to maintain a processing, archiving and distribution capability in support of the Earth Observing System (EOS) Program.

PROJECT JUSTIFICATION:

The EOS program anticipates the cooperative involvement of the United States, the European Space Agency (ESA), and the Japanese National Space Development Agency (NASDA). The United States portion of the program will be implemented by NASA in cooperation with the National Oceanic and Atmospheric Administration (NOAA). The EOS program will support observation of the Earth from space using unmanned platforms. These platforms will be equipped with remote sensing instruments and will be launched into a polar orbit to facilitate viewing of all parts of the globe. The measurements obtained from these observations will constitute a 15-year data set, which will be used by scientists to construct and test models and theories about global environmental events. The results of this research will provide world leaders and policy makers with the information needed to make timely and informed decisions which will help to preserve the habitability of the global ecosystem. Currently no facility or system exists within NASA or the world scientific community that is capable of supporting the data processing and storage requirements that will be generated by the EOS. Construction of a new facility for the EOSDIS is the only viable alternative for providing the required level of EOS support. The magnitude of the facilities requirement precludes the recovery and reuse of existing GSC space, and the cost and inefficiencies associated with leasing off-Center space for a program of this magnitude and longevity would be excessive.

IMPACT OF DELAY:

Completion of the facility is required in 1994 to support the installation of associated computer equipment, Version 1 system development including component software development, installation and debugging, prior to EOSDIS Core System end-to-end integration and testing in mid-1995. Subsequently, the EOSDIS facility will accommodate the development of the expanded Version 2 system required to support the launch of the first space platform in the late 1990's. If construction of the EOSDIS facility is delayed, it will be necessary to delay acquisition and installation of the EOS data system, which will have an adverse impact on the implementation of the EOS program.

PROJECT DESCRIPTION:

The approximately 190,000-square-foot facility will be located east of Soil Conservation Service Road and north of Greenbelt Road. This increment completes the construction of the EOSDIS building and includes interior doors; fenestration; partitioning; all interior finishes; plumbing; heating, ventilating, and air conditioning systems; lighting; electrical power; fire protection and detection; uninterrupted power supply systems; special systems; elevators; and raised flooring. Remaining site/utilities infrastructure requirements to complete this facility will also be included.

The facility will consist of a combination multi-story steel and concrete structure. Exterior finish materials will consist of masonry, glass and aluminum, and architectural panels. Interior finishes include raised flooring in computer areas. Interior and exterior lighting, electrical power, building security systems, and an uninterruptible electrical system will be provided. Necessary provisions for domestic water, sanitary sewer, steam, and telephone and communications duct banks will also be provided. Construction of access roads, necessary parking, sidewalks, curbs and gutters, site lighting, landscaping, security fencing and gate house, electrical substation, and chilled water plant are also included.

PROJECT COST ESTIMATE: The cost estimate is based on a Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit cost	cost
<u>Construction..</u>	---	---	---	~ <u>22,300,000</u>
Site Development/Utilities	LS	---	---	5,300,000
EOSDIS Building	SF	190,000	89.47	17,000,000
Electrical Interior... ..	SF	190,000	34.74	(6,600,000)
Mechanical Interior.....	SF	190,000	28.95	(5,500,000)
Interior Construction....	SF	190,000	22.63	(4,300,000)
Special Equipment.....	LS	---	---	(600,000)
Total				<u>\$22,300,000</u>

Note: The total estimated cost of the project is \$45.3 million; \$8.0 million was provided in FY 1991 and \$15.0 million in FY 1992.

LIST OF RELATED GRAPHICS: Figure 1 - Location Plan Figure 2 - Building Section

OTHER EQUIPMENT SUMMARY: Approximately \$500,000,000 of Research and Development funded computer equipment is needed to support data processing, information management, and data archiving requirements.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1983 ESTIMATES
CONSTRUCTION OF EARTH OBSERVING SYSTEM DATA INFORMATION SYSTEM FACILITY (EOSDIS)

LOCATION PLAN

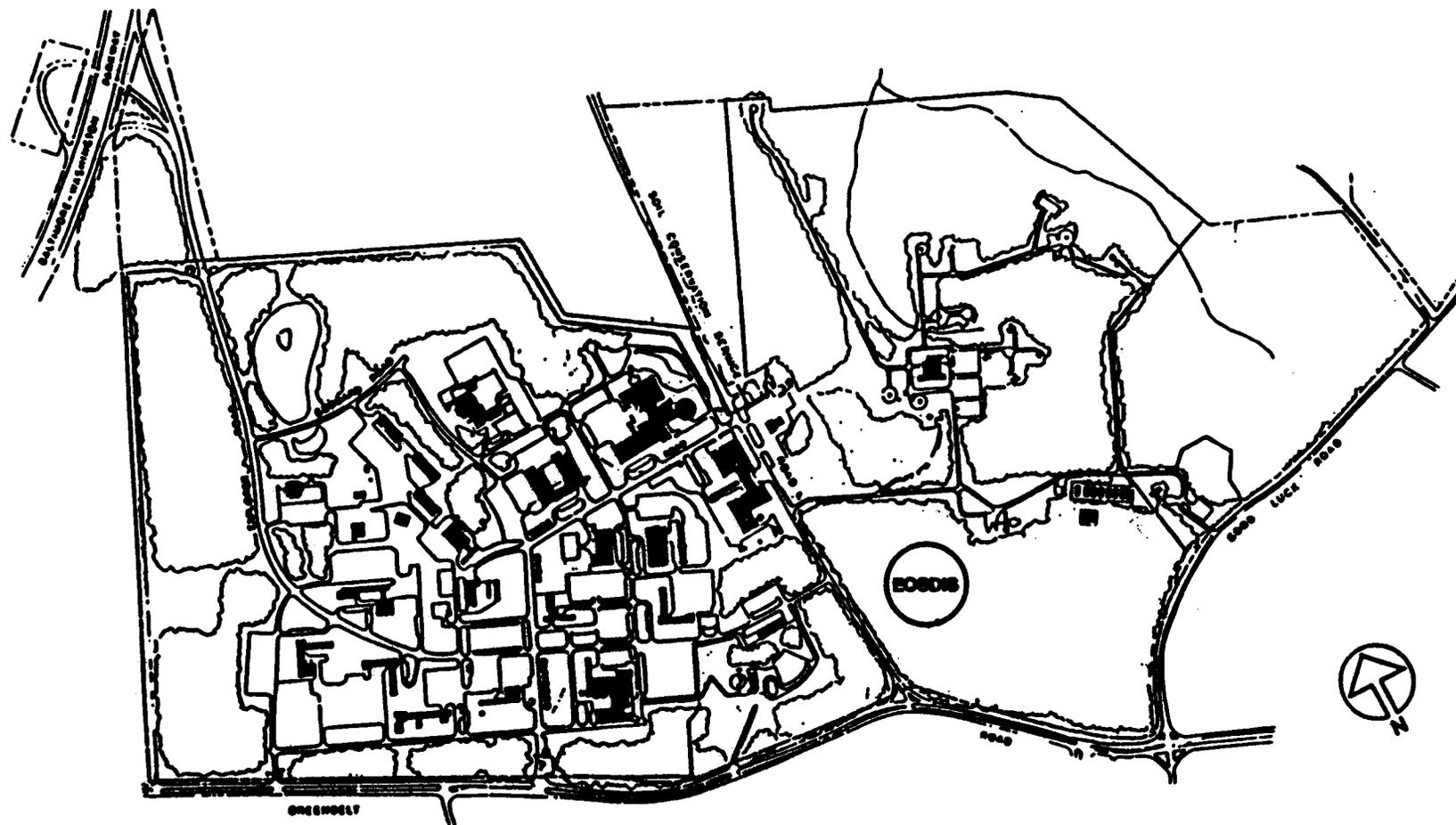


FIGURE 1

**GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1993 ESTIMATES
CONSTRUCTION OF EARTH OBSERVING SYSTEM DATA INFORMATION SYSTEM FACILITY (EOSDIS)**

BUILDING SECTION

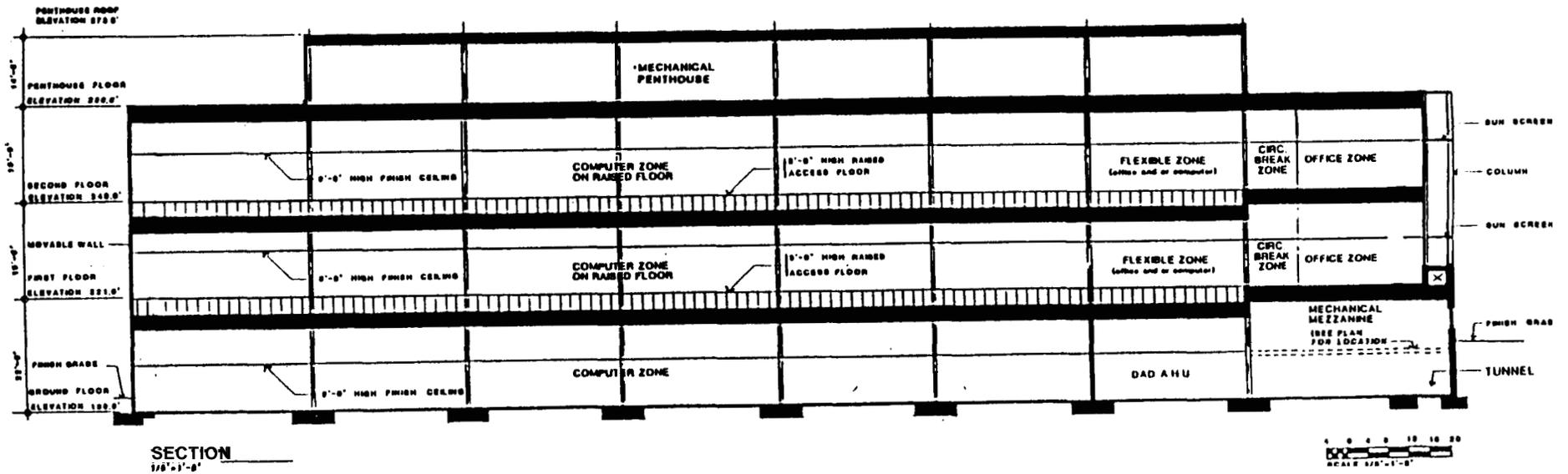


FIGURE 2

AERONAUTICAL
FACILITIES
REVITALIZATION



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 CONSTRUCTION OF FACILITIES
 FISCAL YEAR 1993 ESTIMATES

SUMMARY

AERONAUTICAL FACILITIES REVITALIZATION

Office of Aeronautics and Space Technology: -----	Amount ----- (Dollars)	Page No. ----
Modernization of the Unitary Plan Wind Tunnel Complex, Ames Research Center.	8,000,000	CF 7-1
Modernization of 16-Foot Transonic Tunnel, Langley Research Center.....	3,600,000	CF 7-6
Modifications to 14 by 22-Foot Subsonic Wind Tunnel, Langley Research Center.	2,200,000	CF 7-10
Rehabilitation of Icing Research Tunnel, Lewis Research Center.. ..	2,700,000	CF 7-14
Repair and Modernization of the 12-Foot Pressure Wind Tunnel, Ames Research Center.	21,400,000	CF 7-18
Rehabilitation of Central Air System, Lewis Research Center.. ..	12,200,000	CF 7-23

Total.....	<u>50,100,000</u>	

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Modernization of the Unitary Plan Wind Tunnel Complex

INSTALLATION: Ames Research Center

FY 1993 CoF Estimate: \$8,000,000

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

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1997 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$4,500,000	---	\$ 4,500,000
Capitalized Investment	<u>---</u>	<u>\$44,348,340</u>	<u>44,348,340</u>
Total	<u>\$4,500,000</u>	<u>\$44,348,340</u>	<u>\$48,848,340</u>

SUMMARY PURPOSE AND SCOPE:

This project provides funding for modernization of the Unitary Plan Wind Tunnel Complex to improve productivity, reliability, and the quality of test results. The project will provide new automated tunnel and model support controls; automated controls for tunnel auxiliaries; flow quality improvements in the 11 by 11 foot Transonic Wind Tunnel (11-ft TWT); repair or replacement of aging facility systems; and repair of weld defects in the pressure shell to allow recertification. This increment of work starts construction of the project. This project is included in the Aeronautical Facilities Revitalization Program.

PROJECT JUSTIFICATION:

The Unitary Plan Wind Tunnel is a vital National high-speed tunnel facility consisting of one transonic and two supersonic test sections and supporting auxiliary equipment. This facility is the most heavily used wind tunnel complex in NASA. However, the facility's productivity is limited by the 1950's era control systems and the increasing frequency of equipment breakdowns due to age and heavy use. Modernization is needed now to improve productivity, data quality, and reliability. This complex has been operated on three-shifts-per-day basis since 1956 with minimal improvements to the facility. Tunnel downtime due to equipment and control failures has caused major delays to important aircraft projects. Tunnel backlog of testing exceeds two years. Lack of modern data acquisition equipment results in over half of tunnel tests being concluded before all needed data is acquired. Tunnel downtime is over 25 percent of tunnel occupancy time and is increasing. Comparable foreign facilities have shown two to three times the productivity achieved in this wind tunnel complex. Therefore, the United States leadership role in aeronautics is being jeopardized.

The UPWT Complex has contributed to the development of almost every U.S. developed military and civil aircraft flying in its speed regime of Mach 0.3 to 3.5, as well as Mercury, Gemini, Apollo, and Space Shuttle spacecraft. Current scheduled programs include the Advanced Tactical Fighter, Advanced Tactical Aircraft, National Aero-Space Plane, Boeing 767X, McDonnell-Douglas-11, and McDonnell-Douglas-87V/88V. Modern aircraft place much greater demands on the accuracy of flight simulation in the tunnel. The improvements in control and flow quality to be implemented in this project will significantly increase the quality of the simulation.

Repair or replacement of tunnel components that have reached the end of their useful life will significantly reduce downtime and improve reliability. Also, the welds in the tunnel shell contain defects typical of 1950's technology. These defects must be repaired and the pressure shell recertified over the full design pressure range to safely operate the tunnel in the future.

IMPACT OF DELAY:

Failure to modernize this facility will increase the delay in acquiring critical test data. The existing (unmodified) facility will continue to fail more frequently, requiring the use of alternate testing resources in Europe and other countries. This in turn, will reduce or delay improvements to U.S. commercial and military aircraft, and will significantly increase the cost of testing. In addition, NASA's leadership role in aeronautical research and development will diminish with incalculable detrimental consequences.

PROJECT DESCRIPTION:

This increment of work will initiate construction of facility refurbishments; controls modernization, automation, and replacement; flow quality improvements and pressure vessel shell repair. The total project includes refurbishing and providing automated controls for the tunnel systems, model support systems, make-up air system, and compressor lubrication system; enlarging and modernizing the control rooms; and installing flow quality improvements in the 11-ft Transonic Wind Tunnel. The project also includes refurbishing, repairing, or replacing major components, including the cooling tower, large electrical switch-gear, and make-up air system; and repairing weld defects in the pressurized portions of the tunnel circuits and make-up air system and recertifying the pressurized systems for safe operation.

PROJECT COST ESTIMATE: Based on a preliminary engineering report and a preliminary design.

	Unit of Measure	Quantity	Unit Cost	Cost
<u>Construction:</u>	---	---	---	<u>\$8,000,000</u>
Facility Refurbishments	LS	---	---	2,000,000
Refurbish and Replace Tunnel Control System	LS	---	---	2,000,000
Repair of Pressure Vessels	LS	---	---	3,800,000
Flow Quality Improvements	LS	---	---	200,000
Total				<u>\$8,000,000</u>

Note: The present estimated construction cost of the total project is \$63 million.

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Perspective

OTHER EQUIPMENT SUMMARY: Data acquisition systems, model check-out equipment, and advanced instrumentation estimated to cost \$8.4 million will be located in this facility.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: Based on preliminary estimates developed prior to completion of the final design, it is estimated that \$55 million will be required to complete the project.

EN
SCALE EAR 1993 ES II
WIND TUNNEL COMPLEX

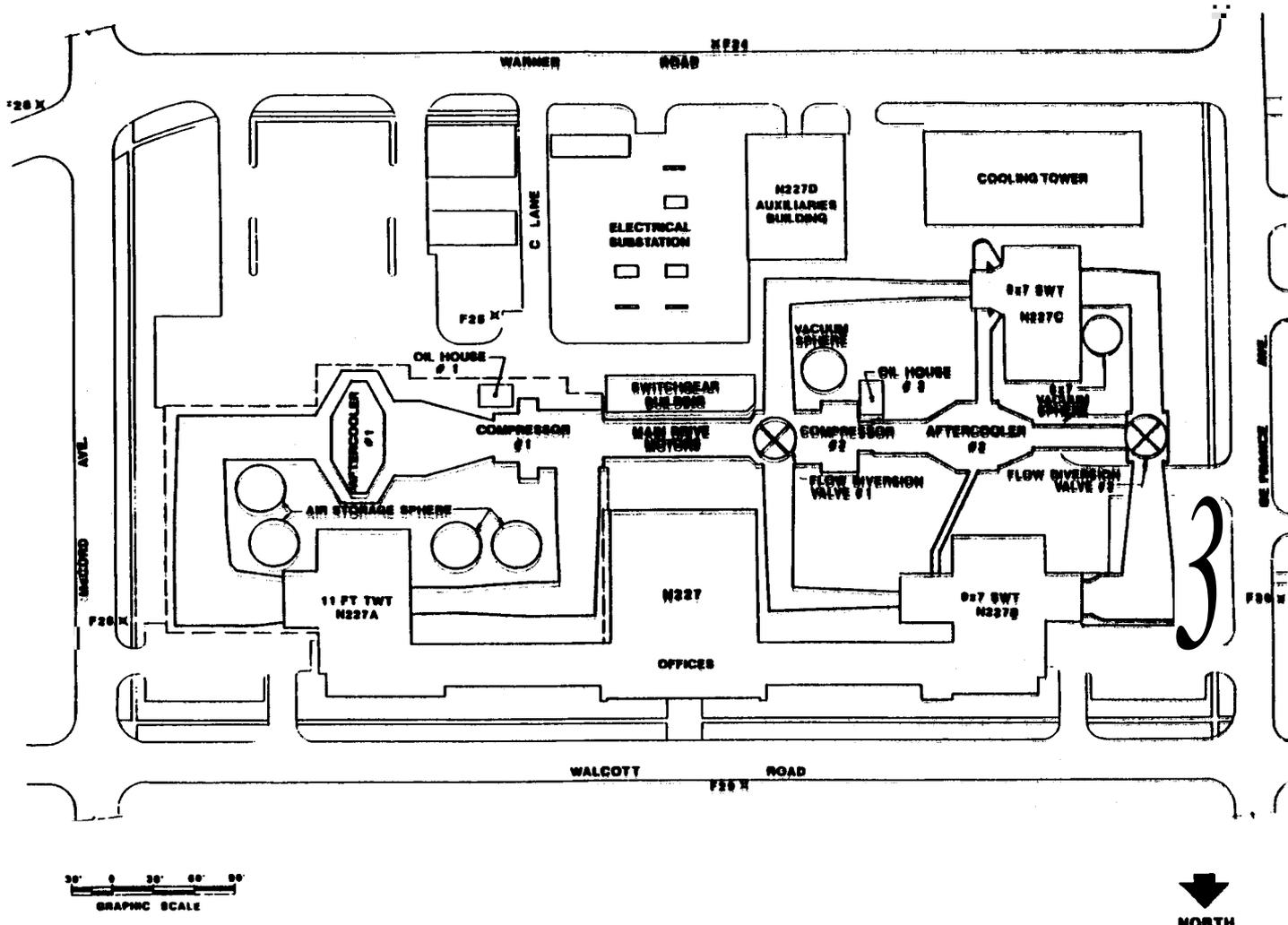
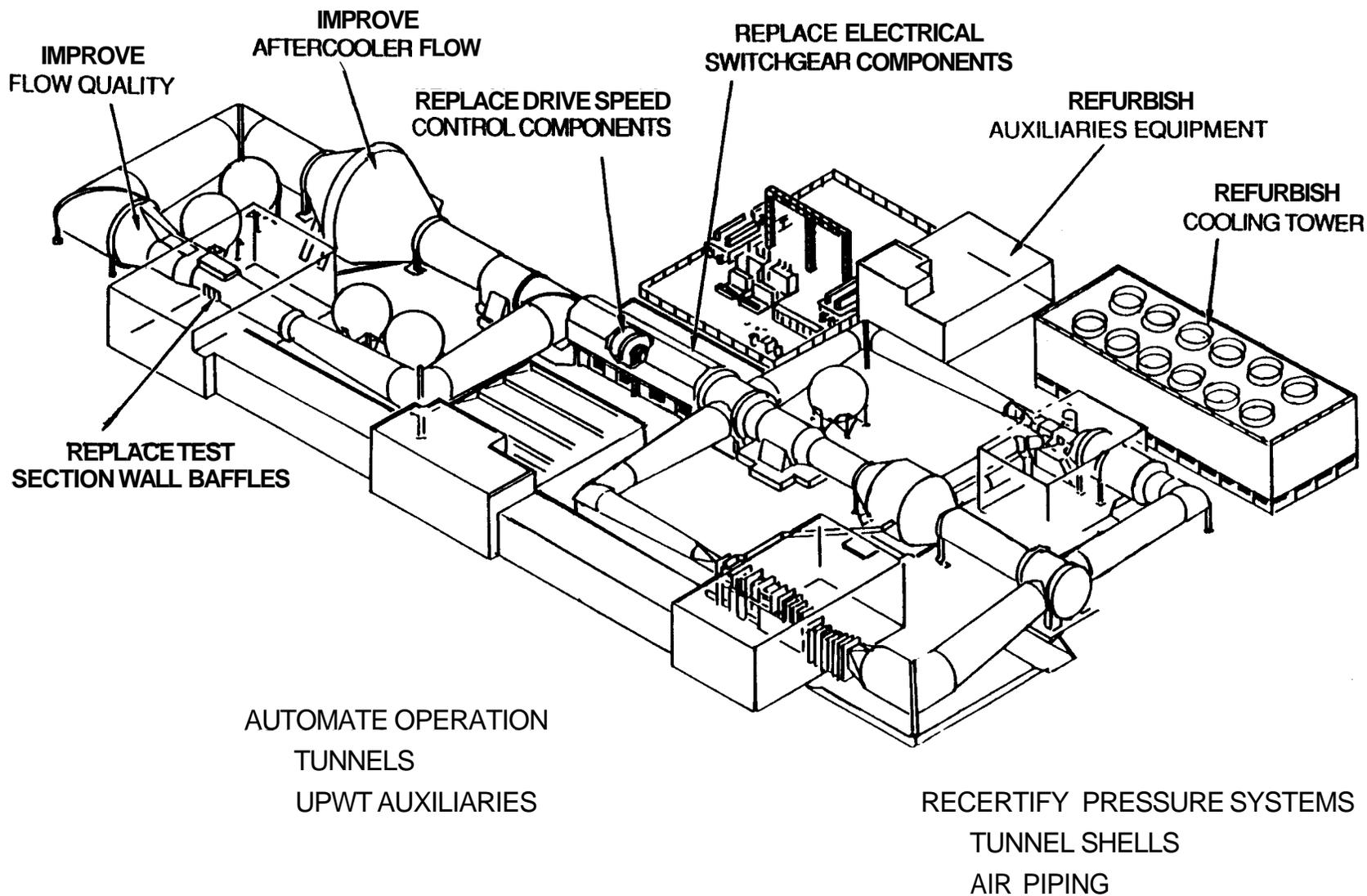


FIGURE 1
SITE PLAN

**AMES RESEARCH CENTER
FISCAL YEAR 1993 ESTIMATES
MODERNIZATION OF UNITARY PLAN WIND TUNNEL COMPLEX**



**FIGURE 2
PERSPECTIVE**

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE : Modernization of the 16-Foot Transonic Tunnel

INSTALLATION: Langley Research Center

FY 1993 CoF Estimate: \$3,600,000

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding.....	\$376,000	---	\$ 376,000
Capitalized Investment.....	---	<u>\$25,557,070</u>	<u>25,557,070</u>
Total.. ..	<u>\$376,000</u>	<u>\$25,557,070</u>	<u>\$25,933,070</u>

SUMMARY PURPOSE AND SCOPE:

This project is part of the NASA Aeronautical Facilities Revitalization program. The project will increase tunnel productivity significantly and provide increased model propulsion air flow to satisfy **research** and development testing of dual flow exhaust system integration for subsonic transports; and for high **speed** transports that have dual exhaust streams for noise abatement. This second high pressure, air-reducing station will separate the air system operation for the 16-Foot Transonic Tunnel **from** the National Transonic Facility (NTF). The project also includes refurbishment of the deteriorated air exchange tower?, tunnel components, and an addition to the building for personnel and model preparation **work**.

PROJECT JUSTIFICATION:

The 16-Foot Transonic Tunnel is a large transonic facility dedicated to airframe/propulsion integration research. The enhanced capabilities, structural refurbishment, and increased productivity are required because: (1) a huge backlog of test requests for the 16-Foot Transonic Tunnel requires improvement in productivity to reduce the time required for individual tests; (2) an increased emphasis on dual flow nozzle designs for advanced aircraft has created a new and continuing demand for an additional propulsion high mass-flow air system to conduct research which is beyond the capability of the current system; (3) the large increase in tests will create a need for additional data analysis space, and model storage area; (4) the additional high pressure air-reducing station will allow independent operation of both the 16-Foot Transonic Tunnel and the National Transonic Facility; and (5) the fiber glass coating on the existing fan blades is deteriorating (1000 man hours per year of overtime pay for continual repair) and causing high research time losses.

IMPACT OF DELAY:

Delay of this project will prolong and exacerbate the large backlog of test requests and research programs focused on optimizing the integration of advanced engine/airframe systems for this Nation's future in aeronautics. If the current high pressure air-reducing system fails, it will shut down both the NIF and the 16-Foot Transonic Tunnel.

PROJECT DESCRIPTION:

This project includes the following: 1) Semi-Span Model Support - Provides capability to test at higher Reynolds numbers with the increase due to the ability to test large models; 2) Additional Propulsion High Mass-Flow System - Additional propulsion simulation system for dual air flow simulation will consist of an independent air source which will include a new pressure reducing station, valves, filters, controls, and piping capable of continuous flow at a maximum mass flow rate of 30 lb/sec at 1800 psi; 3) Refurbishment of Air Exchange Tower and Tunnel Components - Repairs metal surfaces on the intake and exhaust vanes, replace exterior wall panels of the exhaust tower, replaces the cable mechanism of the exhaust vanes actuator, and repairs and replaces tunnel bolting; 4) Addition to Building 1146 - Existing capabilities for propulsion integration data analysis will be upgraded by a 6900 gross square foot addition to Building 1146 consisting of engineers' work area, storage areas, computer rooms, elevator, offices, and conference room enlargement; and 5) Rework Fan Blades- Repair is required to avoid damage to the 51 fan blades.

PROJECT COST ESTIMATE: Based on completed final design.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Cost</u>
<u>Construction....</u>	---	---		<u>\$3,600,000</u>
Semi-Span Model Support.....	LS	---	---	328,000
Propulsion Air System.....	LS	---	---	305,000
Air Exchange Tower.....	LS	---	---	1,319,000
Addition to Bldg. 1146.....	LS	---	---	1,420,000
Fan Blade Repair.....	LS	---	---	228,000
Total..				<u>\$3,600,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

LANGLEY RESEARCH CENTER
FISCAL YEAR 1993 ESTIMATE
MODERNIZATION OF THE 16-FOOT TRANSONIC TUNNEL

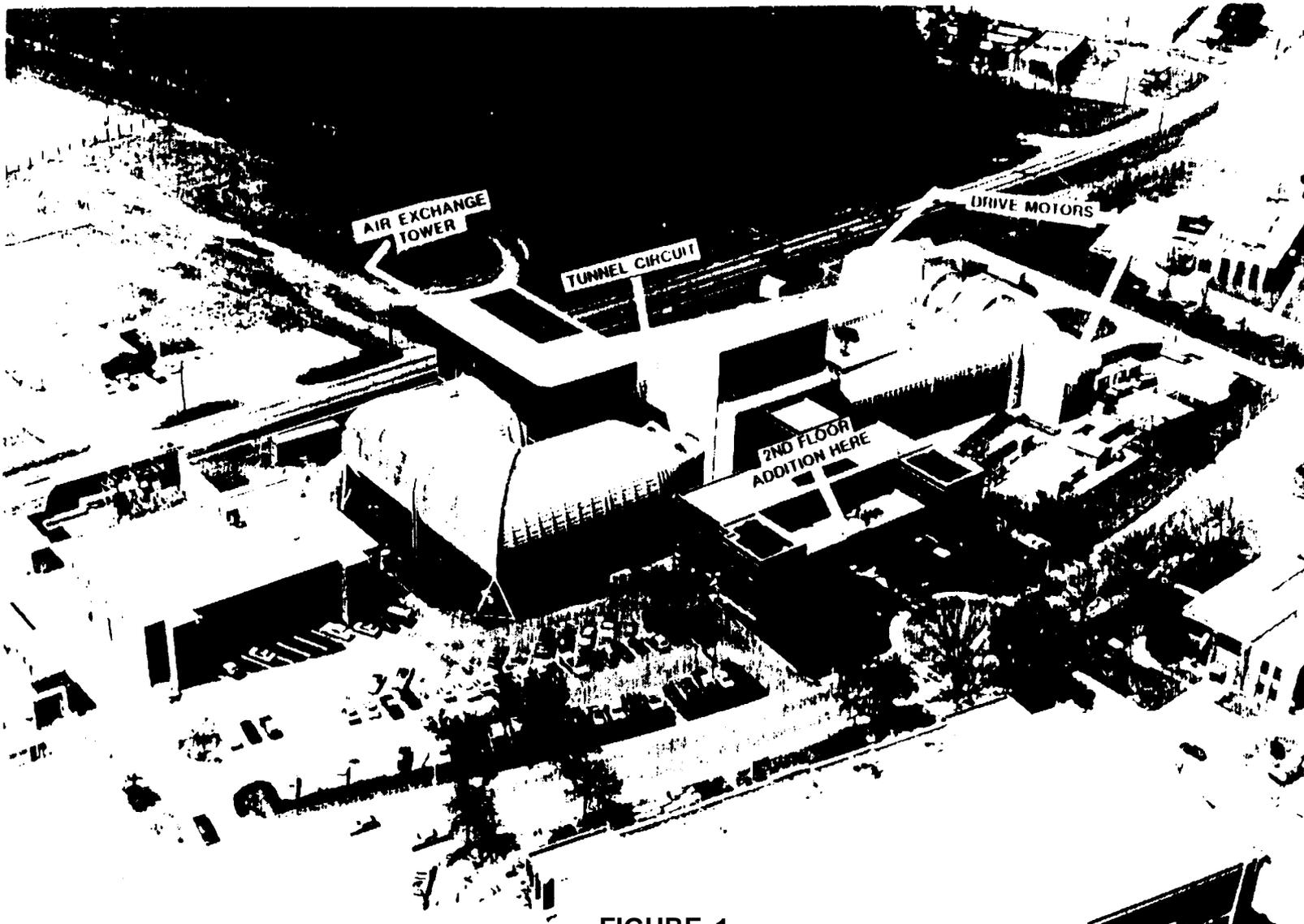


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Modifications to 14- by 27-Foot Subsonic Wind Tunnel

INSTALLATION: Langley Research Center

FY 1993 CoF ESTIMATE: \$2,200,000

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$145,008	---	\$ 145,000
Capitalized Investment :	---	\$14,728,857	14,728,857
Total	<u>\$145,000</u>	<u>\$14,728,857</u>	<u>\$14,873,857</u>

SUMMARY PURPOSE AND SCOPE:

This project will provide ground based wind-tunnel simulation of actual flight conditions during landing and high-rate angular motions in maneuvering. Currently, no capability exists to investigate rate-of-dasceit effects and large amplitude, high-Pate angular motions in wind-tunnel facilities. This project will provide a model support system with the vertical motion speeds and angular pitch rates needed to simulate these parameters. This project is included in the Aeronautical Facilities Revitalization Program,

PROJECT JUSTIFICATION:

Recent experimental results obtained in the Langley Vortex Research Facility (VRF) have shown that the rate of descent is a very important parameter in analyzing ground effects. Flight data has shown that aircraft undergoing high-rate maneuvers can experience engine compressor stalls due to flow problems associated with the high incidence flow entering the engine inlets. The next generation of highly maneuverable aircraft will be required to perform short take-offs and landings and must possess extreme maneuvering capability. No capability exists for this rate-of-descent testing and large amplitude, high-angular-rate testing.

To obtain experimental wind-tunnel results with rate of descent, large amplitude and high-rate angular motions, a new model support system is needed. This system will have the capability to provide vertical motion for rates-of-descent up to 15 ft/sec and pitching motion for angular rates up to 60 deg/sec. The system will be computer-controlled and hydraulically-powered to provide a range of vertical speeds and angular rates which can be used either together or separately, as required by test objectives.

IMPACT OF DELAY:

A delay in this project will eliminate the possibility of rate-of-descent testing and large amplitude, high-rate angular testing for maneuvering aircraft since no such capability currently exists.

PROJECT:

This project includes a new computer-controlled model support system, powered by a 5,000-psi hydraulic system, to provide vertical velocities up to 15 ft/sec and pitch angular rates up to 60 deg/sec. Vertical and pitch motions will be commanded together or separately, as required by the test program. The complete support system consists of a new vertical post assembly and drive mechanism, a new model support cart to provide the required system stiffness and impedance, yaw motion, and an 8-foot by 8-foot moving-belt ground plane located ahead of the post in the floor of the cart.

PROJECT COST ESTIMATE: Based on completed final design.

	Unit of Measure	Quantity	Unit Cost	Cost
<u>Construction</u>	---	---	---	<u>\$2,200,000</u>
Cart Frame	LS	---	---	401,000
Model Support System	LS	---	---	355,000
Hydraulics/Piping	LS	---	---	505,000
Electrical/Automation	LS	---	---	446,000
Yaw System	LS	---	---	24,000
Ground Belt System	LS	---	---	438,000
Mechanical Equipment	LS	---	---	31,000
Total				<u>\$2,200,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Dynamic Model Support System

OTHER EQUIPMENT SUMMARY: None

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

LANGLEY RESEARCH CENTER
 FISCAL YEAR 1993 ESTIMATES
 MODIFICATIONS TO 14- BY 22-FOOT SUBSONIC WIND TUNNEL (1212C)
 DYNAMIC MODEL SUPPORT SYSTEM

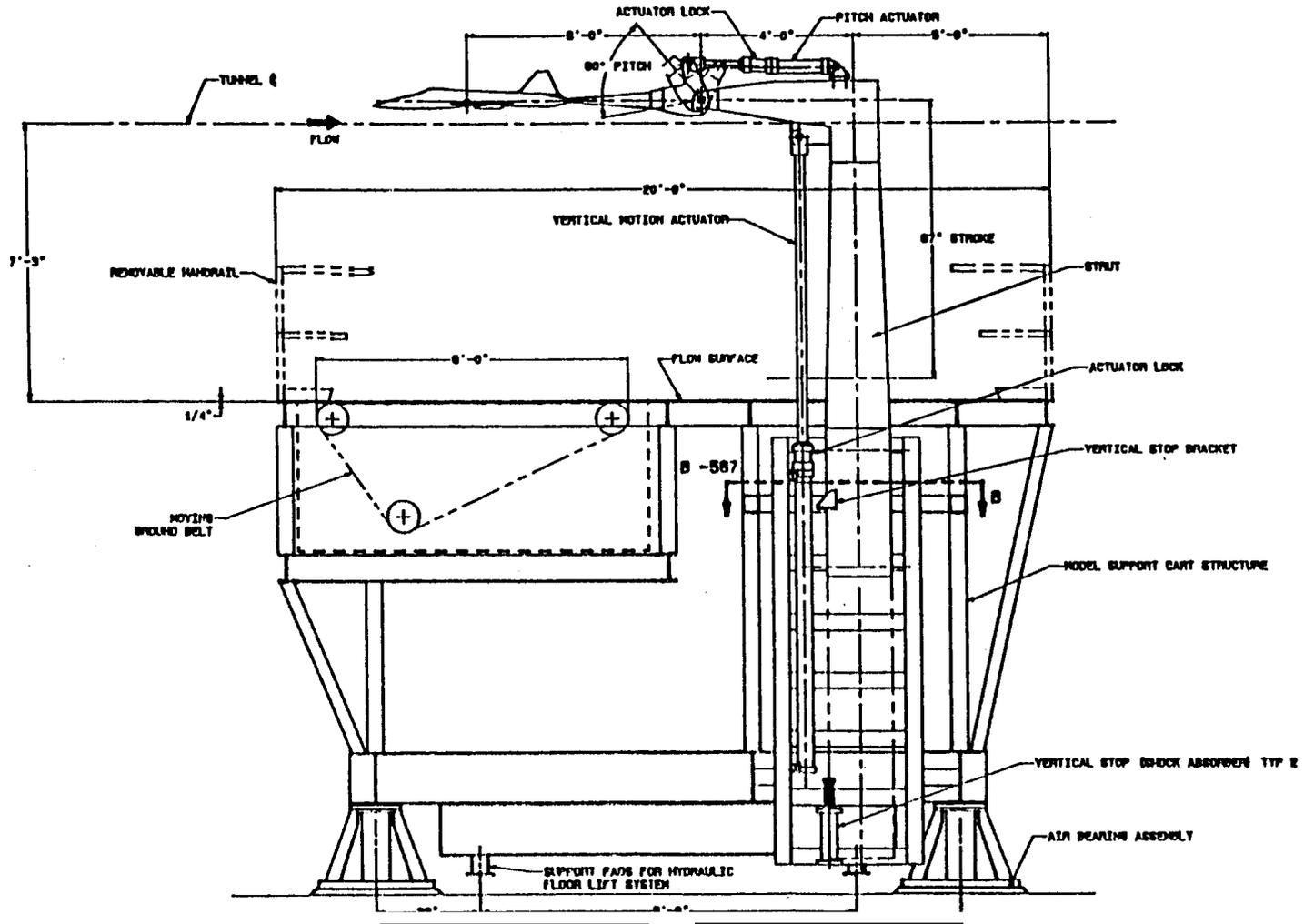


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Rehabilitation of Icing Research Tunnel

INSTALLATION: Lewis Research Center

FY 1993 CoF Estimate: \$2,700,000

LOCATION OF PROJECT: Cleveland, Cuyahoga County, Ohio

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1992 AND PRIOR YEARS' FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific: CoF Funding.....	\$ 260,000	---	\$ 260,000
Capitalized Investment.....	---	\$ 4,063,500	\$ 4,063,500
Total.....	<u>\$ 260,000</u>	<u>\$ 4,063,500</u>	<u>\$ 4,323,500</u>

SUMMARY PURPOSE AND SCOPE?

This project provides for the rehabilitation of the Icing Research Tunnel (IRT) to ensure its continued operation in support of the development of all-weather aircraft and propulsion systems for the nation's aircraft. The work in the project includes the rehabilitation of various components of the facility structure and modifications which will improve test productivity and the quality of the air flow in the test sections. This project is part of the Aeronautical Facilities Revitalization Program.

PROJECT JUSTIFICATION:

The IRT is the nation's largest refrigerated icing research tunnel. It provides the testing capability to develop ice protection systems for all aircraft certified in the U.S. to fly into atmospheric conditions in which ice will

develop on the aircraft. The IRT was designed and constructed in 1942-1944. The environmental test conditions (ice and water) within the tunnel have resulted in severe deterioration of many components. This project is needed to restore the IRT structure, pressure shell, and supports to safe and reliable operating condition and to assure the continued reliability and productivity of the unique icing capability of the IRT. Aircraft advancements have resulted in icing conditions at increased flight speeds. Modifications to the IRT are required to increase its capability for testing and development of ice protection systems at these increased flight speeds.

IMPACT OF DELAY:

A delay of the project increases the risk of a failure of the presently 47-year old structure and test section. The resulting impact for the IRT will be the delay of development of all weather capability for rotor craft and the delay of development of electronic deicing systems for the next generation transport aircraft. Programs supporting commercial aircraft testing will be impacted which will adversely affect the safety of commercial aviation in the U.S. Additionally, the development of computational capability related to predication of icing fundamentals will be impeded because the essential testing verification will be delayed.

PROJECT DESCRIPTION:

- A. Rehabilitation of the tunnel pressure shell by repairing the inner pressure shell, structural framing and supports along the return leg section of the tunnel. Additional work includes removal of the exterior covering and asbestos contaminated insulation, cleaning and painting of the tunnel shell, reinsulating and reskinning the tunnel.
- B. Rehabilitation of the balance chamber exterior by repairing the balance chamber exterior liner panel, pressure shell and framing; removal of asbestos contaminated insulation, and replacement with new insulation.
- C. Modification of the test section top entry hatch and the diffuser leg access hatches to improve tunnel productivity and performance.
- D. Modification of tunnel flow path profiles between the bellmouth contraction and the first downstream turn of the test section to improve flow quality.
- E. Modification of the test section viewing windows and control room to improve model viewing capability during tests.
- F. Rehabilitation of the drive motor cooling fan assembly.

PROJECT COST ESTIMATE: Based on final design.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>cost</u>
<u>Construction.....</u>		---	---	<u>82,700,000</u>
Rehabilitation of Tunnel Pressure Shell.....	LS	---	---	1,620,000
Rehabilitation of Balance Chamber Exterior.....	LS	---	---	500,000
Modifications to Access Hatches.....	LS	---	---	305,000
Modifications for Flow Quality Improvements.....	LS	---	---	90,000
Modifications to Test Chamber.....	LS	---	---	140,000
Rehabilitation of Drive Motor Cooling Fan... ..	LS	---	---	45,000
Total.....				<u>\$2,700,000,</u>

LIST OF RELATED GRAPHICS: Figure 1 - IRT Tunnel Plan

OTHER EQUIPMENT SUMMARY: None

FUTURE CoF ESTIMATED FUNDING ,REQUIRED TO COMPLETE THIS PROJECT: None

LEWIS RESEARCH CENTER
FISCAL YEAR 1993 ESTIMATES
REHABILITATION OF ICING RESEARCH TUNNEL

IRT TUNNEL PLAN

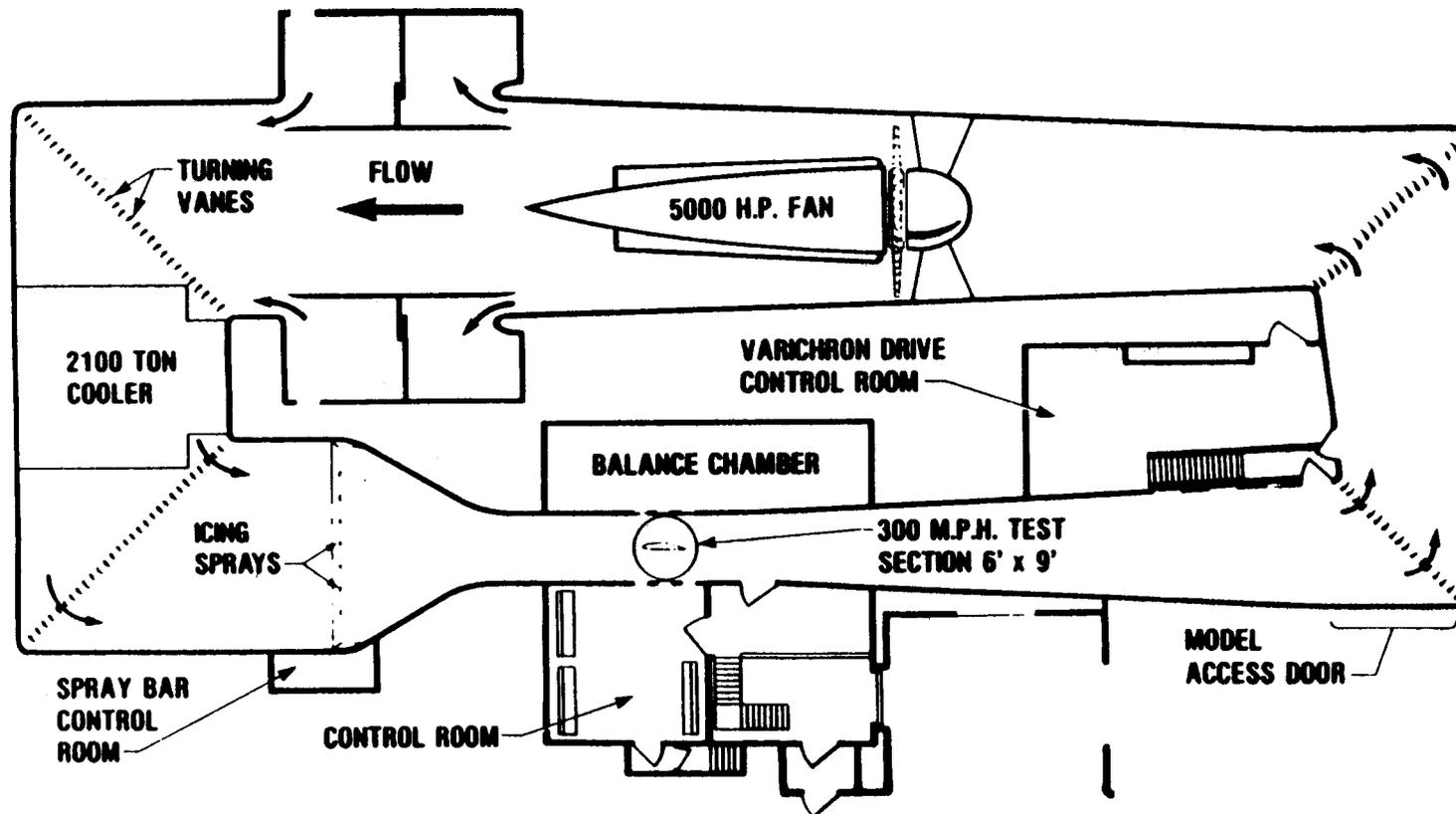


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR. 1993 ESTIMATES

PROJECT TITLE: Repair and Modernization of the 12-Foot Pressure Wind Tunnel

INSTALLATION: Ames Research Center

FY 1993 CoF Estimate: \$21,400,000

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

COGNIXANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$9,091,000	\$80,393,000	\$89,484,000
Capitalized Investment	<u> </u>	<u>10,227,597</u>	<u>10,227,597</u>
Total	<u>\$9,091,000</u>	<u>\$90,620,597</u>	<u>\$99,711,597</u>

SUMMARY PURPOSE AND SCOPE:

This increment of work will complete the repair and modernization of the 12-Foot Pressure Wind Tunnel. The total project will return the tunnel to its original operating capability of six atmospheres, modernize tunnel control systems and model preparation areas, add new capability to make changes ON test models without depressurizing the entire tunnel, and modernize model supports **within** the tunnel to enable a larger range of tests. The facility is required to support the nation's rapidly expanding requirements for low speed, **low** turbulence level, high quality flow and high Reynolds Number, aeronautics testing. This increment completes the repair and modernization of tunnel components, testing, and integration of tunnel systems.

PROJECT JUSTIFICATION

The 12-Foot Pressure Wind Tunnel is a subsonic pressure wind tunnel of national importance which has provided critical high Reynolds Number test capability to NASA, DoD, and the U.S. aircraft industry since 1946. The tunnel has an exceptionally low free stream turbulence level, high quality flow, wide range of flight regimes, and large test section capability for high fidelity models. Since 1965, essentially every military aircraft and civil transport has been tested in the 12-Foot Pressure Wind Tunnel. The discovery of severe, unreparable weld defects forced the derating of the tunnel to one atmosphere of pressure in September 1986 to preclude the possibility of a catastrophic failure. Additional unreparable weld flaws were found in the Make-Up-Air piping. Without repair of the pressure shell and piping for a six atmosphere pressure operation, the 12-Foot Pressure Wind Tunnel could not be used to provide critical high angle of attack, high lift, and laminar flow data for the development of the nation's advanced aircraft.

The 12-Foot Pressure Wind Tunnel is a high-demand facility with tests typically scheduled eight to sixteen months in advance with two-shifts-per-day operation. During its operation, the productivity was severely limited because the entire tunnel circuit had to be depressurized for model changes or adjustments. In addition, the inability to assemble, check out, and calibrate models outside the test section and the use of outdated and obsolete model support systems and controls severely hampered and limited efficient use of the tunnel. The modernization portion of this project will result in a significant increase in productivity with installation of a test section pressure isolation system, a modern measurement and automation system, and dedicated model preparation and calibration areas.

IMPACT OF DELAY:

The backlog of important tests continues to grow as the repair and modernization of this facility progresses. Constraints have been imposed on important aeronautical research and development projects, which contribute to further erosion of the U.S. aeronautical competitive position relative to foreign competition and national defense. Completion of this project is essential at this time.

PROJECT:

This increment completes the replacement of the six atmosphere pressure shell and support structure, control systems, equipment installation; settling chamber internals; Building N206 modifications; cooling system modifications; and the installation of a new spherical rotating test section plenum to provide pressure isolation. The project includes new model handling systems and supports; a new solid state speed control; enhanced Mach Number and Reynolds Number control by modifying the countervane, inlet guide vane and main drive speed controls; and installing a new internal radiator for airstream cooling. The existing air flow cooling system is being replaced, including piping, valves, pumps, cooling tower, and controls. Modern tunnel

automation and system controls are being installed. The tunnel support building is being modified to include a second story addition. Two new model preparation rooms are being provided. The existing control room is being modernized to include raised computer flooring, visual access to the model staging area, control consoles, lighting, power, and air-conditioning as required. A new computer support room is being provided. The building's roof is being raised to accommodate installation of a new 20-ton bridge crane.

PROJECT COST ESTIMATE: This cost estimate is based on bid results, completed designs, and an independent cost analysis performed by a professional construction estimating firm,

	Unit of Measure	Quantity	Unit Cost	Cost
Construction:		---	---	\$21,400,000
Shell Replacement	LS	---	---	900,000
Test Section Isolation/Model Supports	LS	---	---	4,600,000
Equipment Installation	LS	---	---	3,500,000
Settling Chamber/Internals	LS	---	---	1,500,000
Controls and Automation	LS	---	---	3,400,000
Cooling System/Building Mods	LS	---	---	1,800,000
Integration/Systems Testing	LS	---	---	4,800,000
Construction Mgt and Inspection	LS	---	---	1,700,000
Total				\$21,400,000

LIST OF RELATED GRAPHICS: Figure 1 - Site Plan Figure 2 - Scope

OTHER EQUIPMENT SUMMARY: None

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

AMES RESEARCH CENTER
FISCAL YEAR 1993 ESTIMATES
REPAIR AND MODERNIZATION OF THE 12-FOOT PRESSURE WIND TUNNEL

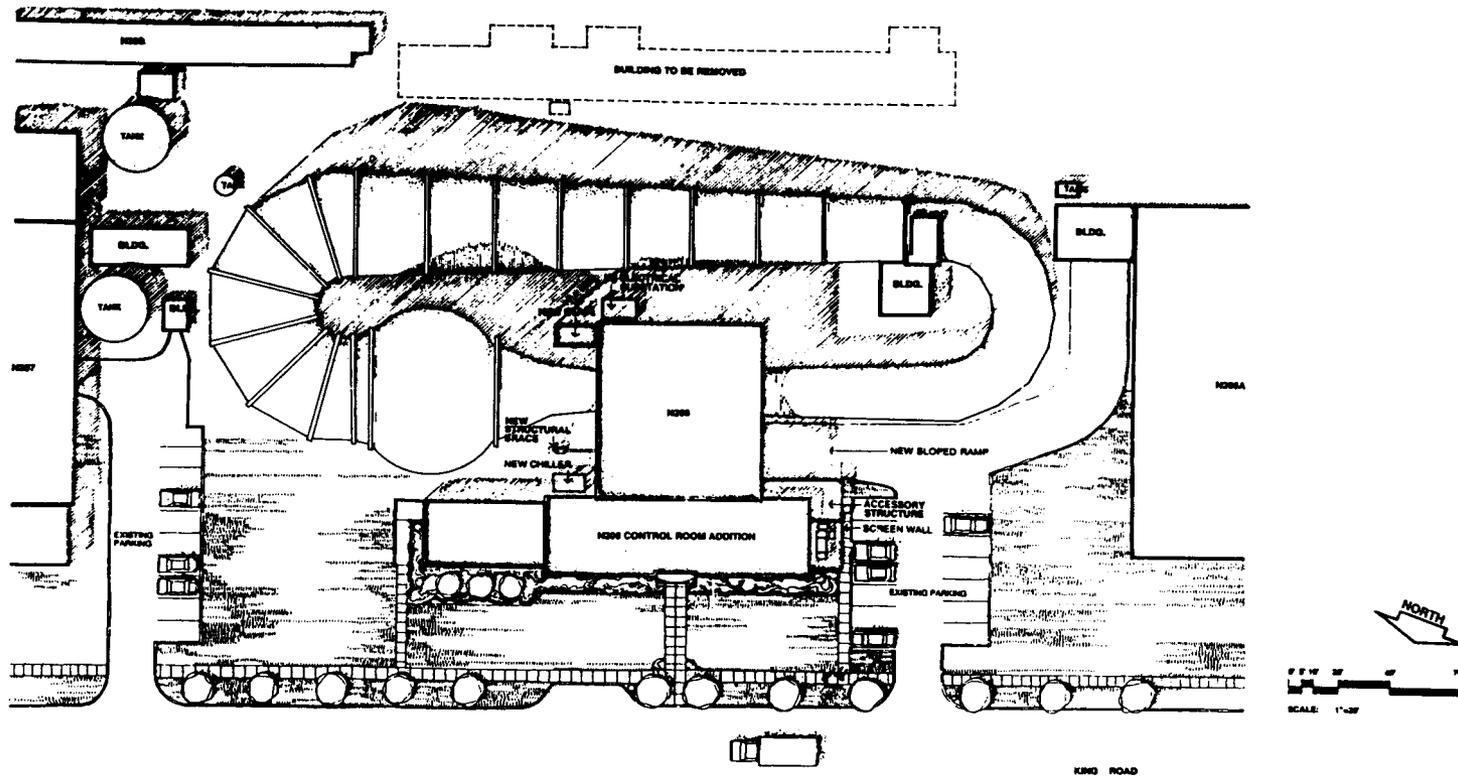
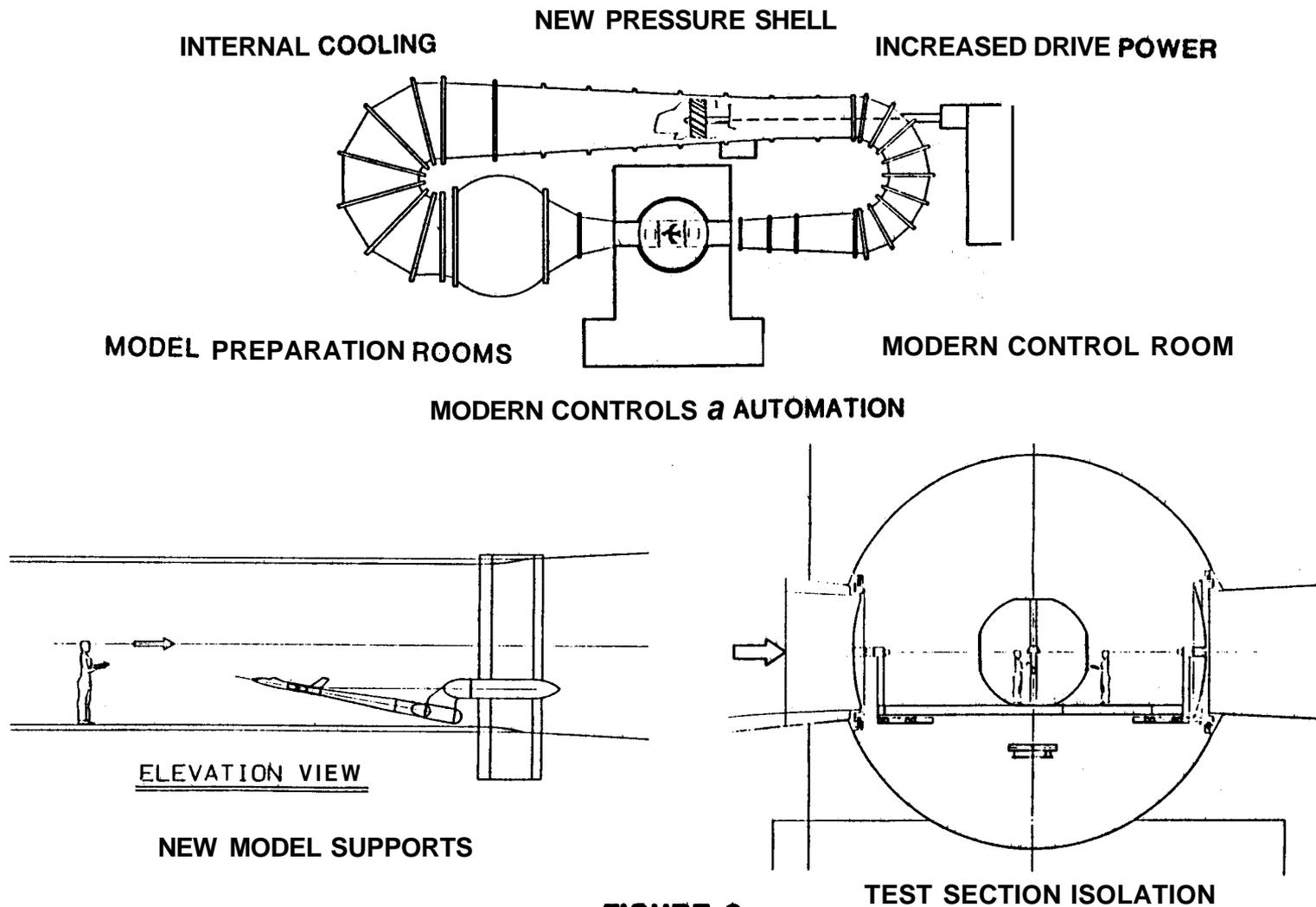


FIGURE 1
SITE PLAN

AMES RESEARCH CENTER
 YEAR 1960
 REPAIR AND MODERNIZATION OF 12-FOOT PRESSURE TUNNEL



MODERN CONTROLS & AUTOMATION

FIGURE 2
SCOPE

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Rehabilitation of Central Air System

INSTALLATION: Lewis Research Center

FY 1993 CoF Estimate: \$12,200,000

LOCATION OF PROJECT: Cleveland, Cuyahoga County, Ohio

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1997 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$1,596,000	\$15,870,000	\$17,466,000
Capitalized Investment	<u>---</u>	<u>38,300,000</u>	<u>38,300,000</u>
Total	<u>\$1,596,000</u>	<u>\$54,170,000</u>	<u>\$55,766,000</u>

SUMMARY PURPOSE AND SCOPE:

This project is part of the NASA Aeronautical Revitalization Program and provides for the rehabilitation and modification of the LeRC Central Air System to assure continued safe and reliable operation of major aeronautical research facilities. The facilities supported by the Central Air System represent the core of NASA's aeronautical propulsion research capability and are heavily scheduled with current and future research programs. The work in this project includes the rehabilitation of the 30 year-old 40 psig and 150 psig compressors and exhausters and rehabilitation of the switchgear, excitation system and controls associated with the compressor and exhauster drive motors.

PROJECT JUSTIFICATION:

The Central Air System was installed more than 30 years ago and has been in continual use supporting research in the 10' by 10' Supersonic Wind Tunnel, the 8' by 6' and 9' by 15' Supersonic Wind Tunnel, the Icing Research Tunnel, the Propulsion Systems Laboratory, Propulsion Lift Facility, and various test cells in the Engine Research Building Complex. This project is required to assure safe and reliable operation of the Central Air System necessary for support of aeronautical propulsion research for subsonic and supersonic transports, hypersonic vehicles, and other advanced systems for commercial and military applications. The project will rehabilitate the 40 psig and 150 psig Central Air System compressors. The rotors in the 40 psig and 150 psig compressors and exhausters were fabricated more than 30 years ago. Since that time the rotor and impeller vanes have acquired numerous cracks varying in size from 1/16 to 2 inches. The cracks can cause catastrophic failure of the system, resulting in excessive downtime of the system. This project will replace the existing rotors with all welded, modern technology rotors. This will reduce delays of vital LeRC research programs due to excessive maintenance time.

Rehabilitation of electrical systems of drive motors is necessary to assure safe and reliable operations of these motors. Failures of these systems have resulted in lost time and personal injuries.

IMPACT OF DELAY:

Delay of this project will significantly increase the risk of unscheduled and lengthy shutdown of one or more major aeronautical research facilities supported by the Central Air System due to failure of worn and deteriorated parts. The current and planned schedule of propulsion testing is dependent on a high degree of reliable and available research facilities that depend on the Central Air System for their operation. Failure of the system would result in major delays and disruption of research schedules. Delay of this project will also increase the risk of equipment failure and attendant safety problems.

PROJECT:

The work in this project includes replacing the following items:

A. Replacing deteriorated rotors in:

1. Group II compressors in Central Air Equipment Building (CAEB) (64) consisting of compressors C-13 (with three rotors) and C-17 (with one rotor).
2. Compressors C-1 and C-2 (with two rotors each) in Engine Research Building (5). Compressor bearings, gears, seals, and couplings will also be replaced. Gearboxes and inlet guide vanes will be replaced on Compressors C-1 and C-2.

- B. Replacing deteriorated impellers in exhauster E-40 (two impellers) and exhauster E-42 (three impellers) located in CAEB (64). Exhauster's inlet guide vanes, bearings, seals, and couplings will also be replaced;
- C. Replacing deteriorated exciters, protective relays, and rehabilitating controls, switchgear and electric cables, and rewinding seven electric drive motors with horsepower ratings of 5,000 to 18,000 horsepower, associated with compressor and exhauster drive systems.

PROJECT COST ESTIMATE: This cost estimate is based on a Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit Cost	Cost
<u>Construction:</u>	---	---	---	<u>\$12,200,000</u>
Rehab CAEB Group II Compressors C-13 and C-17, and ERB C-1 and C-2 Compressors	LS	---	---	6,300,000
Rehab CAEB Exhausters, E-40 and E-42	LS	---	---	1,650,000
Rehab Electrical Power System and Compressor and Exhauster Drive Motors	LS	---	---	4,250,000
T o t a l				<u>\$12,200~000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Location Plan

OTHER EQUIPMENT SUMMARY: None

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

**LEWIS RESEARCH CENTER
FISCAL YEAR 1993 ESTIMATES
REHABILITATION OF CENTRAL AIR SYSTEM**

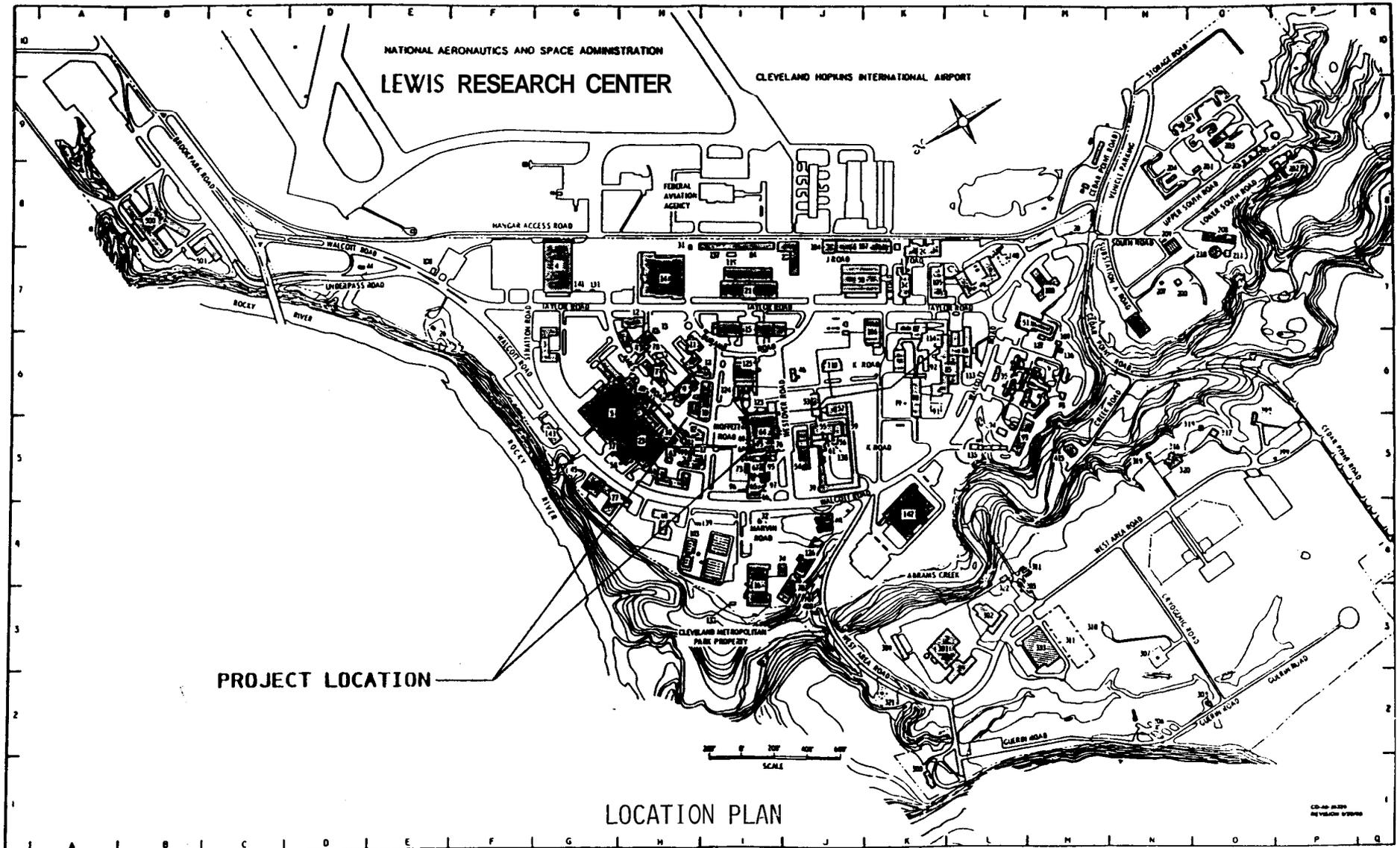


FIGURE 1

VARIOUS LOCATIONS /

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
 CONSTRUCTION OF FACILITIES
 FISCAL YEAR 1993 ESTIMATES

SUMMARY

VARIOUS LOCATIONS

	Amount ----- (Dollars)	Page No. -----
Office of Space Communications: -----		
Construction of 90-Meter Multifrequency Antenna, Canberra, Australia (JPL)	15,600,000	CF 8-1
Construction of 34-Meter Multifrequency Antenna, Madrid, Spain (JPL)	16,200,000	CF 8-5
Subtotal	31,800,000	
Office of Space Science and Applications: -----		
Restoration and Modernization of Infrared Telescope Facility Mauna Kea, HI	2,000,000	CF 8-9
Total	<u>33,800,000</u>	

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Construction of 34-Meter Multifrequency Antenna, Canberra, Australia

INSTALLATION: Jet Propulsion Laboratory

FY 1993 CoF Estimate: \$15,600,000

LOCATION OF PROJECT: Canberra, Australia

COGNIZANT HEADQUARTERS OFFICE: Office of Space Communications

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$70,000	---	\$70,000
Capitalized Investment	---	---	---
Total	<u>\$70,000</u>	<u>---</u>	<u>\$70,000</u>

SUMMARY PURPOSE AND SCOPE

This project provides for the construction of a 34-meter high efficiency beam waveguide type multifrequency antenna to replace an obsolete antenna at the Canberra Deep Space Communications Complex. The replacement antenna will provide performance increases for mission support at the current operating frequencies, and will readily accommodate the higher frequencies required for future deep space missions.

PROJECT JUSTIFICATION:

This project is part of a program for replacement of the three obsolete 34-meter standard antennas at the Deep Space Network (DSN) complexes in Goldstone, California; Madrid, Spain; and Canberra, Australia. The 34-meter antenna at the Canberra site will be 29 years old when it is

replaced by this new multifrequency antenna. These antennas have developed severe structural and mechanical problems that could cause major failures resulting in antenna downtimes of several months to over a year. Further, support requirements of most missions in the latter 1990's exceed the capability of the existing antennas. Replacement of these antennas is vital to ensure DSN reliability in meeting mission support requirements. The new 34-meter multifrequency replacement antennas will provide the additional support capability needed and will eliminate the risks of mission support loss from antenna structural and mechanical failures. The DSN must continue to support the distant Voyager and Pioneer spacecraft in their extended mission phases. The improved performance will provide the capability required for the Galileo IO Encounter, Mars Observer, Cassini, and Ulysses.

IMPACT OF DELAY:

This project for Canberra must begin in FY 1993 so that the antenna can be completed to provide the reliable DSN operational configuration needed for the period of intense mission support that begins late 1995. For example, this period includes the critical 1995 observatory and encounter phases of the Galileo mission to Jupiter, and other missions. In addition, delay would increase the risk of structural and mechanical problems that would result in loss of data and control of spacecraft.

PROJECT DESCRIPTION:

This project includes the fabrication and installation of the antenna structure, reflector panels, gearboxes, bearings, electric drives, controls, beam waveguide reflectors, subreflector, and subreflector positioner. It also includes the construction of the foundation and supporting facilities. The facilities and site development include grading, paving, drainage, electrical power distribution, water, safety systems, cable trays, trenches, heating, ventilation, and air conditioning.

PROJECT COST ESTIMATE: Based on a Preliminary Engineering Report.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Cost</u>
<u>Construction</u>		---	---	<u>\$15,600,000</u>
Antenna Construction	LS	---	---	15,600,000
Total				<u>\$15,600,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Antenna Configuration

OTHER EQUIPMENT SUMMARY: Antenna microwave equipment and electronics and related antenna engineering support required to make this antenna initially operable will be provided with \$14 million in Space Flight Control and Data Communications (SFCDC) resources over Fiscal Years 1993 through 1997.

FUTURE CoE ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

VARIOUS LOCATIONS

FISCAL YEAR 1993 ESTIMATES

CONSTRUCTION OF 34-METER MULTIFREQUENCY ANTENNA, CANBERRA, AUSTRALIA

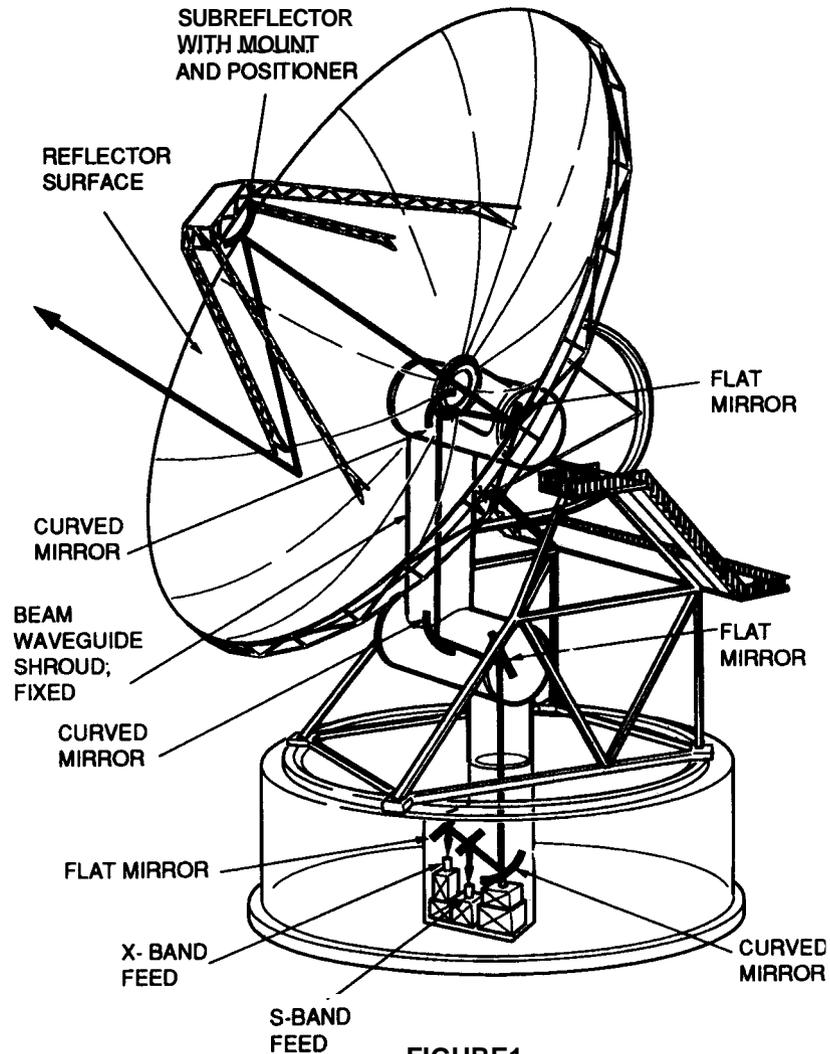


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Construction of 34-Meter Multifrequency Antenna. Madrid, Spain

INSTALLATION: Jet Propulsion Laboratory

FY 1993 CoF Estimate: \$16,200,000

LOCATION OF PROJECT: Madrid, Spain

COGNIZANT HEADQUARTERS OFFICE: Office of Space Communications

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF Funding	\$70,000	---	\$70,000
Capitalized Investment	<u>---</u>	<u>---</u>	<u>---</u>
Total	<u>\$70,000</u>	<u>---</u>	<u>\$70,000</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the construction of a 34-meter high efficiency beam waveguide type multifrequency antenna to replace an obsolete antenna at the Madrid Deep Space Communications Complex. The replacement antenna will provide performance increases for mission support at the current operating frequencies, and will readily accommodate the higher frequencies required for future deep space missions.

PROJECT JUSTIFICATION:

This project is part of a program for replacement of the three obsolete 34-meter standard antennas at the Deep Space Network (DSN) complexes in Goldstone, California; Madrid, Spain; and Canberra, Australia. The 34-meter STD antenna at the Madrid site will be 29 years old when it is replaced by this new multifrequency antenna. These antennas have developed severe structural and

mechanical problems that could cause major failures resulting in antenna downtimes of several months to over a year. Further, support requirements of most missions in the latter 1990's exceed the capability of the existing antennas. Replacement of these antennas is vital to ensure DSN reliability in meeting mission support requirements. The new 34-meter multifrequency replacement antennas will provide the additional support capability needed and will eliminate the risk of mission support loss from antenna structural and mechanical failures. The DSN must continue to support the distant Voyager and Pioneer spacecraft in their extended mission phases. The improved performance will provide the capability required for the Galileo IO encounter, Mars Observer, Cassini, and Ulysses.

IMPACT OF DELAY:

This project for Madrid must begin in FY 1993 so that the antenna can be completed to provide a reliable DSN operational configuration needed for the period of intense mission support that begins late 1995. For example, this period includes the critical 1995 observatory and encounter phases of the Galileo mission to Jupiter, and other missions. In addition, delay would increase the risk of structural and mechanical problems that would result in loss of data and/or control of spacecraft.

PROJECT:

This project includes the fabrication and installation of the antenna structure, reflector panels, gearboxes, bearings, electric drives, controls, beam waveguide reflectors, subreflector, and subreflector positioner. It also includes the construction of the foundation and supporting facilities. The facilities and site development include grading, paving, drainage, electrical power distribution, water, safety systems, cable trays, trenches, heating, ventilation, and air conditioning. Also included in this project is the extension of the site perimeter road and fences for the new antenna.

PROJECT COST ESTIMATE: Based on a Preliminary Engineering Report.

	Unit of Measure	<u>Quantity</u>	Unit Cost	<i>Cost</i>
<u>Construction</u>	---	---	---	<u>\$16,200,000</u>
Antenna Construction	LS	---	---	15,650,000
Perimeter Road and Fences	LS	---	---	<u> 550,000</u>
 T o t a l				 <u>\$16,200,000</u>

LIST OF RELATED GRAPHICS: Figure 1 - Ant-enna Configuration

OTHER EQUIPMENT SUMMARY: Antenna microwave equipment and electronics and related antenna engineering support required to make this antenna initially operable will be provided with \$14 million in Space Flight Control and Data Communications (SFCDC) resources over Fiscal Years 1993 through 1997.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

VARIOUS LOCATIONS

FISCAL YEAR 1993 ESTIMATES

CONSTRUCTION OF 34-METER MULTIFREQUENCY ANTENNA, MADRID, SPAIN

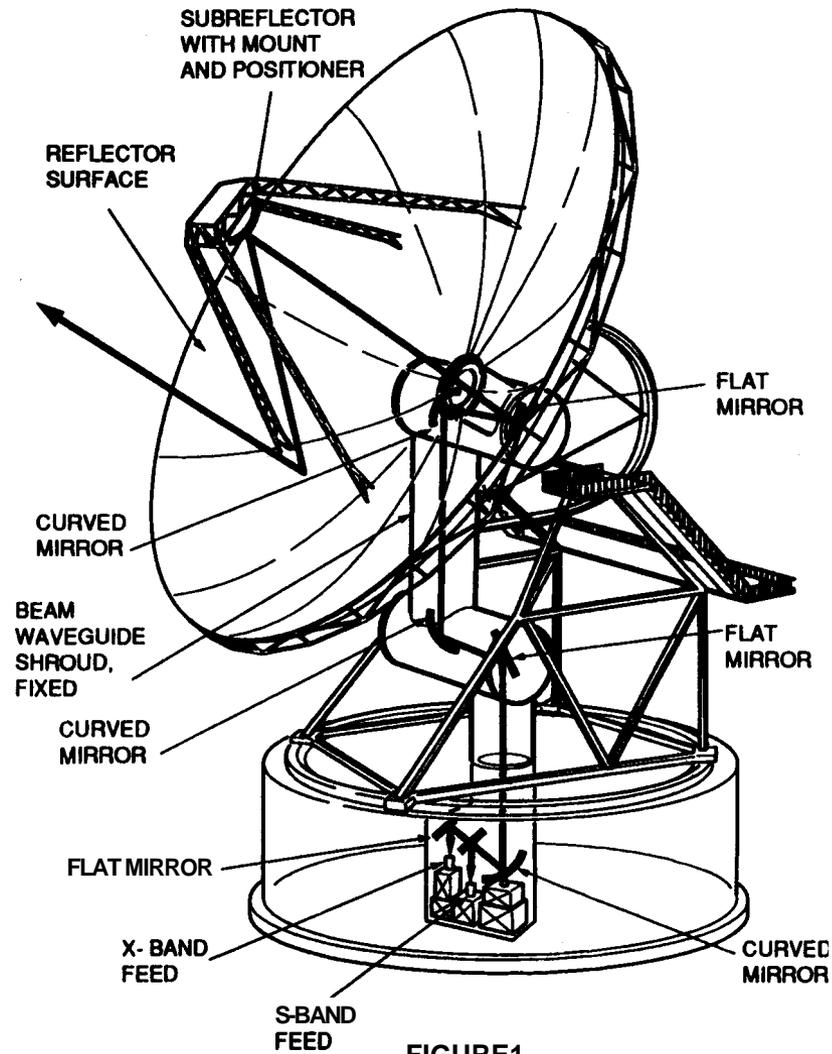


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Restoration/Modernization of Infrared Telescope Facility

INSTALLATION: NASA Headquarters

FY 1993 CoF Estimate: \$2,000,000

LOCATION OF PROJECT: Mauna Kea, Hawaii

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1992 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	Total
Specific CoF Funding	\$200,000	---	\$ 200,000
Capitalized Investment	<u>---</u>	<u>\$6,644,000</u>	<u>6,644,000</u>
Total	<u>\$200,000</u>	<u>\$6,644,000</u>	<u>\$6,844,000</u>

SUMMARY PURPOSE AND SCOPE:

This project restores and modifies the existing roof access room and ladder; the thermal control systems; installs a dome deicing system; resurfaces the mezzanine walkway; installs a drainage system; and reduces the emissivity of the dome interior of the Infrared Telescope Facility located on Mauna Kea, Hawaii. The project is necessary to accommodate changes in the instruments used, as well as the upgrade of the image enhancement of the telescope and to correct safety and design deficiencies in the observatory dome and drainage system.

PROJECT JUSTIFICATION:

The NASA Infrared Telescope Facility (IRTF) is located at 13,800 feet above sea level on the summit of Mauna Kea, on the island of Hawaii. The IRTF is operated and maintained for the National Aeronautics and Space Administration (NASA) under a contract with the Institute for

Astronomy of the University of Hawaii. The construction of the IRTF building, which houses NASA's 3-meter Infrared Telescope and its associated support equipment, was completed in 1978. The IRTF was established as an astronomical observing facility primarily to obtain infrared observations in support of NASA's programs in mid-1979.

As the astronomical instruments have increased in number and complexity, and the telescope's imaging capability has been upgraded, the cooling system capacity was increased. This system now needs extensive restoration to support the operation of cryogenic-array instruments. The shutter tracks and dome require heat traces to prevent snow and ice buildup. Presently, the dome tracks and dome must be cleared of ice and snow by using hand axes while hanging on the dome ladders. The dome and mezzanine drainage systems need to be modified to prevent ice from forming on the mezzanine and observation room floors, which creates safety hazards.

IMPACT OF DELAY:

If the proposed restoration and modernization of the IRTF is delayed, snow and ice buildup on the dome and roof will continue being a safety problem, and the dome cooling system cannot effectively control the thermal conditions necessary for telescope image quality optimization.

PROJECT:

The dome and rooftop safety improvements will include electric heat-tracing cables mechanically fastened to the dome exterior along the shutter tracks and along the dome skirt; special aluminum tape and low emissivity paint to distribute heat laterally from the cables; two metal platforms (one on each side of the shutter) to allow maintenance on the shutter and heat-tracing system. The exterior of the dome will be repainted. The roof adjacent to the dome will also be heat-traced to prevent snow and ice buildup along the perimeter of the dome and facilitate runoff. The roof will be insulated with six-inch thick polyurethane insulation to prevent heat transfer to the interior of the building.

The interior of the dome will be reinsulated as required to minimize heat transfer into the dome. Temperature, humidity and dew point sensors will be located in an array from the floor level to the top of the dome and on the telescope. Two dew point sensors will also be located outside the top of the dome for thermal environment comparisons. A new shutter seal will be installed to better isolate the dome from the exterior weather conditions and will also reduce the infiltration of air which potentially creates a large heat-gain source. New air handlers will also be installed to maintain the temperature of the dome and telescope close to nighttime ambient temperatures.

PROJECT COST ESTIMATE: Based on a Preliminary Engineering Report.

	Unit of Measure	Quantity	Unit Cost	Cost
<u>Construction</u>	---	---	---	<u>\$2,000,000</u>
Modifications to Dome/Rooftop	LS	---	---	900,000
Rehabilitation of Dome Cooling System	LS	---	---	1,100,000
Total				<u>\$2,000,000</u>

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan Figure 2 - Air Conditioning and Heating Tracing Layout

OTHER EQUIPMENT SUMMARY: None.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: None

**NASA HEADQUARTERS
FISCAL YEAR 1993 ESTIMATES
RESTORATION/MODERNIZATION OF INFRARED TELESCOPE FACILITY, HAWAII**

LOCATION PLAN

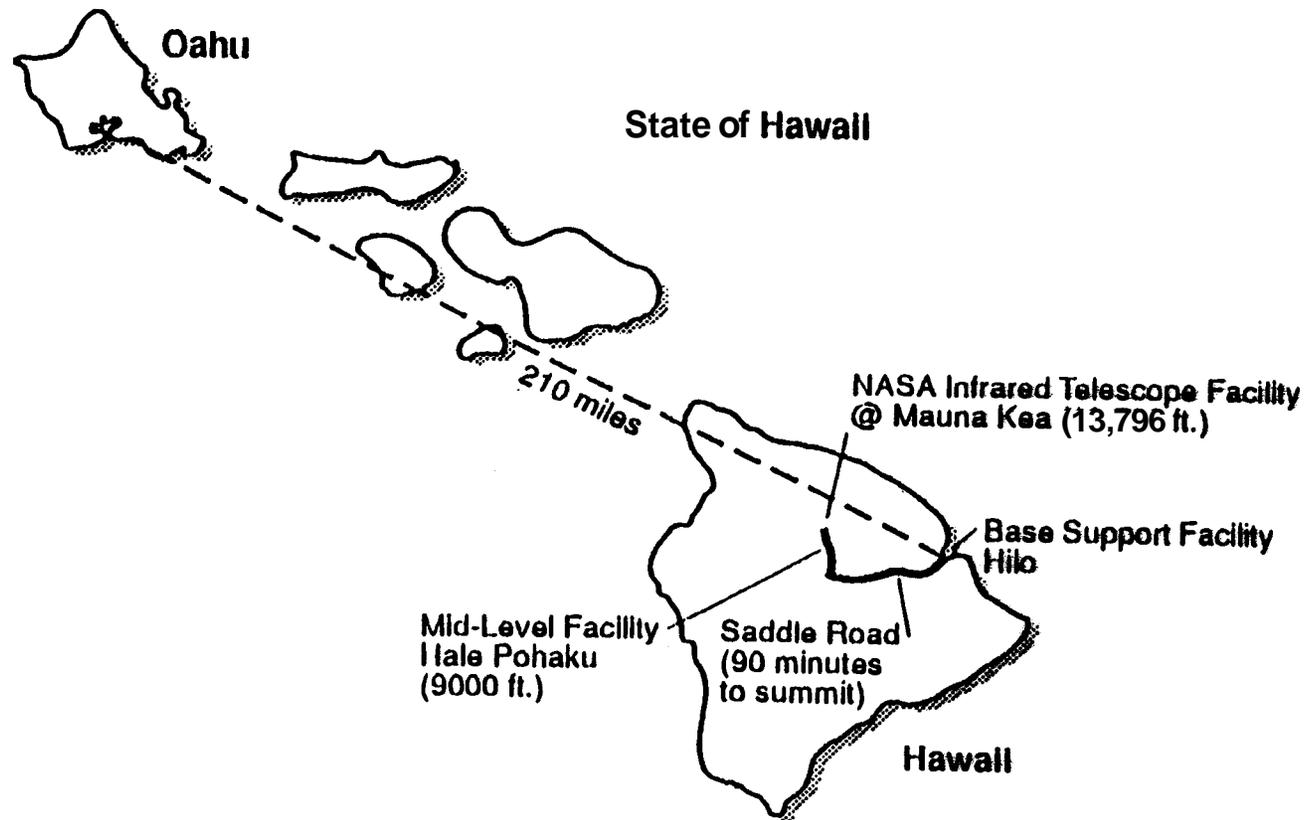


FIGURE 1

NASA HEADQUARTERS
FISCAL YEAR 1993 ESTIMATES
RESTORATION/MODERNIZATION OF INFRARED TELESCOPE FACILITY, HAWAII
AIR CONDITIONING AND HEAT TRACING LAYOUT

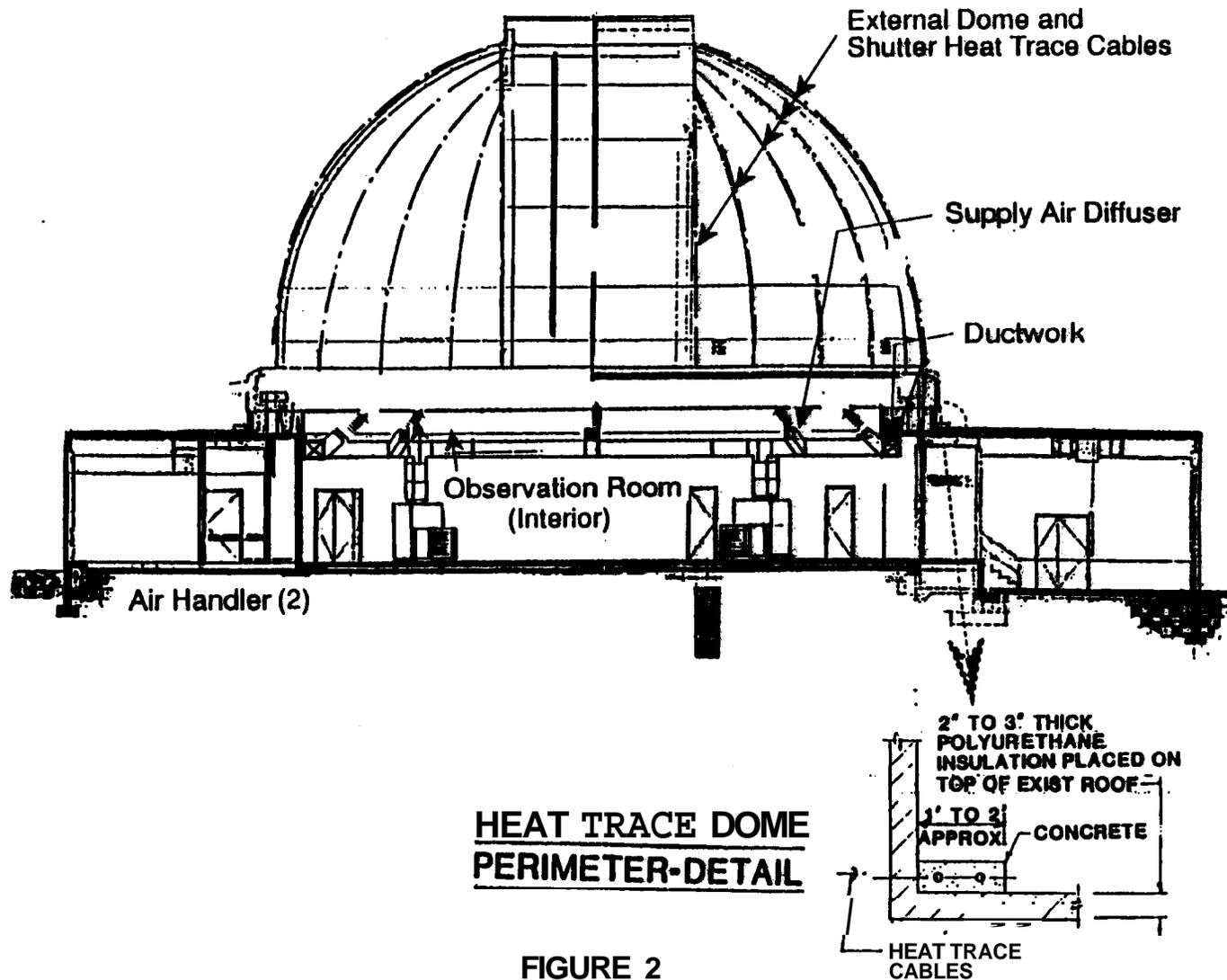


FIGURE 2

REPAIR

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

SUMMARY

REPAIR

<u>Summary of Project Amounts by Location</u>	<u>Amount</u>	<u>Page No.</u>
Ares Research Center	\$3.380. 000	CF 9-3
Dryden Flight Research Facility	500. 000	CF 9-4
Goddard Space Flight Center	2.550. 000	CF 9-4
Jet Propulsion Laboratory	2.740. 000	CF 9-6
Johnson Space Center	2.400. 000	CF 9-7
Kennedy Space Center	3.110. 000	CF 9-8
Langley Research Center	3.825. 000	CF 9-9
Lewis Research Center	3.420. 000	CF 9-10
Marshall Space Flight Center	3.000. 000	CF 9-12
Michoud Assembly Facility	2.170. 000	CF 9-13
Stennis Space Center	1.600. 000	CF 9-14
Wallops Flight Facility	1.990. 000	CF 9-15
Various Locations	700. 000	CF 9-16
Miscellaneous Projects Not in Excess of \$250.000 Each	<u>515,000</u>	CF 9-16
Total	<u>\$31,900,000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Repair of Facilities, Not in Excess of \$1,000,000 Per Project

INSTALLATION: Various Locations

FY 1993 CoF Estimate: \$31,900,000

FY 1991: \$28,484,000

FY 1992: \$31,700,000

COGNIZANT INSTALLATIONS/LOCATIONS OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management Systems and Facilities

SUMMARY PURPOSE AND SCOPE

These resources will provide for critical 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 1993 that can be identified at the time of the submission of these estimates and are not in excess of \$1 million per project. The thrust of this program is to restore facilities and 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 that are normally accomplished on a cyclic schedule of greater than one year.

PROJECT JUSTIFICATION:

NASA is now experiencing "block obsolescence" where a substantial portion of the agency's facilities have been in use for over 25 years. Repair costs for mechanical and electrical systems in a typical building are almost three times higher after system operations exceed 15-20 years than they are during the initial years. Many electrical and mechanical components reach the end of their serviceable or economic life at the 20 year point and should be replaced in the interest of long-term economy. Continued piecemeal repair of these components is usually more costly in the long run than replacement at the end of the economic life of the

original components. Approximately 50 percent of NASA's physical plant has been in service for over 25 years.

A major thrust of this repair program is to help preserve the capabilities of the NASA physical plant, which has a capital investment of \$4.6 billion and a current replacement value of more than \$13 billion. This work must be addressed and progressively accomplished. Otherwise, risks are increased and future repair costs will be significantly greater. More importantly, there will be increased breakdowns, interruption of critical operations, and costly unscheduled repairs incurred.

This program includes only facility repair work having an estimated cost not in excess of \$1 million 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. Repair projects estimated to cost more than \$1 million are included as separate discrete projects in the budget request.

PROJECT:

Proposed repair projects for FY 1993 totaling \$31.9 million are described under "PROJECT COST ESTIMATE." Projects estimated to cost not in excess of \$250,000 have not been individually described or identified by Center. The total request for this category is \$515,000. This repair program has been distilled from requests in excess of \$53 million, and thus represents a modest request in relation to the continuing backlog of this type of work. The projects that comprise this request are of the highest priority based on relative urgency and expected return on investment. 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 priorities may be necessary. This may force a change in some of the items to be accomplished. Any such change, however, will be accomplished within total available repair resources. The following broad categories of work are described further in the "PROJECT COST ESTIMATE".

a. Utility Systems	\$9,295,000
b. General Purpose Buildings	6,075,000
c. Technical Buildings/Structures	10,950,000
d. Pavements and Drainage	2,700,000
e. Building Exteriors and Roofs	2,880,000

PROJECT COST ESTIMATES

A. Ames Research Center (ARC) \$3,380,000

1. Repair Heating, Ventilating, and
Air Conditioning (N-202) 540,000

This project provides for repair of heating, ventilating, and air conditioning (HVAC) equipment in the main library at ARC. The repair includes replacement of the chilled water plant, the main air handler, and associated piping. The HVAC system in this facility is critical for maintaining temperature and humidity control for important documents and reference materials. The existing air handler is 42 years old and the chiller is 32 years old, and both have reached the end of their useful lives. The system has broken down repeatedly in the last few years, and lack of replacement parts requires that custom parts be fabricated to return the system to service.

2. Repair Air Conditioning, Imaging Research Building 550,000

This project will replace air conditioning and air handler units in the Imaging Research Building. Associated piping, ductwork, and controls will be replaced, and the new equipment will be tied to ARC Facilities Management Control System (FMCS). The equipment is 30 years old and has reached the end of its useful life. Temperature control is poor, and the interior lining has begun to flake off the ductwork, causing dirt and dust problems with sensitive photo processing machines and video equipment, and creating a hazard for the workforce.

3. Repair Compressor Motors (N-229A) 960,000

This project will refurbish the 5500 horsepower motors that drive compressors C-1A and C-1B. The refurbishment involves replacement of stator coils, rehabilitation or complete rewinding and reinsulation of field coils, and reconditioning of slip rings. These compressors provide 54 percent of the pumping capacity for the ARC High Pressure Air System as well as providing vacuum capacity for High Reynolds Number Channels I and II and the 3.5-foot Hypersonic Wind Tunnel. Loss of these compressors would seriously degrade ARC's ability to provide high pressure air to research facilities. The C-1A motor was damaged in 1988, and a temporary repair was made to the stator coils. Major repair of the motors is required to insure reliable operation.

4. Repair of Pressure Systems 740,000

This project will provide for the repair and replacement of portions of the Thermal Protection Laboratory Steam Vacuum System (SVS) ductwork, portions of the SVS steam piping,

valves, and portions of the 3000 psi air distribution piping. The existing SVS, which consists of fabricated steel ductwork, piping, and valves, was manufactured in the late 1950's. Inspection has revealed the existence of extensive weld defects and corrosion. The SVS poses significant risk to Center personnel and property due to its high level of stored energy and the potential for failure if not repaired.

5. Replace Heating System (N-243/N-243A) 590,000

This project will replace the boiler and hot water reheat coils and valves for the Flight and Guidance Simulation Laboratory and the Simulation Equipment facility. Work includes replacement of the boiler and five direct exchange air conditioning units with chilled water reheat air handlers, and the provision of instrumentation and connections to the ARC Facility Management Control System. The existing boiler and air handler coils are beyond their useful life. For several years, the boiler system has experienced regular tube leaks and other malfunctions requiring extensive downtime for maintenance. Personnel and computers supporting simulation research in these buildings are dependent on the reliability and performance of this system to control computer lab and office temperatures.

B. Dryden Flight Research Facility (DFRF) \$500,000

1. Repair Roads and Paving 500,000

This project provides for overlay of approximately 35,000 square yards of existing pavements. Paved areas to be repaired include those at Warehouse #7, Integrated Support Facility, service shops, towway area at the Flight Loads Research Facility and Aircraft Servicing Dock, Lilly Avenue Railroad Crossing, and Space Shuttle support areas. The existing pavements are extensively cracked and are at the end of their design life. Loose aggregate from pavements adjacent to flight operations areas is creating a foreign object damage (FOD) hazard for aircraft. If these pavements are allowed to deteriorate further, complete replacement will be required at a much higher cost.

C. Goddard Space Flight Center (GSFC) \$2,550,000

1. Repair Heating, Ventilating, and Air Conditioning Systems,
Various Buildings 550,000

This project provides for the repair of major mechanical equipment, including air handling units, exhaust fans, induction units, air compressors, associated controls, hot water/chilled water piping, insulation, and pumps in Buildings 4, 17, 19, and 20. This equipment, related piping, and controls were installed in the 1960's and have outlived their

service lives. The controls have deteriorated and have become erratic, causing operational problems resulting in lack of cooling in summer and lack of heat in winter. Repair is required to extend equipment life and to prevent potential breakdowns.

2. Repair Electrical Systems, Various Buildings 750,000

This project provides for the replacement of 13 Motor Control Centers (MCC's) in Buildings 1, 4, 23, and 24. The project includes the replacement of existing aluminum feeders that serve the MCC's in Building 23. This project is required to replace electrical equipment that is in poor condition due to age and excessive usage. The equipment is obsolete and replacement parts are not available. Many of the existing motor contactors and controls have been disconnected, resulting in motors that are operating with minimal motor overload protection. Repair of this equipment is necessary.

3. Repair Steam Lines 900,000

This project provides for the replacement of deteriorated steam, condensate, and high pressure drip lines between various manholes at Goddard. The project will also replace 22 steam ejectors in manholes with high temperature sump pumps. In addition, it will provide general rehabilitation of manholes, removal of asbestos insulation, and reinsulation with an environmentally safe blanket-type system. Steam, condensate, and high pressure drip lines are badly deteriorated due to age. Steam ejectors are obsolete and nonfunctional, causing flooding of manholes resulting in further system degradation and difficulty performing routine maintenance activities. This project will also greatly improve the energy efficiency of the steam distribution system and reduce the amount of boiler makeup water currently required.

4. Repair Roofs, Buildings (11 and 25) 350,000

This project provides for the removal and replacement of existing roofing on Buildings 25, 25B, and the east penthouse of Building 11, including removal and replacement of associated coping, flashing, roof insulation, and other roof related accessories as necessary. Approximately 35,000 square feet of existing roof on Building 25, 400 square feet on Building 25B, and 3,700 square feet on Building 11 will be replaced. These buildings have their original built-up roofs, which will be replaced with a mono-membrane system. Drainage problems will be corrected and rooftop walkways will be provided. The existing roofing on these buildings contains numerous patches and temporary repairs. The proposed repair will restore the integrity of these roofing systems and will minimize potential property loss from water damage due to leaking roofs. Replacement of water soaked insulation will also increase energy efficiency in these facilities.

D. Jet Propulsion Laboratory \$2,740,000

- 1. Replace Quartz Window and Optical Mixer,
25-Foot Space Simulator (150) 690,000

This project proposes the replacement of the quartz window lens and optical mixer lens unit for the solar simulator subsystem of the 25-Foot Space Simulator, Building 150. These lenses are in a very hostile thermal and pressure environment and have been in service for approximately 20 years. Failure of the window lens could result in loss of spacecraft under test and/or extensive damage to the simulator and operator personnel. Replacement of these two units is necessary to ensure the continued safe reliable operation of the simulator.

- 2. Refurbish Elevators, Space Flight Support Building (264) 650,000

This project proposes refurbishing three passenger elevators and one freight elevator in Building 264. The refurbishment will include state-of-the-art electrical control systems, drives, microprocessors, and upgrading the mechanical systems. It has become very difficult to procure replacement parts for the 20 year old electrical controls and mechanical systems since some of these parts are no longer manufactured. The refurbishment of the elevators will improve their operation, reducing downtime and maintenance cost, improving operating efficiency, and providing reliable service.

- 3. Replacement of Air Handling Systems,
Physical Sciences Laboratory (183) 900,000

This project replaces deteriorating air handlers on four floors with modern air handlers properly zoned for the current requirements of the building. Unneeded air conditioning ducting and piping and excess fume exhaust ducting will be removed. Control devices will be modernized for better economical control of the building air conditioning systems. Asbestos fireproofing will be replaced in the areas as necessitated by the removal and installation of air conditioning and other utility systems. The existing air handlers are rusted and leaking. Extensive repairs of the existing system are badly needed.

- 4. Replace Ceiling and Lighting,
Earth Space Science Building (169) 500,000

This project replaces the ceiling system and light fixtures of the laboratories, offices, and corridors of the second floor of Building 169. The total project area is approximately 8,000 square feet. The existing suspended acoustic tile ceiling will be removed and replaced with acoustic lay-in panels in a tee bar suspension system. Surface mounted,

recessed, or pendant mounted light fixtures will be replaced with recessed or surface mounted 3-lamp fluorescent light fixtures. The HVAC system will also be modified. Building 169 was built in the mid-1960's and the existing material, equipment, and systems have exceeded their useful life and in many instances do not comply with current codes and standards.

E. Johnson Space Center (JSC) \$2,400,000

1. Repair Building Substations \$250,000

This project provides for the repair of the high voltage electric substations in Buildings 12, 32, and 322. Two dual 15-kV, 600 ampere feed switches will be replaced at Building 12. Eight dual 15-kV feeder switches and 15-kV load-break switches at Building 32 will be replaced with gas-filled switches. In addition, the electrical substation at Building 322 will be replaced. The existing electrical equipment is 24 years old and direct replacement parts are unavailable.

2. Repair Power Poles and Lines (WSTF) \$350,000

This project provides for the inspection and repair of damaged system components on the primary electrical distribution system at the White Sands Test Facility (WSTF). Work includes repair and/or replacement of wooden poles, crossarms, high-voltage wiring, and components. The various pole structures and system components have deteriorated due to the general aging process and extremes in ambient weather conditions.

3. Replace B-Generators, Building 48 \$900,000

This project provides for the replacement of three generators and bus duct and control systems for "B" power in the Emergency Power Building, Building 48. The generators are 28 years old and have exceeded their useful, reliable life. This critical system provides emergency power to the Mission Control Center.

4. Repair Roofs, NASA Industrial Plant, Downey, CA \$900,000

This project provides for the repair of severely deteriorated building roofs at the NASA Industrial Plant, Downey, California. Three of the buildings involve removal and disposal of asbestos roofing material. Repair of these roofs includes the replacement of all flashings, elimination of unnecessary penetrations, removal of deteriorated roofing material, and installation of new roofing material. Transite roof replacement also will require the installation of a wood roof deck.

F. Kennedy Space Center (KSC) \$3,110,000

1. Replace Launch Complex-39 13.8 KV Protective Relays 900,000

This project provides for the replacement of Launch Pads A and B substation overcurrent relays with solid state relays. The work includes replacement of approximately 85 relays and interfaces. Existing relays are 20 years old and require replacement. Parts for some types of relays are increasingly difficult to obtain. The new relays will be more reliable and provide a more readily maintainable system.

2. Replace Launch Pad B Underground Fire Extinguishing Piping 350,000

This project provides for replacement of fire extinguishing piping that services Pad B's outlying facilities with schedule 80 pipe. The existing steel underground piping has been in the system approximately 25 years and is extremely thin and severely corroded. Line ruptures in these locations could impact launch flow processing.

3. Repair Vertical Processing Facility (VPF)
Chilled Water System 760,000

This project provides for replacement and rerouting of the Vertical Processing Facility hot/chilled condenser water piping, replacement of associated valves, pipe hangers, temperature sensors, hot and cold water pumps and one 120-ton chiller. Asbestos abatement for piping systems will be required. The chilled water system is badly deteriorated causing excessive downtime for maintenance and repairs. The downtime adversely affects payload processing at the Vertical Processing Facility.

4. Repair Operations and Checkout Building 27-ton
Cranes Feedrail Control System. 740,000

Repair and upgrade the 480 volt feedrail control system on each of the cranes' trolley with a reliable state-of-the-art system. The existing feedrail control system is susceptible to contamination buildup on the copper bus bars due to its configuration. This results in failures and short circuits. Periodically, the feedrails must be thoroughly cleaned, which results in crane outages and is costly in manhours of labor. Parts from the manufacturer(s) are difficult to obtain and require unacceptable lead time.

5. Replace Propellant Laboratory and High Pressure
Gas Maintenance Facility Roof 360,000

This project provides for replacement of approximately 34,500 square feet of roof area on the Propellant Laboratory and High Pressure Gas Maintenance Facility. Work consists of

removal of existing buildup roof down to the roof deck and repair of any damaged deck area, insulation board, buildup roof, and flashing. Ponding water, ultraviolet rays, ridging, and intrusion of water within the roof system have caused the roof to deteriorate so that normal maintenance is no longer effective.

G. Langley Research Center (LaRC) \$3,825,000

- 1. Repairs to High Pressure Systems, Various Facilities 600,000

This project provides for repairs to the high pressure systems at various facilities at Langley Research Center. The work to be done under this project includes the replacement of defective piping, valves, and fittings; radiographic inspection of welds; and repair of defective welds. The systems to be repaired include piping systems and pressure vessels at the West Area Steam Distribution System, the 16-foot Transonic Tunnel (1146) and the 300 PSI Air Compressor Station (582). Completion of this project is essential to ensure the safe and efficient operation of essential research facilities.

- 2. Repairs to Systems Engineering Building (1209) 920,000

This project provides for repairs to the Systems Engineering Building (1209) in the West Area at Langley Research Center. The work includes the removal of existing heating, ventilating, and air conditioning system components and the installation of a new chiller, cooling tower, cooling tower pumps, chilled water pumps, and associated piping. Controls, electrical components, variable air volume boxes, duct work, and ceiling diffusers will be replaced, and a restroom will be upgraded by adding four water closets. Implementation of this project will prevent a lengthy downtime due to major equipment failure and ensure an appropriate environment for personnel working in this facility. The restroom modifications are necessary to provide sufficient restroom facilities for the occupants.

- 3. Repairs to Vehicle Antenna Test Facility (1299) 390,000

This project provides for the replacement of approximately 27,000 square feet of existing built-up roofing and replacement of approximately 5,600 square feet of ceiling and lights in the Vehicle Antenna Test Facility (1299). The existing roofing will be removed and replaced with a new roof consisting of rigid insulation and 4-ply built-up roof, complete with roof drains, associated plumbing, flashing, fascia, pitch pockets, cant strips, and gravel stops. The ceiling and light fixtures will be replaced with new suspended ceilings and recessed light fixtures in the corridors. The building components to be replaced are approximately 25 years old and have deteriorated due to age. Since normal maintenance is no longer effective, this project is necessary to maintain the integrity of this research facility and to prevent damage to the interior contents.

- 4. Repairs to Office Areas, Building 648 430,000

This project provides for replacement of the ceilings and lights and heating, ventilating, and air conditioning systems for the office areas of Building 648. The project will remove three direct expansion air handlers and associated ducts, heating coils, grills, and diffusers serving the three-story office area and replace them with a new chiller, steam to hot water heat exchanger, pumps, fan coil units, and related equipment. A new equipment room will be constructed to house the major components. This heating, ventilating, and air conditioning equipment is over 20 years old. Replacement of this equipment is necessary to meet current building requirements and reduce maintenance time and costs.

- 5. Replace 110 PSI Service Air Compressor Serving the West Area 585,000

This project provides for replacement of one of the two 110 psi service air compressors that serves all of the facilities in the West area of Langley Research Center. The project also includes replacement of the associated air receiver and the 500 gallons per minute cooling tower that serves the compressors and the replacement of all piping, valves, controls, and insulation required to reconnect to the existing system. The air compressor to be replaced has been in service for over 40 years and is in constant need of repair. The service air provided by this compressor is used at all the research facilities in the West Area of the Center. Failure of the compressor would result in diminished capabilities and possible shutdown of some of the facilities.

- 6. Repairs to the Helium Processing System (1247B) 90,000

This project provides for repairs to the vacuum pumping system serving the Hypersonic Helium Tunnel. The work to be accomplished includes replacement of four existing vacuum pumps; installation of two new blowers; and modifications to the existing foundations, electrical services, and controls. The helium processing system is a critical element of this facility. The system has been overheating in some operational modes. The additional blowers will correct this problem. The replacement pumps will eliminate oil contamination of the helium during the vacuum pumping process.

H. Lewis Research Center (LeRC) \$3,420,000

- 1. Repair Steam Trenches 800,000

This project provides for the repair and replacement of deteriorated concrete steam trenches, steam system piping and components, and paving. The repair areas include Taylor Road from Building 21 to Building 12. Roadways will be excavated; trench covers will be removed; concrete trench and manholes will be repaired; trench drainage will be improved; water level

sensors will be installed; condensate piping, steam insulation, and components will be replaced; new concrete covers will be installed; and the roadway will be resurfaced with new asphalt paving. Existing conditions include collapsed sections of trench and roadway; severe concrete deterioration due to road salts and freeze-thaw cycling; advanced corrosion of condensate piping and pipe supports due to the trench environment; and poor condition of the steam line insulation, valves, and expansion joints. This project will provide safe, reliable steam service to critical research buildings and administrative functions.

2. Repair Central Water Distribution System 700,000

This project provides for the repair of the central water distribution system. Mineral deposits on the inside of the mains have caused a general reduction in water flow throughout the Center. The work includes the replacement or cleaning/relining of corroded and clogged water mains located along Taylor Road and Hangar Access Road. It also includes the replacement or cleaning/relining of the service pipes from the street main to some of the buildings along Taylor and Hangar Access Roads. This project will increase domestic water pressure and improve water quality for the various buildings served.

3. Repair Roofs, Central Air Equipment Building 64 320,000

This project provides for the replacement of the deteriorated roofing system on the Central Air Equipment Building 64. The work includes removal of all existing roofing material, including asbestos containing materials, insulation, roof curbs, and penetrations; and installation of a new four-ply roofing system, insulation to meet current American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) standards, new roof curbs, flashing, and other roof penetrations. The roofs in this project are severely deteriorated and do not comply with current safety and ASHRAE standards. This project is necessary to provide adequate protection for personnel, the building, and its housed equipment.

4. Repair HVAC System, Space Power Research Lab. (309) 750,000

This project provides for the repair of the heating, ventilating, and air conditioning systems in the Space Power Research Laboratory Building (309). The work consists of replacing the gas-fired boiler; hot water circulating pumps and piping; unit ventilators and controls; and chiller, piping, and circulating pumps. The project also includes installing domestic water system backflow preventers and potable water piping; providing make-up air to labs; correcting sewer code violations; asbestos removal of pipe insulation; and improving lighting in some labs. The existing HVAC systems were installed in 1966 and have been kept operating only by making frequent repairs. This project will reduce maintenance requirements, correct sewer code violations, provide filtered make-up air to labs, and ultimately provide a safer, more reliable building for continued research activities.

- 5. Repair Interior Water System, Various Buildings 400,000

This project provides for repair/replacement of the domestic water distribution systems in Buildings 14, 51, 105, 106, and 309. The domestic water piping in these buildings is 35 years old and iron oxide and calcium build-ups inside the piping have caused drastic reduction in flow rates. Replacement of the piping will increase water pressure capabilities to the levels required by the plumbing codes within the buildings at the Center. Prescribed procedures will be followed to handle and remove piping that is covered with asbestos insulation.

- 6. Repair Roads, Plum Brook 450,000

This project provides for the repair and improvements of load bearing capability of approximately eight miles of deteriorated primary roads serving the four major test facilities. The repairs to the road surfaces are needed to enable the safe transportation of experimental hardware, roadable dewars, and support equipment to the four major test facilities at Plum Brook.

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

- 1. Repair High Pressure Components, Various Locations 750,000

This project provides for the replacement of approximately 4,000 linear feet of gaseous nitrogen (GN2) piping and 3,000 linear feet of high pressure air piping throughout the Center. It also provides for the refurbishment of selected cathodic protection systems for piping systems and water storage tanks throughout the Center. The GN2 and high pressure air systems provide critical support to major test programs. These systems are very old and deteriorated, and continued repairs are costly and disruptive to testing activities.

- 2. Repair Roofs, Various Locations 950,000

This project provides for the replacement of the roofs on Buildings 4610, 4612, and 4707. Scope includes replacement of approximately 230,000 square feet of roofing membranes, installation of a light weight R-20 roof insulation system, selective replacement of flashing, and the removal of unnecessary expansion joints and vents. The existing roofs have already exceeded their life expectancy and are very deteriorated. Repair of these roofs will preserve the integrity of the facilities, reduce maintenance costs, and provide energy cost savings.

- 3. Repair Roads and Paved Areas, Various Locations 540,000

This project provides for the repair and resurfacing of approximately 131,000 square yards of deteriorated roads, parking areas, and hardstands. Scope includes repair of damaged

base course, application of tack coats, overlaying with asphaltic paving and/or seal coat, and painting of parking stripes and road markings. Deteriorated concrete pavements will be repaired by replacement of damaged slabs and joint sealing materials. These road surfaces and hardstands provide primary access to key test, development, and production facilities.

- 4. Repair Exterior of Surface Treatment Facility (4760) 760,000

This project provides for the replacement of exterior windows and asbestos siding with new insulated metal panels and operable aluminum windows in Building 4760. It also provides for the replacement of the built-up roof and insulation, installation of new gutters and downspouts, and upgrading of main entrances. This facility is over 30 years old and very deteriorated. The new insulated siding, windows, and roof will provide an energy efficient, low maintenance building envelope.

J. Michoud Assembly Facility (MAF) \$2,170,000

- 1. Repair First Floor, East End Building 101 900,000

This project provides for the repair of the interior systems of the Administration Building on the east end of the first floor. Scope includes replacement of the supply/return duct work, electrical distribution/cabling system, existing acoustical ceiling/lighting system, and modification of the overhead sprinkler and fire alarm systems. This building is over 40 years old. These repairs are required to provide an adequate work place environment.

- 2. Repair Process Water System 820,000

This project provides for the replacement of approximately 8,000 linear feet of cast iron overhead piping in the External Tank Main Manufacturing Building. This process water system is used for vapor degreasers, pumps, dehumidifiers, and for production process for final assembly, hydraulic pressure test and robots associated with external tank production. The piping system provides return and supply runs for these and other process and production areas, both in and adjacent to the Main Manufacturing Building. The piping system was originally installed in the 1940's and is very deteriorated. Lack of easy access to piping makes piecemeal repairs difficult and costly.

- 3. Repair Sewer Lift Stations 450,000

This project provides for the repair of eight sewer lift stations that are part of the Center's sanitary sewer system. Scope includes replacement of components such as pumps/motors, electrical systems, piping/valves, flotation devices, and surge tanks; also included is the repair of the walls in the wet wells of the lift stations. These stations are over 45 years old and have never been overhauled. The pumps, valves, and pipes are leaking,

the motors are continuously failing, the controls do not function, and the electrical systems are obsolete.

- K. Stennis Space Center (SSC) \$1,600,000
- 1. Replace Main Substation Switchgear and Enclosure 650,000

This project provides for the replacement of the switchgear and associated relaying and metering systems for bus #1 at the Center's 13.8 KV main substation. Bus #1 provides primary electric power to the Space Shuttle Main Engine Test Area and to numerous other key facilities throughout the Center. Scope includes construction of an environmentally controlled enclosure to house new relaying and metering equipment. New substation steel and buswork will also be provided as required to accommodate new outdoor circuit breakers. The existing air circuit breakers are over 25 years old and difficult to maintain. This project will improve the reliability of the Center's electric power, which is essential to ongoing rocket engine testing activities.

- 2. Replace T-1 Steel High Pressure Air Line, "B" Complex 500,000

This project provides for the replacement of approximately 3,800 linear feet of high pressure air piping between the Gas Battery Area and various locations within the "B" Test Complex. Scope includes replacement of all valves and components, and the cleaning and testing of the restored system. New piping will be coated carbon steel to provide high strength and resistance to corrosion. Severe corrosion has resulted in the loss of about one-half the normal wall thickness of the existing piping. Frequent patchwork fixes are required using stainless steel tubing, which restricts air flow and downgrades the High Pressure Air System. Reliability of this system directly impacts the Center's capability to support Space Shuttle Main Engine testing activities.

- 3. Repair Canal and Waterway System 450,000

This project provides for the repair of approximately 6,000 linear feet of canal and waterway embankments and 1,600 linear feet of canal access roads. Work includes placement and compaction of select fill; placement of geotextile filter fabrics, erosion control mats, and concrete rip rap at the waterline; and sodding of the embankment above the waterline. Dirt roads will be repaired and regraded, as required. The canal and waterway system serves as the primary transportation artery for movement of fuel barges to the test stands. Unimpeded water access is essential.

L. Wallops Flight Facility (WFF) \$1,990,000

1. Repair Seawall 900,000

This project provides for the repair of the Wallops Island seawall to protect the Pad 1 launch complex and the area south to Pad 0 and associated facilities. The construction will be seaward of the existing seawall and include all necessary toe protection. This work is necessary to prevent or minimize storm damage, which is becoming increasingly common due to beach erosion and deterioration of the existing protection system.

2. Repair of Roofs and Interior of Surplus Utilization and Disposal Building (N-222) 280,000

This project provides for the repair of Building N-222 and includes the replacement of 5,350 square feet of roof; the replacement of ceiling and floor finishes; the installation of metal doors, thermal windows, and new ceiling insulation; the sealing of building leaks; the painting of interior and exterior walls; and repair of the heating and ventilation system, and the office air conditioning. This building houses the operations for surplus materials for reuse or disposal. Built in 1958, it has had no major work done to date. Due to the numerous leaks in the existing metal roof, rain has damaged the suspended ceiling, insulation, and floor tile. This work is necessary to alleviate existing safety hazards, prevent further structural damage from the deterioration of the building envelope, prevent materials loss due to water damage, and restore the energy efficiency of the building.

3. Repair Island Roads 810,000

This project provides for the repair of concrete and paved surfaces on Wallops Island. The work includes sections of the island and connecting roads, launch pads, service areas, and various parking areas. The work includes 74,000 linear feet of concrete joint repair, the filling and repair of surface cracks, the placement of 70,000 square yards of 1-1/2 inches bituminous concrete overlay on the by-pass road and sections of the North Island Road and the placement of 7,000 square yards of surface treatment and base material on the north island road. The paved surfaces, launch pads and parking areas on the north and south end of Wallops Island are deteriorating and require repair and resurfacing. The island by-pass road built in 1969 provides an alternative route to both the north and south sections of Wallops Island during launches and emergencies. The North Island Road built in 1952 serves the Scout launch and assembly complex, launch pads 4 and 5, rocket storage and the Static and Dynamic Testing facilities.

M.	<u>Various Locations</u>	\$700,000
1.	Repair Radar Building, Bermuda	300,000

This project provides for repair of the main structural frame of the two-story reinforced concrete Radar Building at the Bermuda Tracking Station. Project includes removal of salt-permeated and spalled concrete, cleaning or replacement of reinforcing steel bars, and provision of anticorrosion protection for the reinforcing steel. Salt spray at this coastal location has permeated the concrete, resulting in corrosion of reinforcing steel in columns and beams. This project will correct the structural deficiencies of the facility.

2.	Repair of Storm Damage, Bermuda	400,000
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This project provides for the restoration of the grounds at the Bermuda Tracking Station that have been eroded by hurricanes and storms and for the installation of erosion protection. Included are concrete headwalls and riprap to prevent advancement of washout crevices in order to protect facility foundations and underground utility systems. Recent hurricanes and storms have exposed underground utilities and under-cut roads. Further erosion of the shoreline would eventually undermine existing facility foundations. This project provides the shoreline stabilization necessary to protect the facilities, utilities, and roads.

N.	<u>Miscellaneous Projects Not In Excess of \$250,000 Each</u>	\$515,000
	Total	\$31,900,000

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated \$34 million to \$38 million per year will be required for continuing repair needs.

REHABILITATION
AND MODIFICATION

/



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

SUMMARY

REHABILITATION AND MODIFICATION

Summary of Project Amounts by Location:

Amount

Ames Research Center	\$3,180,000	CF 10-3
Bryden Flight Research Facility	670,000	CF 10-4
Goddard Space Flight Center	2,700,000	CF 10-4
Jet Propulsion Laboratory	2,710,000	CF 10-5
Johnson Space Center	2,710,000	CF 10-7
Kennedy Space Center	2,810,000	CF 10-8
Langley Research Center	3,625,000	CF 10-10
Lewis Research Center	3,400,000	CF 10-12
Marshall Space Flight Center	3,800,000	CF 10-13
Michoud Assembly Facility	1,850,000	CF 10-15
Stennis Space Center	2,225,000	CF 10-16
Wallops Flight Facility	2,010,000	CF 10-17
Various Locations	1,595,000	CF 10-18
Miscellaneous Projects Not in Excess of \$250,000 Each	<u>715,000</u>	CF 10-19
Total	<u>\$34,000,000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Rehabilitation and Modification of Facilities,
Not in Excess of \$1,000,000 Per Project

INSTALLATION: Various Locations

FY 1993 CoF Estimate: \$34,000,000

FY 1991: \$32,900,000

FY 1992: \$34,800,000

COGNIZANT INSTALLATIONS/LOCATIONS OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management Systems and Facilities

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 1993 that have been fully identified at the time of the submission of these estimates and are estimated not to exceed \$1,000,000 per project. The purpose of this program may include some restoration of current functional capability but also includes enhancement of the condition of a facility so that it can more effectively accomplish its designated purpose or increase its functional capability.

PROJECT JUSTIFICATION:

The NASA physical plant has a capital investment of \$4.6 billion and has a current replacement value of \$13 billion. A continuing program of rehabilitation and modification of these facilities is required to accomplish the following:

- 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.

This program includes only facility rehabilitation and modification work having an estimated cost not in excess of **\$1,000,000**. 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.

PROJECT:

Proposed rehabilitation and modification projects for FY 1993 totaling **\$34** million are described under "PROJECT COST ESTIMATE." The total program of **\$34** million has been distilled from requests of more than **\$71** million 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. Only those projects estimated to cost not in excess of \$250,000 have not been individually described or identified by center. The total cost of these miscellaneous projects is \$715,000.

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	\$8,965,000
b. Fire Detection/Protection Systems	3,915,000
c. General Purpose Buildings	4,405,000
d. Technical Buildings/Structures	16,715,000

PROJECT COST ESTIMATE

A. Ames Research Center (ARC) \$3,180,000

1. Modify Fire Detection and Suppression System (N-248) 680,000

This project will modify the existing fire detection and suppression system in the Aircraft Servicing Facility. The work includes provision of a new automatic foam water deluge system in the hangar bay with connection of the existing floor nozzles to the foam system, installation of wet pipe sprinklers in office and shop areas, and extension of an existing high pressure water main to supply the additional water needed for the new system. The facility houses expensive research equipment, including the Kuiper Telescope and aircraft. The existing fire detection and suppression system does not meet NASA and Health/Safety fire code standards and must be modified to provide adequate protection for these important assets.

2. Modify National Full-scale Aeronautics Complex (NFAC) for Variable Frequency Power 900,000

This project modifies the power feed to the NFAC by providing a parallel control substation near the motor generator for the 40x80-foot leg of the NFAC, fed from a split bus in the existing 150 hertz switchgear in the motor generator room; installation of a new 5 kV feeder and load station at the 40X80 test section, and associated wiring modifications. Variable frequency power is the best means of starting the Large Rotor Test Apparatus and controlling its operation. The existing variable frequency power supply is outdated and cannot supply adequate power to support full-scale rotor testing, reducing ARC's ability to support research requirements.

3. Rehabilitate and Modify Battery System and Supply Circuits 700,000

This project provides replacement batteries for electrical equipment and provides for transfer of building loads from the 6.9 kV supply circuits A&B to the 13.8 kV supply circuits C&D. The work includes replacement of the battery system at Substation N225B, replacing transformers and switchgear at Buildings N-239 and N-239A, disconnecting existing building feeders from supply circuits A&B, and reconnecting these buildings to supply circuits C&D. The battery systems have reached the end of their useful lives. A failure of these systems would result in a loss of DC power and could cause destruction of vital and costly electrical equipment. Supply circuits A&B were initially designed as a loop system fed by two transformers. These circuits have become overloaded and the loop system is no longer effective because load transfer trips the breaker. Therefore, power to the facilities must be curtailed for routine maintenance and repair of the system. This condition can be corrected by transferring Buildings 239 and 239A to supply circuits C&D.

4. Modify Life Science Laboratory (N-239A) North Area 900,080

This project will rehabilitate and modify the northern half of the Life Science Research Laboratory high bay. The work will include new ceilings, new laboratory space, heating and cooling to offices and laboratories, utilities, high pressure air, vacuum and oxygen bins, wet sprinkler system, mechanical modifications, asbestos abatement as needed to accomplish the work, and an exterior stair to meet egress requirements. Ames Research Center has the lead in the research and development of Advanced Regenerative Life Support Systems. This R&D effort is expanding and requires additional facilities to accommodate staff, additional laboratories, and research equipment.

B. Dryden Flight Research Facility (DFRF) ~~\$670,000~~

1. Rehabilitate and Modify Fire Detection and Suppression System (B-4802) 670,000

This project will replace the existing water deluge sprinkler system in the main hangar with a foam fire suppression system to meet National Fire Protection Association (NFPA) and NASA standards. The project will correct current inadequate conditions in the primary DFRF hangar, which houses mission essential aircraft and test vehicles valued in excess of \$500 million. The existing system does not adequately protect this essential equipment.

C. Goddard Space Flight Center ~~\$2,700,000~~

1. Modifications for Cryogenic Research Integration Facility (CRIF)/Spacecraft Checkout Area (7) 900,000

This project provides for the modification of the Spacecraft Checkout Area (SCA) cleanroom and high bay area in the Payload Testing Facility, Building 7. This work includes the installation of three 10 foot by 10 foot control rooms, two of which require radiofrequency interference (RFI) shielding. Modifications include relocation of the SCA air shower to provide access to the control rooms and adjacent CRIF building; electrical upgrades; cryogenic distribution piping for the SCA; and installation of RFI shielding. A 20 foot by 20 foot roll-up door will provide direct access between the CRIF and SCA cleanrooms via a 2,000 square foot link to be constructed between CRIF and Building 7. Structural modifications and utilities distribution modifications are also required. Power conditioning, HVAC, and interior finishes will be upgrades in these areas. A helium supply system will be installed in the CRIF with associated pumps and piping. In addition, cleanroom class finishes and upgraded HVAC will be provided. This project is required in order to upgrade the deteriorating surfaces and engineering systems of the existing SCA cleanroom and to provide environmentally controlled access between the SCA and CRIF for payload integration and testing.

- 2. Modification for High Performance Computing Initiative, (28) 850,000

This project proposes modifications in Building 28 to provide approximately 1,750 square feet of computer space to house a parallel computer and approximately 900 square foot for program/project investigators. An addition 3,800 square feet will be modified to house displaced personnel. This work is required to support the Federal High Performance Computing and Communications Program, whose goal is to accelerate the commercial availability and utilization of the next generation of high performance computers and networks.

- 3. Modification of HVAC System for Building 7/10/15 Complex 350,000

This project provides modifications to HVAC systems in the Building 7/10/15 complex to preclude contamination by infiltration of building air into critical clean room and integration areas. The project includes: capacity adjustments, redistribution of air flow, improvements to static pressure controls, and other modifications, as required, to maintain positive building pressure. Spacecraft integration and test areas within the Building 7/10/15 complex must be maintained under positive static pressure to prevent infiltration of contaminated air. HVAC systems serving these areas cannot properly satisfy this requirement. Control systems are old and inadequate for static pressure control. Individual HVAC system performance has been impacted by various building modifications, resulting in improper distribution and intermixing of air flow between zones. This HVAC system must be upgraded to prevent continued performance degradation.

- 4. Rehabilitation of Utility Control System 600,000

This project will replace the existing Utility Control System (UCS), pneumatic automatic temperature controls and sensors with a state-of-the-art Direct Digital Control UCS system for Building 2, 4, 8, 11, and 12. Building control panels will be replaced with new digital systems to provide independent local control of air conditioning systems. The cables, connecting building control panels to the master control in Building 24 will be reused. This project is critical to providing effective energy conservation. The existing obsolete UCS is primarily a monitoring system and has incurred numerous operational problems. Software failures in particular have been frequent problems. The new digital system will provide for an efficient, reliable, and maintainable air conditioning control system.

D. Jet Propulsion Laboratory (JPL) \$2,710,000

- 1. Modifications to Cryogenic Laboratory Building (197) 650,000

This project provides for the modification of existing space by enclosing the north side test cell and the patio area of Building 197. In addition, the existing vacuum pumps will

be relocated, and the roof structure, flooring, underground drainage utilities, and mechanical systems will be modified and upgraded. The purpose of these modifications is to Convert the building for use as a Cryogenic Fluid Mixing Laboratory, Low Thrust Rocket Test Facility, and Fluid Catalytic Processes Laboratory. The space currently housing these activities is being reclaimed and demolished for new facility requirements.

2. Modifications of Anechoic Chambers Building (212) 400,000

This project provides for the modification and rehabilitation of the anechoic antenna test chambers in the Antenna Laboratory, including new extra high performance anechoic material suitable for ka-band frequency testing, anechoic lining materials, enlargement of four rear access doors, addition of two new anterooms and roll-up doors, and installation of two 1-ton JIB cranes. The existing anechoic material in the 40 X 60 foot chambers has lost its radio frequency absorbcency properties due to age and deterioration, rendering it unsuited for accurate testing of research hardware. The anteroom with roll-up doors is needed at the rear of the chambers to provide a weatherproof holding area for flight storage containers. The enlargement of the existing doors and the overhead cranes are needed to accommodate the increased size and weight of new space science spacecrafts and research hardware.

3. Modify the Electric Converter and Pyrotechnic Lab Building (76) 950,000

This project modifies approximately 6,000 square feet of existing area, formally used to house wind tunnel compressors, into laboratories for Alkaline Metal Thermal to Electrical Converter (AMTEC) and pyrotechnic activities. The laboratories will be separated by a 4-hour fire rated concrete block wall and will utilize separate HVAC systems. The AMTEC laboratory will be approximately 4,700 square feet, including a 400 square foot 100,000 class clean room. The pyrotechnic laboratory will be approximately 1,300 square feet, including Class H-1 storage areas with outside access and fire containment walls. This project is necessary because the present antiquated AMTEC and pyrotechnic facilities in Buildings 90 and 189 are scheduled for demolition to make room for new construction. Also the expansion of the AMTEC program and pyrotechnic development require a more adequate facility in order to meet flight program schedules.

4. Modifications to Nitrogen Systems 260,000

This project proposes the underground interconnection of the liquid nitrogen (LN2) storage tanks at the Environmental Lab and the 25-Foot Space Simulator to permit bidirectional LN2 transfer between these tanks. Also proposed is the enlargement of the high pressure gaseous nitrogen (GN2) line between the storage bottle farm just east of the 10-Foot Space Simulator and the cluster of pressure regulating valves on top of the Environmental Lab, serving the acoustical chamber. The bidirectional transfer line will improve logistics and operation of the LN2 system. The high pressure GN2 line change is necessary because of the greatly increased mass flow

requirements of the new acoustic modulators now driving the acoustic test chamber's low and mid-range horns.

5. Modification of South Lab Air Compressor System 450,000

This project proposes the relocation of one existing 125 HP, rotary screw, oil-free, 100 psi air compressor; the procurement of another new identical unit; and their joint installation in the immediate vicinity of the Fabrication Shop to supply the air distribution system in the southern section of the Laboratory. Compressors will be installed on a concrete slab with an air receiver, package cooling tower and pump, cooling and dehumidification equipment, control and safety devices, motor control center, and piping to connect to the distribution system. These two oil-and dirt-free compressors, equipped with adequate dehumidification procedures, will maintain the quality of the plant air supply while reducing the amount of electrical energy consumed to power this utility source.

E. Johnson Space Center (JSC) \$2,710,000

1. Modifications to Test Stand 302, White Sands Test Facility 950,000

This project will support Space Station Freedom propulsion module development and qualification tests. Modifications will be made to propellant, altitude, and electrical systems to incorporate an additional, existing vacuum cell. This cell will be refurbished and plumbed into the Test Stand 302 Altitude Simulation System with multiple, two-stage steam ejectors. A special diffuser/heat exchanger will be installed to accommodate single or multiple-thruster firings at simulated altitudes. The hydrazine propellant and mechanical vacuum pump systems supporting Test Stand 302 will be modified to support the additional cell. The Test Stand 302 utility systems including power, communications, area warning, and video will also be extended to the vacuum cell. A new heating, ventilating, and air conditioning system will be installed in Building 320 for thermal control, and a new valve pit will be installed for cooling water and fire control.

2. Modification of Liquid Nitrogen Capacity and Distribution (7) 400,000

This project provides for increasing the storage capacity for liquid nitrogen (LN2) and improving the LN2 distribution system for the Crew Systems Laboratory, Building 7. The work includes the relocation and certification of an existing 4,000-gallon cryogenic tank from Building 32 to the north side of Building 37. This tank will be placed adjacent to the existing 1,200-gallon LN2 storage tank. The work also includes installation of a two horsepower cryogenic pump and 450 feet of new vacuum-jacketed cryogenic piping; removal and replacement of approximately 200 feet of existing fiberglass-insulated cryogenic piping with vacuum-jacketed piping; adding approximately 140 feet of PEA panel architectural enclosure around the new and existing cryogenic tanks; and electrical modifications to serve and control the new cryogenic

pump and new cryogenic tank vacuum system. The existing LN2 supply system has insufficient storage capacity, and the existing insulation on the cryogenic piping has deteriorated.

- 3. Rehabilitate Mechanical Systems
(100 & 101 Area), White Sands Test Facility 450,000

This project provides for the repair, refurbishment, and/or replacement of the major heating, ventilating, and air conditioning (HVAC) systems in Buildings 100 and 101. These are the administration buildings in the White Sands Test Facility (WSTF) 100 Area. Work will replace obsolete equipment, include asbestos abatement, and provide control modifications for energy conservation. HVAC systems include air handling units, chillers, boiler, direct expansion refrigeration equipment, air distribution components, humidifiers, and control systems.

- 4. Installation of Automatic Sprinkler System Building (4) 550,000

This project provides for the installation of an automatic sprinkler system in the Flight Operations Facility, Building 4, to increase safety and property protection. Approximately 105,000 square feet of office area will be protected by the new sprinkler system. Work includes the installation of sprinkler heads and piping, isolation valves, drain lines, and alarms. The work will also include spot removal of asbestos in the ceiling to facilitate installation of the new sprinkler system.

- 5. Modify Site Sewage Lift Stations 360,000

This project provides for modifications to the sanitary sewer system lift stations. The work includes modifications to Lift Station 1 which serves the Thermochemical Test Area and the 300/400 Areas, modifications to Lift Station 2 which serves the main mall area to increase pumping capacity, and an upgrade of the Cooling Tower Blowdown Pre-Treatment Facility, Building 223, wet well. Other work includes replacement of air compressors with motors at Lift Station 2, relocation of controls to ground level at Lift Station 3, replacement of an air compressor and motor at Lift Station 6, and replacement of pumps at Lift Station 7. This work is required to upgrade lift stations to meet increasing demands on the system.

F. Kennedy Space Center (KSC) \$2,810,000

- 1. Upgrade Gaseous Helium (GHe) Compressor (LC-39) 350,000

This project provides for the replacement and upgrade of a 400 cubic feet per minute, 6000 pounds per square inch gaseous helium compressor. The compressor will be located next to other helium compressors at the east end of the Converter Compressor Facility. The project is required to support the increasing helium demands at Launch Complex-39 and to incrementally replace the existing back-up helium compressors. Some compressors are 27 years old and are no

longer manufactured. Spare parts for these compressors are no longer available. Failure of these units will eliminate the existing marginal back-up capacity.

- 2. Modify Communications Maintenance and Storage Facility 560,000

This project modifies and refurbishes the Communications Maintenance and Storage Building (M6-791) to include the heating, ventilating, and air conditioning systems; installation of ceilings; replace and improve lighting, floor tile, refinish walls, modify external southeast shelter, and pave west parking lot. The facility is 23 years old and has deteriorated beyond ordinary maintenance capability. Modifications are required to provide economical and efficient operation of communications maintenance in support of Shuttle launches. The heating, ventilating, and air conditioning system is insufficient, and the lighting system is inadequate for operations, and building space is poorly laid out for efficient operations.

- 3. Modify Hangar L for Life Science Programs 410,000

This project modifies approximately 5,000 square foot of storage space at Hangar L for use as office and teaching areas. Also, a new pre-engineered storage building, approximately 3,600 square feet, will be constructed behind Hangar L to replace lost storage space. Office space, lecture room and teaching areas are required to support the Life Sciences Flight Experiments (LSFE) Program and the Student Life Training Program. The LSFE must support 50 to 80 principal investigators for each Spacelab mission and 10 to 20 principal investigators for each mid-deck experiment. Temporary accommodations are currently being used.

- 4. Upgrade Operations and Checkout Building Elevators 350,000

This project will remove existing relay type controls, hydraulic valves, leveling motors, and traveling cables in elevators 5, 6, and 7. They will be replaced with new unitized valves, traveling cables, and programmable logic controllers for elevator control. Handicapped and fire alarm modifications will be installed. Existing controllers and hydraulic valves are obsolete and not cost effective to maintain.

- 5. Upgrade Repeater Station Cooling System 390,000

This project provides for replacement of primary and secondary heating, ventilating and air conditioning (HVAC) systems in the Vehicle Assembly Building. Work consists of replacement of the existing air handling units, compressors, and boiler. The new system includes a new 80-ton direct expansion unit with electrical reheat. This facility is a critical communications and data link between Kennedy Space Center (KSC) and other centers, Launch Complex-39 area and KSC Industrial Area, control rooms and the launch pad. The equipment in the repeater station must be kept cool to function. The existing HVAC system is more than 25 years old. Failure to meet

cooling requirements of the electronic equipment in the repeater station would delay a Shuttle launch.

- 6. Modify Vehicle Assembly Building External Tank/Solid Rocket Booster Shop and Flight Hardware Kitting Area 320,000

This project provides for modifications of the Vehicle Assembly Building areas used for External Tank/Solid Rocket Booster shop and flight hardware kitting. Work includes removal of existing fencing and lighting fixtures; installation of walls, suspended ceiling, ceiling mounted lights, and air conditioning in the kitting areas; and renovation of shop areas with suspended ceilings, ceiling mounted lights and an enclosed office. This project is needed to provide necessary environmental and security conditions for processing flight hardware. The shop areas and enclosed office areas require modification to enhance working conditions and provide privacy for shop supervision and securing of records.

- 7. Modify Payload Transporter Parking Shed 430,000

This project will enclose the existing Payload Hazardous Servicing Facility Transporter parking shed with walls and 2 large roll-up doors on the north side. The existing shed is 700 square feet and 44 feet high. This facility is used to park payload environmental transportation systems and single pallet rotation device payload transporters. Continuous exposure to the environment is causing excessive operation and maintenance costs. If this project is not implemented, operations and maintenance costs will increase.

G. Langley Research Center (LaRC) \$3,625,000

- 1. Rehabilitation of Office Area, Building 1265 730,000

This project provides for rehabilitation of approximately 5,000 square feet of existing office area in Building 1265; construction of a 2,300 square foot addition to the east end of the facility for seven two-person offices and a ramp for handicap access to the facility; and addition of 14 parking spaces for the Structures Directorate which performs research in the 8-foot High Temperature Tunnel. The rehabilitation will include installing new windows and exterior doors; replacing ceilings, lights, and interior walls; upgrading restrooms to include handicap access; upgrading the electrical system; upgrading the heating, ventilating, and air conditioning system in one portion of the building; and replacing the heating, ventilating, and air conditioning in another portion. The project also includes asbestos removal in the crawl spaces of those areas of the facility that are involved in the project. This office area has not been upgraded since the original construction in 1959 and has deteriorated due to its age and continued use.

2. Upgrade Safety Systems Building, 1268/1268A 615,000

This project provides for modifications to upgrade the fire protection system and alternate power system in the Central Scientific Computing Complex (1261/1268A). The modifications to the fire protection system include removal of the existing obsolete high voltage system and installation of a new low voltage system. The upgraded system will include the installation of new smoke detectors, controls, control panels, wiring, and conduit. The alternate power source will be modified to increase the "standby" power available for critical applications. The existing fire detection system is over 20 years old and replacement parts are no longer available. Completion of the proposed project is necessary to ensure system efficiency, reliability, and safety.

3. Modifications to 15-Inch Mach 6 Air Tunnel (1251A) 850,000

This project provides for modifications to the 15-Inch Mach 6 Air Tunnel. The work includes modification and upgrade of the model injection/support system and test section, installation of a new five micron in-line filter, augmentation of an existing electrical resistance heater, and installation of a new monorail crane. The modified model injection/support system will provide the capability to rapidly inject and retract the model being tested in the air stream. It will also provide for angles of attack of -10 to +50 degrees and angles of sideslip of ± 6 degrees. The filter will protect the test models and instrumentation from damage due to particle impingement. The augmented heater, along with modifications to the air supply system, will upgrade the facility flow capabilities from 1,000 degrees Fahrenheit, 5 pounds per second mass flow to 800 degrees Fahrenheit, 20 pounds per second mass flow. This tunnel is a blowdown facility and will be used for development of testing techniques critical to the advancement of the hypersonic research program.

4. Modification to Central Steam Generating Facility Building (1215) 730,000

This project provides for the installation of a new gas-fired boiler in Building 1215. The new boiler will be capable of producing 50,000 pounds per hour of steam at 350 pounds per square inch. Installation will include all piping, valves, instrumentation, controls, low pressure air, electrical, and insulation necessary for a complete system. The Central Heating and Steam Generating Facility is used to augment Langley's steam demands beyond the capacity of the Refuse-Fired Steam Generating Plant. The refuse plant can supply 60,000 pounds per hour (pph) of steam for the research facilities. When the demand exceeds 60,000 pph, the existing large oil-fired boilers are used to provide the additional steam. These boilers are very inefficient and often waste up to 40,000 pph of steam when in use. The new smaller, more efficient boiler will provide large savings each time demand augmentation requires use of this boiler.

- 5. Rehabilitation of the Stability and Control Laboratory (1298) 700,000

This project provides for the rehabilitation of building 1298 which includes the installation of new lights, ceilings, and modifications to provide additional office, shop, laboratory and storage space. Modifications will include installation of computer-deck flooring, a two-story personnel stairwell, equipment/personnel elevator, and construction of a 1765 square foot, single-story shop/fabrication/assembly area addition. The project will include all utilities required such as additional power and HVAC as necessary to accommodate the additions and rehabilitation efforts. The rehabilitation to building 1298 will be used to support advanced cockpit technology and multidisciplinary controls research.

H. Lewis Research Center (LeRC) \$3,400,000

- 1. Modification of North Central Chilled Water Plant Building (9) 750,000

This project provides for upgrading the existing 385 ton chiller in LeRC's North Central Chilled Water Plant, Building 9, with a new 1,100 ton chiller and upgraded controls. Current cooling loads in the northern portion of the Center exceed the chiller capacity available. Addition of the new chiller will increase capacity to meet the cooling load, and provide required chiller redundancy within the plant.

- 2. Rehabilitation of Basic Materials Lab Building (106) 750,000

This project provides for rehabilitation of the Basic Materials Laboratory. The work includes replacing the office area fan/coil type HVAC system with a variable volume system; replacing the perimeter heat system and office and laboratory windows; and upgrading electric power distribution panels and wiring. The existing 1962 vintage HVAC system maintenance costs, prolonged downtimes, and ineffective environmental controls have increased to unacceptable levels. The exterior windows can no longer seal out the weather. Upgrading is also required to provide an efficient and effective system and to bring the building into compliance with the National Fire Protection Association Life Safety Code and the National Electric Code.

- 3. Rehab Composite Lab Mechanical Systems Building (51) 750,000

This project provides for rehabilitation of the mechanical systems in the High Temperature Composites Lab. The work includes replacement of heating, ventilating, and air conditioning systems; renovation of toilet rooms to accommodate the handicapped; separation of potable and non-potable water systems; and installation of power distribution panels. The 42 year-old building and mechanical system have deteriorated beyond repair, and are unreliable. This project is necessary to provide research occupants with reliable/efficient systems, reduce maintenance costs, and comply with current codes and standards.

- 4. Modification for Handicapped Access, Building (3) 400,000

This project provides for the construction of a personnel elevator in the Administration Building for access to all floors. The work includes modifications for an elevator shaft, elevator, pump room, and modification of adjacent building office walls, structural members, and mechanical and electrical equipment as necessary to accomplish this project. This project will provide handicapped access to all areas within the building.

- 5. Rehabilitation of Drop Tower Mechanical Systems, Building (45) 750,000

This project provides for rehabilitation of the mechanical systems in the Drop Tower, Building 45. The work includes installation of a new central HVAC system for the Tower; new ventilation units for gas cylinder storage cabinets; replacement and/or encapsulation of the remaining transite siding; evaluation and correction of the shale erosion around the Drop Tower's base; replacement of the Tower's flooring; and modification of the laboratories located on the third, fourth, and sixth floors. Major rehabilitation is required to correct deteriorated and nonfunctional conditions of the 1948 vintage facility in order to continue to support Lewis and other sponsored programs. These modifications are essential to restore the structure and services to an acceptable controlled environment required for testing, hardware, and personnel performance.

I. Marshall Space Flight Center (MSFC) \$3,800,000

- 1. Modifications to the 100-Meter Vacuum Chamber 950,000

This project provides for the replacement of the 48-inch inner diameter vacuum tube in the Straylight Facility and for the addition of oil free pumping to support optical work. Scope also includes installation of new cryopump compressors with associated shelters, utilities, instrumentation, pressurization system, and other ancillary equipment. These modifications will convert the Straylight Facility into a contamination-free ultra high vacuum test chamber for testing the straylight suppression capability of high performance optical systems.

- 2. Rehabilitate Chemical Tank Areas, Building (4760) 850,000

This project provides for the restoration of the small tank line and the chemical laboratory in the Surface Treatment Facility. The small tank line is used for electroplating processes and consists of 66 tanks. Work to be performed in this area includes replacement of deteriorated tanks, pumps, and plumbing; tank lining and insulation repair; tank cleaning and painting; installation of sump pumps with drains connecting to pollution control equipment; replacement of overhead monorail hoist and track; restoration of rectifiers and associated control boxes; and painting of walls in the tank area. The chemical laboratory is used to perform chemical analysis on the various process solutions used in electroplating operations.

Work to be performed in this area includes installation of new lights, ceiling, and floor tiles; modification of the functional layout to improve space utilization; replacement of the HVAC system and controls; and upgrade of the restrooms.

3. Modifications for Combustion Physics, Building (4583) 725,000

This project provides for the conversion of a 2,000 square foot underutilized section of the existing high bay area in the Test and Data Recording Facility into a work and support area for the Combustion Physics Group. The converted space provided by this project will be used to support combustion diagnostics research and test activities conducted at Test Stands 115 and 116, and at the Technology Test Bed. The converted space will specifically provide additional laboratory space, storage for sensitive control and instrumentation equipment, and supporting office space. Scope also includes demolition work, removal of obsolete equipment, installation of an equipment lift, and rehabilitation and modification of the power distribution, HVAC, and lighting systems to support the new laboratories and the remaining high bay area. A new 1,500 square foot pre-engineered metal building will be constructed adjacent to Building 4583 for a mechanical shop and staging area.

4. Modifications to the Neutral Buoyancy Facility 375,000

This project provides for reconfiguration of the Neutral Buoyancy Facility to include the addition of two decks and a freight elevator. This facility is used for the development of extravehicular activity procedures and provides support to programs such as Shuttle, Spacelab, Hubble Space Telescope, and Space Station Freedom. Work to be performed includes modifications to the existing power distribution system, lighting system, hydraulic supply lines, compressed air lines, potable water lines, and HVAC system. The new decks will provide needed laboratory space and secure equipment storage space. The freight elevator is required to transport user test equipment.

5. Modifications to the Hydrolaser Facility (Kennedy Space Center) 525,000

This project provides modifications to permit use of the existing robotic hydrolaser to strip paint from major Solid Rocket Booster structures. Scope includes reconfiguration of the existing effluent processing equipment within the facility to enable installation of a debris shredder and a high flow flush water system. A small building annex will also be provided to house a new slurry pump, separator, and waste dumpster. The resulting system will automatically remove solids and contaminants from the wastewater generated by using the robotic hydrolaser to strip paint and insulation (thermoblative) simultaneously. By automating the paint removal process, and performing it concurrently with the thermoblative removal, process time and costs will be reduced.

6. Rehabilitate the Program Support Communication

Network Building, Building (4306) 375,000

This project provides for the complete rehabilitation of Building 4306. Work to be performed includes restoration of interior finishes, including installation of new ceilings, floor coverings, and wall treatments. The HVAC system and the electrical distribution system will be upgraded to handle current loads. Fire detection and suppression systems will be installed where required. Exterior wall treatments, insulation, and windows will be replaced or upgraded to provide an energy efficient building environment. A standing seam metal roof will be installed, and the existing roof deck and structure will be repaired. This facility is 45 years old, and was converted from a cafeteria into an office building. The facility is poorly configured and does not meet the functional requirements of the user. Due to its age, the building systems are badly deteriorated and out of compliance with applicable safety and building codes.

J. Michoud Assembly Facility (MAF) \$1,850,000

1. Modify Advanced Manufacturing Technology Spray Booth 950,000

This project provides for the modification of the Advanced Manufacturing Technology Sprayed on Foam Insulation Spray Booth in the External Tank (ET) Main Manufacturing Building (103) to accommodate full scale ET component testing. Scope includes enlargement of access door, modification of floor for ET component supports, reconfiguration of cool room, construction of control room, installation of woven wire panels, HVAC, utilities, and overhead lighting. The north-south aisle will be expanded by four feet and the turntable rails will be embedded in the floor. Clean Air Act Amendment of 1990 mandates the phaseout of the current blowing agent chlorofluorocarbon (CFC-11) by the year 2000. Four existing compounds or mixtures are undergoing evaluation with three blowing agents. Full scale testing of the selected blowing agent must be conducted before use in production. These modifications to the Spray Bdoth will allow us to accomplish this.

2. Rehabilitate and Modify Fire Protection System 900,000

This project provides for the restoration and upgrade of the fire protection system in the External Tank Main Manufacturing Building. Scope includes replacement of approximately 1,700 linear feet of feed mains and 2,700 linear feet of risers; installation of new post indicator valves, sectional control valves, and pressure switches; and wiring of switches to new fire protection System panels. The existing fire protection system is 1940's vintage. The entire system requires 10,000 gallons per day of make-up water because the feed mains and sprinkler risers are severely corroded and leak extensively. Valves are faulty and do not hold or close properly and new pressure switches are required to detect pressure drops in the supply piping.

K. Stennis Space Center(SSC) \$2,225,000

1. Modify Consoles in the Industrial Water Plant 615,000

This project provides for the rehabilitation of the operator consoles in the High Pressure Industrial Water (HPIW) Plant. This plant provides deluge water and emergency power to the two Space Shuttle Main Engine test stands and to the nine cryogenic propellant barges used during SSME testing. Work to be done includes the replacement/refurbishment of the controls for the HPIW diesel engines and pumps, the emergency power diesel generators, and the 13.8 kV power switchgear. This equipment is obsolete and replacement parts are no longer available.

2. Modify Utility Control System Building (2204) 525,000

This project provides for the modification of the utility control system in Building 2204. Work to be done includes the replacement of the HVAC controls for the existing chillers, air handling units, heating/ventilating units, and cooling towers. The HVAC controls in this building are more than 20 years old and parts are no longer available. This project will reduce operations and maintenance costs and improve energy conservation.

3. Rehabilitate Instrumentation Laboratory HVAC System 675,000

This project provides for the rehabilitation of the HVAC system and modification of the utility control system in the Instrumentation Laboratory. This laboratory provides cryogenic and high pressure gas evaluation and contamination analysis for the Space Shuttle Main Engine testing program. Work to be done includes replacement of hot water and chilled water control valves, replacement of damper actuators, refurbishment of air handling units and heating/ventilating units, and the upgrade of pneumatic controls. Work performed in this laboratory is sensitive to variations in temperature and humidity making the frequent HVAC system failures very disruptive to the user. The HVAC system is more than 20 years old and parts are no longer available.

4. Modify Flammable Material Storage Building 410,000

This project provides for the modification of the 7,400 square foot centralized bulk storage area for flammable supplies located in Building 2203. Work to be done includes upgrade of the ventilation system, installation of explosion-proof electrical equipment, improved lighting, interior wall modifications, and installation of an emergency drainage system. The facility is currently out of compliance with applicable safety and building codes.

L. Wallops Flight Facility (WFF) \$2,010,000

1. Rehabilitation of Information Processing
 Facility, Building (N-161) 700,000

This project provides for the conversion of computer areas into offices. The rehabilitation requires installing interior partitions, doors, ceiling, floor finishes, fire protection, HVAC and electrical modification, exterior doors and windows, expansion of the second floor into the garage area, and construction of an exterior vestibule on the east side of the building. The relocation of the Flight Information Control and Analysis Laboratory to the new Integrated Range Control Complex permits the rehabilitation and modification of a structurally sound facility into much needed offices. This effort allows separate operational functions to operate from the same facility and provides more effective communication and coordination.

2. Modification of Fire Protection System,
 Various Buildings 500,000

This project provides for installing fire alarm systems in Buildings F-7, F-8, F-19, F-20, F-25, F-160, N-167, J-17, and 5-20; installing wet pipe sprinkler systems in Buildings F-8, F-20, F-25, M-1, N-167, N-168, V-45, V-55; and extending existing sprinkler systems to new building expansion areas in Buildings M-16 and X-15. In addition, the work includes installing dry chemical fire protection systems in the range hoods in the cafeteria, Building E-2 and adding multiplexers to the existing fire alarm systems in Buildings F-16, M-1, and F-157. The present fire alarm system provides inconsistent coverage of the facility. Upgrading the system will provide the capability to multiplex zone data directly to the fire station's central alarm panel. The addition of wet sprinkler and fire alarm systems will provide necessary protection to property and personnel.

3. Modification to Blockhouse 2, Building Y-30 360,000

This project provides for the modification of Building Y-30. The work includes the removal and replacement of 5660 square feet of roofing, the addition of 5660 square feet of 24-inch thick reinforced concrete to the existing roof slab, and the relocation of miscellaneous items on the roof. This building houses the ground support equipment, firing circuits, and launcher controls for launching sounding and meteorological rockets from Launch Pad 2. This work is necessary to upgrade the existing building and provide personnel protection in the event of a catastrophic rocket failure.

4. Modification to the HVAC Systems
 (Buildings E-105 and E-106) 450,000

This project provides for modification of the HVAC systems in Buildings E-105 and E-106. The work includes installing louvers, exhaust fans, air handling units, refrigeration equipment, new duct work, supply air diffusers, return air registers, piping and control valves, temperature and humidity controls, modification to outside air duct works, and the testing and balancing of both the air and water flows to each floor of the two buildings. The present HVAC systems are undersized in capacity resulting in condensation collecting on the supply air diffusers, unbalanced air flow, mold and mildew problems, and irregular temperatures (hot and cold spots) throughout each building. The modifications of these systems will provide adequate cooling, heating, air flow, humidity and temperature control for equipment and personnel.

M. Various Locations \$1,595,000

1. Modification of Electric Powerhouse, Canberra, Australia 875,000

This project provides for modification or replacement of transformers, meters, cables, switchgear, and breakers as required to allow operation of the existing diesel engine generators at their full capacity for brief periods; addition of one 230 kW diesel engine generator dedicated to critical power requirements; implementation of high resistance grounding and ground fault detection; switchgear trip coordination; programmable controller installation; and instrumentation for monitoring and equipment recording. This project will correct power system deficiencies to improve the safety and system reliability of the power generation and distribution systems to maximize the system's availability in the event of a major power outage.

2. Modification of Air Conditioning DDS-14, Goldstone, California 320,000

The project will rehabilitate or replace all existing air handlers, ducting system, pumps, and chilled water piping at the 70-meter antenna (Bldg. G-80). The existing air handling units at the 70-meter antenna (G-80) are more than 20 years old, have insufficient capacity, and require considerable maintenance. These modifications will provide the additional cooling capacity to meet the present and planned loads.

3. Rehab. and Mod Air Conditioning System, Madrid, Spain 400,000

This project provides for replacing or modifying the obsolete heating, ventilation, and air conditioning (HVAC) equipment at the Madrid Deep Space Communications Complex. Modifications include replacement of the direct expansion units; and associated control equipment at several complex buildings, including two (2) antennas, the Power Plant (Bldg. 100), NASA Communication

Center (Bldg. 16001, Complex Maintenance Facility (Bldg. 500), Cafeteria (Bldg. 400), and Logistics (Bldg. 2100). Maintenance problems have increased due to high failure rates and difficulties in acquiring spare parts for the 20 year old systems. The replacement of these old and inefficient units will reduce maintenance and operation costs and will enhance station reliability

N. <u>Miscellaneous Projects Not in Excess of \$250,000</u>	\$715,000
Total	<u>\$34,000,000</u>

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT: An estimated \$35 million to \$40 million per year will be required for continuing rehabilitation and modification needs.

MINOR
CONSTRUCTION

1

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

SUMMARY



<u>Summary of Project Amounts by Location:</u>	<u>Amount</u>	<u>Page No.</u>
Ames Research Center	\$720, 000	CF 11-3
Dryden Flight Research Facility	500,000	CF 11-3
Goddard Space Flight Center	1,200, 000	CF 11-3
Jet Propulsion Laboratory	1,120, 000	CF 11-4
Johnson Space	1,350, 000	CF 11-5
Kennedy Space Center	1,980, 000	CF 11-6
Langley Research Center	1,140, 000	CF 11-6
Lewis Research Center	1.400. 000	CF 11-7
Marshall Space Flight Center	1.220. 000	CF 11-7
Michoud Assembly Facility	600. 000	CF 11-8
Stennis Space Center	1.140. 000	CF 11-8
Wallops Flight Facility	720. 000	CF 11-9
Miscellaneous Projects Not in Excess of \$250. 000 Each	910. 000	CF 11-9
Total	<u>\$14,000,000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Minor Construction of New Facilities and Additions to Existing Facilities,
Not in Excess of \$750,000 Per Project

INSTALLATION: Various Locations

FY 1993 CoF Estimate: \$14,000,000

FY 1991: \$11,000,000

FY 1992: \$12,900,000

COGNIZANT INSTALLATIONS/LOCATIONS OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management Systems and Facilities

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 in this program is estimated to cost no more than \$750,000 and involves either the construction of new facilities or additions to facilities. The FY 1993 request of \$14 million 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, testing, and similar activities. Specific justification for each minor construction project is provided under "PROJECT COST ESTIMATE."

PROJECT:

Included in the FY 1993 minor construction program are those facility projects for institutional or technical facility needs that could be fully identified at the time of

submission of this budget estimate. Items of work totalling \$14 million are included in this resource request and have been distilled from a list totalling over \$38 million. 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, the revision of priorities may require changes in some of the items to be accomplished. Such changes will be accommodated within the total resources allocated.

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

a. General Purpose Buildings	4,560,000
b. Technical Buildings/Structures	9,440,000

PROJECT COST ESTIMATE:

A. <u>Ames Research Center</u> (ARC)	<u>\$720,000</u>
1. Construct Addition to Fluid Mechanics Laboratory (N-260)	720,000

This project will provide a 4,300 square foot addition to the Fluid Mechanics Laboratory for an experiment preparation area, office, and support space for approximately 20 researchers and staff. The addition will also include high pressure (3,000 pounds per square inch) air. Completion of this project will provide needed research space for supersonic transition research. This is part of an expanded effort in high-speed aeronautics, including research programs supporting the next-generation commercial supersonic transport aircraft. There is no adequate space available to perform this needed research.

B. <u>Dryden Flight Research Facility</u> (DFRF)	<u>\$500,000</u>
1. Construct Roads, (Various Locations)	500,000

This project will provide approximately 22,000 square yards of roadway in various locations to provide additional access and improve vehicle circulation at DFRF. Areas to be improved or extended include Swann Avenue, Lancaster Boulevard, and access road to the north and northwest portions of DFRF. These roads will permit future development of the north side of DFRF and will improve traffic circulation and safety in the existing Forbes/Lilly Avenue area.

C. <u>Goddard Space Flight Center</u> (GSFC)	<u>\$1,200,000</u>
1. Construct Addition to Research Projects Laboratory (2)	700,000

This project provides for the construction of an approximately 5,000 square foot high bay addition to Building 2. The proposed facility will support instrument integration activities in a clean environment. The construction includes a class 100,000 clean room, a 3-ton capacity rail crane, and water and drain service for water cooled equipment. Ancillary space outside the clean area for equipment staging, loading/unloading of trucks, and temporary storage of handling and shipping accessories are also included. Provisions for power, lighting, HVAC, and fire protection and detection will be provided. Present facilities cannot provide assurance of instrument cleanliness and long-term reliability. Large advanced space science instruments require a clean high bay and quiet electrical environment.

- 2. Construct Addition to Space Projects Building (1) 500,000

This project provides for a 2,500 square foot addition to Building 1 to accommodate expansion of the Program Support Communications Network (PSCN). The gateway provides the Goddard Space Flight Center (GSFC) with long distance telephone service (FTS), packet and circuit switched data communications, facsimile service, and voice and video teleconferencing. The addition will be adjacent to the existing gateway located in the basement of Building 1 and will consist of a single story reinforced concrete extension of the existing PSCN area. The new facility space is needed for housing additional new circuit switched data communications equipment by the end of 1993 to allow uninterrupted PSCN support to GSFC. Raised flooring, electrical power, lighting, air conditioning, and fire detection and suppression will be included.

D. Jet Propulsion Laboratory (JPL) \$1,120,000

- 1. Construct Grounds Maintenance Facility 670,000

This project provides for construction of a 3,800 square foot facility located in the JPL maintenance yard. The building will include areas for landscape maintenance equipment repairs, materials storage, tools/supplies, and office areas. Site work includes 1,500 square feet of open storage area, new fencing, site grading, and replacement of 6,000 square feet of deteriorated paving. Relocation of the grounds maintenance facilities into this building will consolidate the present scattered grounds maintenance operating areas and significantly improve the operation of the grounds maintenance office.

- 2. Construct Addition to Table Mountain Facility Garage/
Maintenance Facility (TM-19) 450,000

This project provides for construction of a 3,400 square foot addition at the north side of the existing garage/maintenance building (TM-19) to provide expanded facilities for vehicle and equipment storage, maintenance, emergency generator and repair work. The addition will consist of 1,400 square feet on the lower level to allow exterior access at the north for the additional vehicle bays and welding/repair shop area, along with expanded space for a new emergency generator. The added 2,000 square feet on the upper level will provide access from the present structure to the enclosed storage room and the staging/storage space. With the current growth at the Table Mountain Facility, it has become necessary to expand the existing garage/maintenance shop to effectively accommodate this operation.

E. <u>Johnson Space Center</u> (JSC)	\$1,350,000
1. Construction of Parking Area	300,000

This project provides for the construction of a parking area of approximately 9,000 square yards to accommodate approximately 260 cars. The construction consists of subgrade and base, asphalt overlay, concrete curb and gutter, striping, curb ramps, site grading/swales, turf irrigation removal, fire hydrant and light standard relocation, and changing area inlet/manhole elevations. The work also includes tree removal and relocation of trash dumpster pads. Additionally, the work includes construction of approximately 870 feet of sidewalks. The significant increase in the number of people working in this area in support of Space Shuttle and Space Station crew training, mission planning, and mission support has resulted in parking requirements far in excess of in place capabilities.

2. Construct Addition for Advanced Life Support Testing (241)	550,000
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This project provides for an addition to the Botanical Sciences Laboratory, Building 241, of approximately 3,000 square feet for the development, testing, and analysis of advanced regenerative life support systems. The existing chamber is too small to accommodate physiochemical life support processes. Work includes the installation of a preengineered metal building, site utilities, electrical power, lighting, heating, cooling, and plumbing. The work also includes modifications to the existing Building 241.

3. Construct Addition to Materials Test Facility, . White Sands Test Facility	500,000
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This project provides for the construction of a control room as an addition to the existing Materials Test Facility in the 800 Area at the White Sands Test Facility (WSTF). This project is required to provide a safe efficient facility to conduct materials tests that are expected to exceed 900 components per year in the foreseeable future. The new facility will interface with and support the Hazardous Fluid and High-pressure Test Areas. Associated with the construction of the control room will be the installation of computer room floor, conduits, cable trays, interface racks, power distribution, heating/ventilation/air-conditioning, and area safety and control provisions required to perform hazardous testing. **Also** included in this project are upgrades to the power distribution system and minor modifications and extensions to fluid supply systems necessary for the new addition.

F. Kennedy Space Center (KSC) **\$1,980,000**

1. Construct Orbiter Processing Facility Support Building **630,000**

This project provides for the construction of a two story **30 X 40** foot building to house orbiter ground support coolant and hydraulic system equipment. Work includes relocation of portable purge unit electrical power; relocation of fire hydrant and safety shower; installation of a heating, ventilating, and air conditioning system, and of electrical power and fire protection; and relocation of environmental control system ducts. This project is required to prevent deterioration of ground cooling and hydraulic equipment. New equipment scheduled for delivery in FY **1993** requires an environmental enclosure.

2. Construct Vertical Processing Facility Operations
Support Building Annex **650,000**

This project will provide approximately **5,000** square feet of office space and a scheduling/planning area for permanent and transient personnel. Heating, ventilation, air conditioning, and electrical power will be included. Personnel are currently housed in the existing Vertical Processing Facility operations support building, trailers and various other locations currently at maximum occupancy capacity. Additional space is required to support **60** to **70** people who join the test team during payload processing activities.

3. Construct Extension to South Bound Lane,
Kennedy Parkway to NASA Parkway **700,000**

This project provides for an approximately **1.4** mile extension of the existing outside (third) southbound lane on Kennedy Parkway from approximately one mile south of Schwartz Road to the NASA Parkway intersection. Project includes filling and excavating the base and stabilization, paving, and extension of the westbound merge lane on the NASA Parkway. The existing third lane is too short for the high volume Launch Complex-39 traffic exiting the space center to the south and west, and creates a traffic bottleneck north of the NASA Parkway, increasing the possibility of an accident.

G. Langley Research Center (LaRC) **\$1,140,000**

1. Construction of the Electronics Laboratory Addition (1238) **440,000**

This project provides for construction of an approximately **4,000** square foot addition to Building **1238**. The addition will include laboratory space for **18** electronics technicians who provide electronic technical support for the automated control systems and data acquisition instrumentation for Center test facilities and research aircraft. The project will also include restrooms, associated utility connections, site improvements, and landscaping.

This project centralizes equipment critical to support development of advanced aerodynamic diagnostic techniques.

- 2. Construction of Management Operations Building Addition (1195) . . . 700,000

This project provides for construction of an approximately 5,500 square foot addition to Building 1195 for a management operations administrative building. The addition will include provisions for a future second floor. The project will include modifications to the existing building to accommodate the addition, site improvements, additional parking spaces, and utility connections. This addition will allow the initial consolidation of some of the management operations activities, including the Financial Management Division and the Acquisition Division.

- H. Lewis Research Center (LeRC) \$1,400,000

- 1. Construction of Office Addition, Fabrication Shop (50) 700,000

This project provides for construction of a 7,000 gross square foot office area over an existing single-story office building. Work includes modification to entrances and construction of stairwells and toilet facilities, along with mechanical heating, ventilation, air conditioning and electrical power, communications, and lighting. LeRC currently needs additional office space to relieve overcrowded offices at the Center. This project will provide office area for approximately 50 personnel and will improve staff efficiency and productivity.

- 2. Construct Addition to Instrument Research Lab. (77) 700,000

This project provides for construction of a 5,000 gross square foot, two floor addition to the Instrument Research Laboratory (77). The work includes demolition, utility work, and construction of offices, along with structural steel framing, reinforced concrete foundations and floor slabs, heating, air conditioning, plumbing, and electrical systems. This building addition is required to relieve overcrowded and confined conditions. It will enable the researchers to move their desks and workstations out of laboratories and into a suitable office space.

- I. Marshall Space Flight Center (MSFC) \$1,220,000

- 1. Construct Addition to Payload Crew Training Complex (4612) 475,000

This project provides for the construction of a 3,000 square foot combination high bay/low bay addition to Building 4612. The addition will be built to match the existing facility, and will include all required utilities, building systems, and interior finishes.

Also, the existing six-ton crane will be extended the full length of the high bay addition. The Payload Crew Training Complex provides the only means of performing integrated payload crew training for MSFC managed Spacelab missions. It houses a variety of simulators and mock-up trainers that support current and projected Spacelab missions. This project will relieve the current overcrowded condition of the facility.

2. Construct Space Station Module Paint Facility 745,000

This project provides for the construction of a 5,000 square foot facility for performing chemical cleaning and painting of the Space Station modules and integration racks. Special cleaning and protective coating of the interior surface area of the Space Station modules are required to prevent long-term microbiological growth and to reduce the potential for reaction to volatile chemicals within the Space Station atmosphere. The project will provide a high bay area to support chemical cleaning, painting, and drying operations; and a low bay area to support functions such as the control room, office space, and locker rooms.

J. Michoud Assembly Facility (MAF) \$600,000

1. Construct Hazardous Waste Drum Rinser Facility 600,000

This project provides for the construction of a 4,000 square foot facility adjacent to MAF's Hazardous Waste Storage Facility for installation of a drum rinser, an evaporator, and a shredder. The facility will be used to triple rinse drums used to store hazardous material waste, and then reuse them, or shred them for sale as scrap metal. This project will reduce liability associated with sending hazardous material waste off-site, will eliminate dependency and cost of off-site incineration/land filling, and will minimize waste.

K. Stennis Space Center (SSC) \$1,140,000

1. Construct Science and Technology Laboratory 740,000

This project provides for the construction of a 10,000 square foot pre-engineered metal building with concrete slab on grade. All interior finishes, and required building and utility systems will be provided. Interior configuration includes laboratory space, office space, and computer and technical areas. The Science and Technology Laboratory is responsible for the development of propulsion test non-intrusive instrumentation systems (e.g., plume diagnostics, thermal imaging, and hydrogen sensors) that support the Space Shuttle Main Engine program and other advanced propulsion testing programs. Personnel are currently located in substandard temporary facilities that are unsuitable for their assigned functions.

2. Construct Centralized Records Storage Facility 400,000

This project provides for the construction of a 3,300 square foot centralized microfilming and records storage facility. The building will be environmentally controlled and built of noncombustible materials with four-hour fire resistant interior walls. The facility will be equipped with an intrusion alarm system, a fire alarm system, and a deluge system. Record holdings are currently located in five remote locations that are filled to capacity and are not in compliance with the standards of the National Archives and Records Administration. This facility will consolidate retention areas, provide improved environmental control and security, and facilitate more efficient records retrieval at the Center.

L. Wallons Flight Facility (WFF) \$720,000

1. Construction of Addition to Balloon Staging Facility, Fort Sumner, NM 720,000

This project provides for the construction of a second and third level interior laboratory, shop, and operations control area (approximately 3,200 square feet); and site work in and around the Balloon Staging Facility at the National Scientific Balloon Facility in Fort Sumner, New Mexico. The work includes secondary structural steel supports; steel and steel pan stairways; a 20 by 20 foot steel antenna deck; concrete floor decks; metal stud and gypsum wallboard partitions; doors; thermal windows; interior finishes of vinyl floor tile, suspended acoustic tile ceiling, and painting. Also included is an HVAC system with ductwork and controls, an electrical system with lighting, and a fire protection system. Site work includes concrete pavement around three sides of the structure and an asphalt paved parking area. The site work will improve access to the facility for the larger payload-carrying vehicles. The additional interior space is required to separate the launch and flight operation control areas, shops, and electronic areas from the main staging area.

M. Miscellaneous Projects Not In Excess of \$250,000 Each \$ 910,000

Total \$14,000,000

FUTURE CoE ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated \$13 to \$15 million per year will be required for continuing minor construction needs.

FACILITY PLANNING
AND DESIGN

1

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

SUMMARY

FACILITY PLANNING AND DESIGN

	<i>Amount</i>	<u>Page No.</u>
<u>Regular Requirements</u>	<u>\$16,300,000</u>	CF 12-2
Master Planning	700,000	CF 12-2
Sustaining Engineering Support	1,100,000	CF 12-2
Preliminary Engineering Reports and Related Special Engineering Support	3,400,000	CF 12-4
Final Design	11,100,000	CF 12-5
<u>Other Requirements</u>	<u>\$10,400,000</u>	CF 12-5
Space Flight Facility Planning and Design	4,200,000	CF 12-5
Space Station Freedom Facility Planning and Design	3,200,000	CF 12-5
Mission to Planet Earth	3,000,000	CF 12-6
Total	<u>\$26,700,000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Facility Planning and Design

FY 1993 CoF Estimate: \$26,700,000

FY 1991: \$28,000,000

FY 1992: \$34,000,000

The funds requested in this estimate are required to provide for the following advance planning and design activities related to facilities activities and projects where not otherwise provided for:

a. The accomplishment of necessary studies, development and master planning for field installation and 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. Also includes the preliminary engineering efforts required to initiate design-build projects.

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," which are also in support of "regular" purposes, cover those special needs related to large, complex projects or specific programs considered to represent high potential future construction requirements for which a definition is essential. The large projects require more planning and longer lead time. Much of this planning must be completed prior to inclusion of the project in a budget request.

1.	<u>REGULAR REQUIREMENTS</u>	<u>\$16,300,000</u>
A.	<u>Master Planning</u>	<u>\$700,000</u>

1.	<u>REGULAR REQUIREMENTS</u>	<u>\$16,300,000</u>
A.	<u>Master Planning</u>	<u>\$700,000</u>

Provides for updating, developing and automating existing field installation master plans. This effort includes facility studies, site investigations, analyses of utility systems, and transfer of master plan data to automated formats. The master plan documents will be updated to reflect as-built conditions and to graphically represent the 5-year facility plan baseline for future development.

The NASA field center master plans are periodically updated. On an agencywide basis, the level of effort remains fairly constant. The master plans are essential as reference documents for land use planning, identification of physical relationships of facilities, and proper orientation and arrangement of facilities. Representative candidates for FY 1993 master planning are as follows:

(1) Jet Propulsion Laboratory

An update of the facilities inventory base to include current utilization with emphasis on changes caused by recent facility planning, construction, and modifications.

(2) Kennedy Space Center

An update to reflect as-built condition of facilities and utility systems with emphasis on changes caused by recent facility construction and modifications.

B.	<u>Sustaining Engineering Support</u>	<u>\$1,100,000</u>
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Provisions for facility studies and specific engineering support continue in importance as evidenced in recent years. These efforts are important due to changing cost trends in construction materials and fuels; the operation and maintenance costs for the physical plant; and energy conservation and efficiency.

The following items are included in the FY 1993 requirements:

(1) Building Research Board

Covers annual support to the Federal Construction Council's (FCC) operations and provides for special studies that the Council will perform throughout FY 1993 to help

advance the science and technology of Federal Government building and construction. The FCC is subordinate to the Building Research Board, National Academy of Sciences, and its activities are supported by NASA and other Federal agencies.

(2) Facility Operation and Maintenance Analysis

Provides for studies and engineering support where not otherwise provided for, at NASA field installations relative to functional management of maintenance, automated maintenance management systems, and facilities condition assessments. Included in this activity are field surveys to be conducted at selected NASA field installations to evaluate the effectiveness and efficiency of the operations and maintenance management activities, and to identify possible improvements in productivity.

(3) 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 detailed independent reviews by engineering specialists. Also provides services necessary to predict and validate facility costs to aid in resources planning.

(4) Facilities Utilization Analyses

Provides for the analyses of agencywide facilities utilization data covering (1) office and other types of building space; (2) designate 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 to quantify level of facilities use; and (3) actions to improve 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 use of facilities.

(5) Facilities Management Systems

Provides for continued engineering support for the technical updating of NASA's master text construction specifications to reflect the use of new materials, state-of-the-art construction techniques and current references to building codes and safety standards. Also included is the on-going effort to improve the NASA construction project status reporting and data system.

(6) Independent Analysis and Third Party Reviews

Provides the technical and engineering support analyses, designs, and reviews required to verify, confirm and ensure suitability of construction designs within the project cost estimates.

C. Preliminary Engineering Reports and
Related Special Engineering Support \$3,400,000

(1) Preliminary Engineering Reports (PER's) (2,900,000)

This estimate provides for preparation of PER's, investigations, and project studies related to proposed facility projects in the FY 1995 and FY 1996 Construction of Facilities programs. These reports are required to permit the early and timely development of the most suitable project to meet the stated programmatic and functional needs. Reports provide basic data, cost estimates and schedules relating to future budgetary proposals. This request provides for PER's associated with proposed construction, except as provided for in Other Requirements (paragraph 2 below) for Space Flight, Space Station Freedom, and Mission to Planet Earth projects.

The estimated cost of PER support for FY 1995 construction projects is \$2,400,000, which will permit updating of PER's for \$50 to \$70 million in construction, and the development of new PER's for an additional \$130 to \$150 million in projects.

An additional \$500,000 has been included in this line for the completion of new PER's for approximately \$20 to \$30 million of construction projects which will be high priority candidates for inclusion in the FY 1996 Construction of Facilities program. The activity associated with FY 1996 will be confined to the highest priority candidates.

(2) Related Special Engineering Support (500,000)

This estimate provides for investigations and project studies related to proposed facility projects to be included in the subsequent Construction of Facilities programs. 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, 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 \$11,100,000

The amount requested will provide for the preparation of designs, plans, drawings, and specifications necessary for the accomplishment of projects other than Space Flight, the Space Station Freedom, and Mission to Planet Earth projects. Amounts required for those efforts are included under Other Requirements. Projects involved are planned for inclusion in the FY 1994 and FY 1995 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 1994 program, estimated to cost \$130 to \$140 million, and for \$20 to \$30 million of high potential projects proposed for the FY 1995 program. The final design amount included for FY 1994 candidates and for residual requirements of this nature which have accumulated from prior years activities is \$9,200,000. For FY 1995 \$1,900,000 is included and design activity will be confined to the highest priority candidates.

2. OTHER REQUIREMENTS \$10,400,000

Included in this particular request are other facilities planning and design requirements primarily associated with specific programs characterized by large size, long planning cycles, and/or complexity of scope. These programs require a multi-year planning effort. These requirements are required beyond the regular and most recurrent facility planning and design needs.

A. Space Flight Facility Planning and Design (\$4,200,000)

These resources provide for early and progressive design, final drawings, specifications, and site investigations for Space Flight facilities in order to ensure the best design, reliable cost estimates and realistic construction schedules. The Shuttle operational era requirements include the improvement of Shuttle processing facilities, operational facilities, and Shuttle support facilities, construction of personnel facilities, and modifications at various locations for Shuttle engine enhancement and testing.

B. Space Station Freedom Facility Planning and Design (\$3,200,000)

This requirement is a continuing effort primarily for preparation of preliminary engineering reports and final design drawings, specifications and associated site investigations required for construction of Space Station Freedom facilities at various locations. Included are automation and robotics sciences research, space sciences research, solar dynamics simulation, crew training, processing and prelaunch checkout facilities.

ENVIRONMENTAL
COMPLIANCE AND
RESTORATION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

SUMMARY

ENVIRONMENTAL COMPLIANCE AND RESTORATION

Summary of Project Amounts by Location:

	<i>Amount</i>	<i>Page No.</i>
Ames Research Center	\$1.530. 000	CF 13-3
Dryden Flight Research Facility	550. 000	CF 13-4
Goddard Space Flight Center	500. 000	CF 13-4
Jet Propulsion Laboratory	1.750. 000	CF 13-4
Johnson Space Center	1.200. 000	CF 13-5
Kennedy Space Center	3.100. 000	CF 13-5
Langley Research Center	4.680. 000	CF 13-6
Lewis Research Center	5.400. 000	CF 13-7
Marshall Space Flight Center	3.050. 000	CF 13-9
Michoud Assembly Facility	1.200. 000	CF 13-9
Wallops Flight Facility	2.500. 000	CF 13-10
White Sands Test Facility	2.950. 000	CF 13-10
Various Locations	350. 000	CF 13-11
Miscellaneous Projects Not in Excess of \$250.000 Each	1.640. 000	CF 13-11
Remedial Investigations. Feasibility Studies. Assessments. Studies. Design. and Related Engineering	<u>9.600.000</u>	CF 13-11
Total	<u>\$40.000.000</u>	CF 13

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1993 ESTIMATES

PROJECT TITLE: Environmental Compliance and Restoration Program

INSTALLATION: Various Locations

FY 1993 CoF Estimate: \$40,000,000

FY 1991: \$32,000,000

FY 1992: \$36,000,000

COGNIZANT INSTALLATIONS/LOCATIONS OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management Systems and Facilities

SUMMARY PURPOSE AND SCOPE

These resources will provide for studies, assessments, remedial investigations, feasibility studies, design, related engineering, and remedial action projects for environmental compliance and restoration measures at NASA field installations, Government-owned industrial plants supporting NASA activities, and other locations where NASA operations have contributed to environmental problems and NASA is obligated to contribute to cleanup costs. In addition, these resources will be used to acquire land if necessary to implement environmental compliance and restoration measures. The purpose of this program is to enable NASA to comply with mandatory environmental statutory requirements and standards. The resources authorized and appropriated pursuant to this program may not be applied to other activities. The program includes studies or assessments to determine compliance status and options for remedial action; conduct of prescribed remedial investigations and feasibility studies as required by Federal environmental laws; and performance of environmental restoration, hazardous waste removal and disposal, cleanups, and closures.

PROJECT JUSTIFICATION/DESCRIPTION:

Proposed environmental compliance and restoration projects and activities for Fiscal Year 1993 total \$40 million, which has been distilled from requests in excess of \$65 million. This program represents only a modest request in relation to the total requirements for environmental compliance and restoration that must be implemented within the next several years. Based on relative urgency and potential health hazards, the following listed projects are the highest priority requirements currently planned for accomplishment in FY 1993. Deferral of these necessary remedial measures would preclude NASA from complying with environmental requirements and jeopardize critical NASA operations. The remedial investigations, feasibility studies, assessments, design, and related engineering costs are estimated to be approximately \$9,600,000. Projects estimated to cost less than \$250,000 have not been described or identified by specific location. The estimated cost of these projects is \$1,640,000. As studies, assessments, remedial investigations, feasibility studies, and designs progress and as new discoveries or regulatory requirements change, it is expected that priorities may change and revisions of the activities and projects may be necessary.

The following listing summarizes broad categories of effort to be undertaken with projects of an estimated cost of over \$250,000:

- a. Replacement of Underground Storage Tanks \$2,915,000
- b. Rehabilitation/Replacement of Polychlorinated Biphenyls (PCB)
Transformers 1,050,000
- c. Hazardous Waste Corrective Actions/Cleanups 18,695,000
- d. Hazardous Waste Storage and Control 4,900,000
- e. Oil Spill Prevention and Control 1,200,000

PROJECT COST ESTIMATES

A. <u>Ames Research Center</u> (ARC)	\$1,530,000
1. Remediate Solvent Sites, Various Locations	680,000

This project will provide for remediation of the soil and groundwater at various solvent contaminated sites within ARC. The contamination is believed to have been caused by past disposal practices. Remediation at the sites will be consistent with the standards of the California Regional Water Quality Control Board, the California Department of Health Services and the Environmental Protection Agency (EPA) as enforced by the Santa Clara Valley Water District.

2. Remediation of Groundwater Contamination, Middlefield-Ellis-Whisman (MEW) Superfund Site	500,000
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This project will continue to provide a NASA contribution to the remediation of groundwater contamination from the MEW Superfund site. It provides for a portion of the work needed to treat and remove chlorinated solvents and petroleum hydrocarbon contamination in the groundwater plume currently reaching under the ARC site. The discharge from the treated water will be available for use as makeup water for ARC related uses. This project is covered by a Record of Decision with the EPA, the California Regional Water Quality Control Board, the Santa Clara Valley Water District, and the California Department of Health Services.

3. Remediate Underground Tank Sites, Various Locations	350,000
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This project provides monitoring and remediation of soil and groundwater at approximately eight sites where underground storage tanks (USTs) were previously located. Limited sampling and analyses during UST removals indicate site contamination. The project involves the removal of contaminants from the soils and groundwater including testing and analyses to ensure compliance with established cleanup levels. Remediation will be consistent with the EPA standards, the California Regional Water Quality Control Board, and the California Department of Health Services. Completion of the project will bring these sites into compliance with federal and State of California UST regulations.

B.	<u>Dryden Flight Research Facility</u> (DFRF)	.....	<u>\$550,000</u>
1.	Replace/Retrofill PCB Transformers	.....	550,000

This project will remove, replace or retrofill approximately fifteen existing polychlorinated biphenyl (PCB) and PCB contaminated transformers with non-PCB fluids and equipment. The project includes disposal of PCB fluids and transformers in accordance with current environmental regulations. The project will prevent potential contamination and disruption of the Center's operations due to leaks, spills, or fires associated with these transformers. It will provide for compliance with environmental regulatory requirements and tenancy agreements. PCBs are regulated by the Toxic Substances Control Act (TSCA).

C.	<u>Goddard Space Flight Center</u> (GSFC)	.....	<u>\$500,000</u>
1.	Remove and Replace Underground Storage Tanks, Various Locations	..	500,000

This project continues a program to replace the underground storage tanks (USTs) at the Greenbelt facility. The 13 tanks to be removed range in age from 9 to 28 years and constitute the balance of Goddard's USTs. These 13 tanks, which are located in the vicinity of Buildings 3, 24, 27, 97, and 300, will be removed and replaced with an above ground fuel farm. This is required to be in compliance with the State of Maryland and federal UST regulations (COMAR Title 26.10.01 and 40 CFR 280).

D.	<u>Jet Propulsion Laboratory</u> (JPL)	. . . . .	<u>\$1,750,000</u>
1.	Cleanup of Arroyo Seco Groundwater Contamination	.....	1,000,000

This project provides for continuation of the groundwater cleanup effort of the Arroyo Seco aquifer contamination. Sampling and testing of groundwater in the vicinity of JPL confirmed the presence of trichloroethylene, carbon tetrachloride and tetrachloroethylene beneath the site and nearby production wells, in excess of federal and State of California standards. Ongoing assessments and studies are continuing to identify the extent of the contamination. This site is expected to be added to the EPA's "National Priorities List" and subject to provisions of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

- 2. Remove/Replace Underground Storage Tanks, Edwards Test Station . . . 750,000

This project provides for the removal and replacement of three underground storage tank (UST) systems and approximately six catch basin tanks at various sites within the Center. The project involves the excavation and proper disposal of tanks and contaminated soils, installation of new double wall tanks and piping, leak detection systems and corrosion protection. Federal regulations require UST systems to be provided with leak detection and corrosion protection and local regulations require double wall UST systems with leak detection.

- E. Johnson Space Center (JSC) \$1,200,000

- 1. Remediation of Hazardous Solid Waste Management Units 350,000

This project will provide remediation of the most critical solid waste management units (SWMU) identified by JSC during their Resource Conservation and Recovery Act (RCRA) Part B permit process. Areas to be remediated include an abrasive blast area, two construction landfills, a sludge landfill, and a dredging spoils area. Remediation may require capping, trenching, soil incineration, and bio-remediation. Site specific techniques to be used will be determined based on an ongoing characterization study of the SWMU's. This project is required to be in compliance with RCRA Part B permit requirements.

- 2. Water Table Isolation/Remediation,
Thermochemical Test Area (TTA) 850,000

This project will consist of construction of a slurry wall trench to isolate the shallow aquifer and the installation of four additional wells to pump the groundwater where the highest level of freon contamination has been found. This will isolate the shallow groundwater aquifer at TTA, thereby accelerating the remediation of contaminated groundwater. This remediation effort will be included as part of JSC's RCRA Part B permit. This project is **also** required to be in compliance with state and federal regulations.

- F. Kennedy Space Center (KSC) \$3,100,000

- 1. Close Schwartz Road Landfill 2,600,000

This project continues the closure of the Schwartz Road landfill. The closure provides for the construction of an impermeable cap with a gas collection system and a surface water runoff collection system. This increment will provide for a landfill membrane, a passive

gas collection system, the closure permit, various stormwater management designs and structures, and a variety of other requirements associated with the closure of the landfill. Existing groundwater monitoring wells have detected contaminants above the Florida Department of Environmental Regulations Standards for groundwater. The impermeable cap is required to reduce the formation of landfill leachate, to inhibit off-site migration of the contaminants, and to comply with state regulatory standards.

- 2. Industrial/LC-39 Areas PCB Transformer Retrofill 500,000

This project involves the retrofill of 25 transformers in the industrial and Launch Complex-39 areas at KSC. Upon removal of the PCB-containing oil, the transformers will be cleaned, flushed, and refilled with insulating oil which is PCB-free. Continued use of the PCB transformers represents a potential hazard to human health and the environment and significant potential for disruption of the Center's operations and schedules from leaks or fires. PCB's are regulated by the Toxic Substances Control Act (TSCA).

G. Langley Research Center (LaRC) \$4,680,000

- 1. Remediation of PCB/PCT at Tabbs Creek 2,000,000

This project will continue the remediation of Tabbs Creek, contaminated with polychlorinated biphenyls (PCBs) and polychlorinated terphenyls (PCTs) believed to have been released from the Center's storm drain system. Tabbs Creek is located behind the Center and joins the northwest branch of the Back River about a mile from the Center property line. Tabbs Creek is a tidal wetland and Back River is used for oyster harvesting. Remediation is required to prevent the spread of contaminants by tidal action to the Back River. The Center was cited with a Notice of Violation from the State Water Control Board for the unpermitted discharge of both PCBs and PCTs into Tabbs Creek and Back River, and for the contamination of shellfish in the area. The Center has also been cited by the EPA as a noncomplying federal agency within the Chesapeake Bay watershed. A Federal Facilities Compliance Agreement was signed with the EPA. PCBs are regulated under TSCA and cleanup is regulated under CERCLA.

- 2. Remediation of Storm Sewers 1,000,000

This project will continue the cleanup and replacement or abandonment of portions of the storm sewer system contaminated with PCB's and PCT's. The project includes the replacement of oil/water separators and installation of tide gates on the system outfall lines to prevent surcharge of water from the Back River back into the storm sewer system. The Center was found in violation of its National Pollution Discharge Elimination System (NPDES) permit under the

Clean Water Act (CWA) and TSCA. This project will address provisions of the signed Federal Facilities Compliance Agreement with the EPA.

- 3. Replacement and Closure of Underground Storage Tanks,
 Various Locations 630,000

This project provides for the removal and replacement of three underground storage tanks (USTs) containing regulated substances and for the closure of approximately 12 USTs at various sites within the Center. The replaced USTs will include secondary containment and monitoring, corrosion protection, and spill/overflow controls. The project includes removal of contaminated soil as required. The project will continue the Center UST program to comply with federal and State of Virginia UST regulations requiring upgrading and closure of UST systems not in use.

- 4. Cleanup of Chemical Waste at the Pyrotechnic Dump Site,
 West Area 650,000

This project provides for the cleanup and remediation of an abandoned dump site formerly used for the disposal of chemical laboratory waste. The project involves site cleanup including ground and surface water monitoring, site excavation and backfill, and proper disposal of excavated materials conforming with environmental regulatory requirements. Cleanup of the site will ensure compliance with the CWA and CERCLA regulations.

- 5. Cleanup of Abandoned Construction Dump Site 400,000

This project provides for the cleanup of an abandoned dump site formerly used for waste oil storage and disposal of construction debris. Other undocumented materials are also believed to have been disposed of at the site. The project involves site cleanup including ground and surface water monitoring, site excavation and backfill, and proper disposal of excavated materials as required for the closure, conforming with environmental regulatory requirements. Cleanup of the site will ensure compliance with the CWA and CERCLA regulations.

H. Lewis Research Center (LeRC) \$5,400,000

- 1. Cleanup of Hazardous Materials, Building 109 1,400,000

This project provides for the cleanup of hazardous materials in and around the Components Cleaning Facility. The work to be performed involves the closure of the building by decontaminating and demolishing the structure and the treatment of contaminated soils around

the facility. Past use of the facility for equipment cleaning and hazardous material storage has caused significant contamination of the building and the area around it. Cleanup of the site and building closure are required under RCRA. The site cleanup will address requirements of a State of Ohio issued Consent Order.

- 2. Cleanup and Closure of Buildings 415 and 209 500,000

This project provides for the cleanup and closure of the Barrel and Cylinder Storage Site and the Coal Storage Facility used for storing hazardous materials and/or hazardous wastes. The work to be performed involves the removal of all the remaining chemicals, decontamination, removal and disposal of structures and cleanup of the soil around the site. Cleanup and building closure are required for compliance with requirements under RCRA.

- 3. Remediation of South 40 Landfill 2,000,000

This project will continue the environmental remediation effort of the South 40 landfill area at Lewis. The South 40 area is located in the southeastern most portion of the Center and includes the South 40 landfill, which covers an approximate area of six acres. The landfill was used as a disposal site from 1940's through the late 1970's and the quantities and types of wastes disposed of at the landfill are largely undocumented. Preliminary site assessments have identified areas adjacent to or within the boundary of the landfill suspect of contamination. Investigations, cleanup and remediation is required to comply with CERCLA.

- 4. Remediation of Underground Storage Tanks Sites,
Various Locations 1,500,000

This project will initiate the remediation of soil and/or groundwater at various underground storage tank (UST) sites within Plum Brook Station and Lewis. Site assessments of previously closed UST systems and systems undergoing removal indicate that some of these sites have been contaminated with hazardous substances and/or petroleum products. The project will include the removal of contaminants from the soils and/or groundwater including sampling and analyses to achieve required cleanup levels. Site remediation is required to conform with Federal and State of Ohio UST regulations.

I. Marshall Space Flight Center (MSFC) \$3,050,000

- 1. Cleanup of Groundwater Contamination Source,
Santa Susana Field Laboratory (SSFL) 1,015,000

This project will continue the groundwater and soil contamination assessment and cleanup underway at SSFL. As part of the groundwater contamination assessment/cleanup, the State of California Department of Health Services (CA DHS) is requiring the closure of four surface impoundments. The assessment/cleanup will consist of well installations, report preparation, and capital purchases. Results of the current assessment/clean up work indicate high levels of trichloroethylene in the groundwater which have been associated with the rocket testing performed at SSFL by both NASA and the Air Force. This project is required to be in compliance with RCRA and with the requirements placed on SSFL by the Record of Violation issued by the State of California.

- 2. Remove and Replace Underground Storage Tanks, Various Locations 1,035,000

This project continues a program to replace the underground storage tanks (USTs) at MSFC. This project will remove and replace nine USTs with above ground tanks. These tanks must be replaced to comply with EPA UST regulations (40 CFR Part 280) and with the State of Alabama's Department of Environmental Management Water Division-Water Quality Program regulations.

- 3. Remediation of Drillers Mud Site 1,000,000

The Drillers Mud site is an area which has been estimated to contain approximately 1,000 cubic yards of wastes (drillers mud) and 500 cubic yards of adjacent soil which has become contaminated by the waste. This project is the continuation of the remediation process for the site. The waste and soil, which have been contaminated with barium, chromates, and organics, need to be removed or steps have to be taken to assure that the contaminants do not migrate from the site. These actions are required to be in compliance with RCRA and CERCLA.

J. Michoud Assembly Facility (MAF) \$1,200,000

- 1. Modify Above Ground Storage Tanks, Facility Wide 1,200,000

This is the first increment of a project to upgrade and modify above ground chemical and petroleum products/waste tanks located throughout the facility. The work, which includes overfill alarms, secondary containment, visual level indicators, dry disconnects, and emission

controls, is needed to comply with EPA and Louisiana Department of Environmental Quality regulations. Approximately one third of the tanks requiring upgrades will be accommodated in this increment.

K. Wallops Flight Facility (WFF) \$3,500,000

- 1. Cleanup of Groundwater Contamination 2,000,000

This project will continue the groundwater and soil cleanup at the old Aviation Fuel Farm, Wallops Flight Facility, Main Base. The ongoing assessment/investigation has confirmed the presence of contaminants in the groundwater that have the potential for contaminating town of Chincoteague drinking water supply wells located on WFF. This increment of the remediation process includes soil treatment, installation of extraction and injection wells, and the installation of groundwater treatment units. The cleanup and remediation is required to comply with a State of Virginia Compliance Order and with EPA UST regulations.

- 2. Construction of a Hazardous Waste Staging Facility 500,000

This project provides for the construction of a 3,100 square foot, 90 day hazardous waste storage building for the Main Base. The structure will consist of separate areas for storing WFF's hazardous wastes. Each area will be designed and built to handle a particular type of waste. WFF's current building is inadequate and was cited by the Commonwealth of Virginia Hazardous Waste Inspector. This project is required to be in compliance with RCRA and Commonwealth of Virginia regulations.

L. White Sands Test Facility (WSTF) \$2,950,000

- 1. Contamination Assessment 2,000,000

This is the continuation of the ongoing groundwater assessment at WSTF. The assessment is required to quantify the extent and potential impact of the contamination and to identify and evaluate remediation options. This effort also provides the final RCRA Facility Investigation (RFI) and Corrective Measures Study (CMS) reports as required by a RCRA 3008(h) consent order. The project is required to be in compliance with RCRA.

- 2. Replace Evaporation Tank Liners 950,000

This project will provide for the replacement of WSTF's two aboveground evaporation tanks' existing polymer liners with corrosion-proof liners. The tanks' outer structure and the

leak detection systems will also be modified to interface with the new liners. The polymer liners need to be replaced since one has already failed and been repaired. The new liners will allow continued operation of WSTF's hazardous waste treatment system. This project is required to be in compliance with RCRA.

M.	<u>Various Locations</u>	<u>\$350,000</u>
1.	Upgrade Hazardous Materials and Waste Storage Areas; Madrid, Spain	350,000

This project provides for construction of a hazardous material storage facility at the Madrid Deep Space Communications Complex (MDSCC), and modifications of existing hazardous material storage areas. The current facilities used at the Complex for the storage of hazardous materials and wastes are inadequate and do not comply with environmental requirements. The new facility will provide for adequate storage and consolidation of the hazardous materials. The new covered, open sided storage facility will have safety showers, fire extinguishers, safety eyewash, forklift access, spillage control equipment and berms as required by regulatory requirements. The modification work includes the removal and replacement of contaminated soils, asphalt, and other materials.

N.	<u>Miscellaneous Projects Not in Excess of \$250,000 Each</u>	<u>\$1,640,000</u>
O.	<u>Remedial Investigations, Feasibility Studies, Assessments, Studies, Design, and Related Engineering</u>	<u>\$9,600,000</u>
	Total	<u>\$40,000,000</u>

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

Approximately \$50 million per year for the next few years is the current rough estimate for meeting Environmental Compliance and Restoration requirements.

Fiscal Year 1993 Budget Estimates

TL 521.3 .B8 U58 1993 v.2

United States. National
Aeronautics and Space

Budget estimates