National Aeronautics and Space Administration

BUDGET ESTIMATES

FISCAL YEAR 1971

Volume IV

RESEARCH AND PROGRAM MANAGEMENT

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1971 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RESEARCH AND PROGRAM MANAGEMENT

GENERAL STATEMENT

The Research and Program Management appropriation includes funding for research in Government laboratories, management of programs and other activities of the National Aeronautics and Space Administration. Principally, these are to:

Provide the civil service staff necessary for in-house research, and to plan, manage, and support the Research and Development programs.

Provide other elements of operational capability to the laboratories and facilities such as general purpose computer capability, logistics support including travel and transportation, maintenance and operation of facilities, and technical and administrative support.

The following table summarizes the distribution of the Research and Program Management appropriation by installation:

SUMMARY OF OBLIGATIONS BY INSTALLATION

	Fiscal Year 1969	Fiscal Year 1970	Fiscal Year 1971
MANNED SPACE FLIGHT.....	$310,968,000	$323,688,000	$330,583,000
John F. Kennedy Space Center, NASA.....	95,794,000	97,445,000	98,150,000
Manned Spacecraft Center.....	98,840,000	104,546,000	107,758,000
Marshall Space Flight Center....	116,334,000	121,697,000	124,675,000
SPACE SCIENCE AND APPLICATIONS....	$82,329,000	$94,317,000	$97,461,000
Goddard Space Flight Center.....	73,227,000	84,772,000	87,670,000
Wallops Station.....	9,102,000	9,545,000	9,791,000

	Fiscal Year 1969	Fiscal Year 1970	Fiscal Year 1971
ADVANCED RESEARCH AND TECHNOLOGY..	$193,890,000	$208,578,000	$201,521,000
Ames Research Center.....	34,032,000	36,359,000	38,248,000
Electronics Research Center.....	17,237,000	19,483,000	4,470,000
Flight Research Center.....	9,697,000	10,131,000	10,549,000
Langley Research Center.....	62,945,000	67,973,000	70,734,000
Lewis Research Center.....	67,844,000	72,398,000	75,218,000
Space Nuclear Propulsion Office.	2,135,000	2,234,000	2,302,000
SUPPORTING OPERATIONS			
NASA Headquarters.....	$60,777,000	$61,818,000	$62,735,000
TOTAL.....	$647,964,000	$688,401,000	$692,300,000

The Research and Program Management appropriation request is subdivided into six functional categories, as follows:

1. Personnel Related Costs are comprised of salaries and benefits for civil service personnel, over 70% of whom are technical, and for personnel of other government agencies detailed to NASA. Costs in this category also include supporting personnel costs, i.e., the cost of moving expenses, as provided by law, the cost of recruiting and personnel investigation services provided by the Civil Service Commission, and personnel training.

2. Travel includes the cost of transportation, per diem and related expenses of travel required for direction, coordination, and management of research and development and construction of facilities program activities, for contract management and flight mission support; overseas travel to launch and tracking sites; and travel to meetings and technical seminars.

3. Automatic Data Processing includes the cost of the lease, purchase, and maintenance of equipment, and the cost of providing contract services for programming and operations for general purpose computer capability.

4. Facilities Services includes the cost of leasing research laboratories and facilities, minor construction, maintenance and related services, custodial services, facility operations, and range operations at the John F. Kennedy Space Center, NASA.

5. Technical Services includes the cost of certain engineering services, the dissemination of scientific and technical information derived from the technology utilization program, and the operation of educational and program activities.

6. Administrative Support includes the cost of communications, administrative printing, administrative supplies, materials and equipment, transportation support, and other support services.

The following summary table indicates the distribution of the total appropriation requirements by functional category:

Function	1969	1970	1971
Personnel related costs.....	$463,675,000	$516,175,000	$515,108,000
Travel.....	14,003,000	16,712,000	18,200,000
Automatic data processing...	23,808,000	21,548,000	22,710,000
Facilities services.....	85,841,000	80,872,000	84,083,000
Technical services.....	18,026,000	15,272,000	14,327,000
Administrative support.....	42,611,000	37,822,000	37,872,000
Total.....	$647,964,000	$688,401,000	$692,300,000

Installations are under the management direction of the Associate Administrator having primary responsibility for the research and development programs conducted at the installation. The Associate Administrator for Manned Space Flight is responsible for the Kennedy Space Center, Manned Spacecraft Center, and Marshall Space Flight Center; the Associate Administrator for Space Science and Applications is responsible for the Goddard Space Flight Center and Wallops Station; and the Associate Administrator for Advanced Research and Technology is responsible for the Ames Research Center, Flight Research Center, Langley Research Center, Lewis Research Center, and the Space Nuclear Propulsion Office. The Electronics Research Center will be closed in 1971. The Associate Administrator for Organization and Management is the institutional director for NASA Headquarters.

1970 OPERATING BUDGET

The budget request for 1970 for Research and Program Management was $650,900,000. Final Congressional action reduced both the authorization and appropriation to $637,400,000. After careful consideration of the effects of several alternatives on the NASA program of operating at this level, it was NASA's judgment that the level of R&PM must be increased to $643,750,000 through a reprogramming action.

In addition to the reprogramming of $6,350,000 to meet the minimum operating requirements of the agency, $3,020,000 is required to provide cost increases as a result of legislative actions increasing (a) the government's contribution for civil service retirement and (b) the level of per diem paid Federal employees while on travel status. A final

reprogramming of $338,000 will result from a decision to transfer to NASA 50 civilian employees of the Air Force, whose cost is now reimbursed from NASA R&D funds and who perform inspection and reliability functions for NASA at Seal Beach and Downey, California. These increases to the R&PM appropriation have been partially offset by an appropriation transfer of $474,000 to the General Services Administration for the rental of buildings for the Goddard Institute of Space Studies in New York.

To provide for the costs of the final increment of the Federal Employees Pay Act of 1967, which was effective in July 1969, NASA is to be included in a government-wide supplemental appropriation for a total of $41,767,000. With the reprogramming, and supplemental appropriation, as partially offset by the transfer to GSA, the NASA 1970 operating plan for R&PM is $688,401,000. The following table summarizes the development of the 1970 operating budget:

Appropriation.....	$637,400,000
Increase to minimum operating level....	+6,350,000
Subtotal.....	$643,750,000
Reprogramming for the increase in the government's contribution for civil service retirement.....	+1,154,000
Reprogramming for the increase in per diem rates.....	+1,866,000
Reprogramming for the transfer of 50 Air Force civil service employees to NASA.....	+338,000
Proposed supplemental for civilian pay act increase.....	+41,767,000
Subtotal.....	$688,875,000
Transfer to GSA.....	-474,000
Planned FY 1970 program level.....	$688,401,000

Concerning civil service manpower NASA planned, in the 1970 budget as submitted to Congress, an end year 1970 employment level of 31,600. This level represented a gross reduction of 452 positions from the planned end year 1969 level, partially offset by planned increases of 56 at the Electronics Research Center and 251 at the Goddard Space Flight Center for the final increment for the conversion of certain functions formerly carried on through support service contracts to civil service operation. The net reduction planned in 1970 was 145.

During 1970, NASA was directed as part of the government-wide reduction in personnel to reduce its end year 1970 employment level by an additional 300. This reduction was partially offset by the transfer to NASA of 50 civil service employees from the Air Force. These employees have been performing inspection and reliability functions for NASA at Seal Beach and Downey, California, industrial plants for several years. The net result of these actions is to reduce the planned end year 1970 employment level to 31,350.

During the 1971 budget process the decision was made to discontinue operations at the Electronics Research Center. The 600 positions shown in the budget for 1970 are required to close the center, dispose of property, and plan and assist in the transfer of continuing research and technology effort. These positions will be vacated shortly after June 30, 1970. Some R&PM costs are carried for ERC in 1971 as required for the closing of the center and the program transfer.

1971 BUDGET ESTIMATE

The 1971 budget estimate is based on a continuation of the basic operating level established in 1970. The reduction in costs associated with the phasing out of ERC is offset by the full year costs of legislation passed during 1970 (increases in the rate for civil service retirement contributions and per diem allowances), the full year costs of the final increment of the conversion of certain functions carried on through support services contracts to civil service performance at Goddard Space Flight Center, the full year costs of certain increases in personnel costs for the remainder of NASA, the provision for twelve months funding of support services contracts currently in effect, and the provision for increased man year cost rates for such contracts.

For civil service manpower, NASA plans an end year complement of 30,550 in 1971, a decrease of 800 from the planned end year 1970 level. The reductions will be as follows:

Final close out of the Electronics Research Center...	-600
Reductions at Other Installations:	
Headquarters.....	-50
Kennedy Space Center.....	-31
Manned Spacecraft Center.....	-50
Marshall Space Flight Center.....	-69
Total reductions.....	-800

The following table distributes civil service positions by installation:

NUMBER OF PERSONNEL POSITIONS

	Fiscal Year 1969	Fiscal Year 1970	Fiscal Year 1971
MANNED SPACE FLIGHT.....	13,410	13,033	12,883
John F. Kennedy Space Center, NASA.....	2,877	2,779	2,748
Manned Spacecraft Center.....	4,384	4,250	4,200
Marshall Space Flight Center....	6,149	6,004	5,935
SPACE SCIENCE AND APPLICATIONS....	4,625	4,900	4,900
Goddard Space Flight Center.....	4,141	4,412	4,412
Wallops Station.....	484	488	488
ADVANCED RESEARCH AND TECHNOLOGY..	11,617	11,294	10,694
Ames Research Center.....	1,992	1,972	1,972
Electronics Research Center.....	802	600	---
Flight Research Center.....	539	535	535
Langley Research Center.....	3,912	3,872	3,872
Lewis Research Center.....	4,268	4,215	4,215
Space Nuclear Propulsion Office.	104	100	100
SUPPORTING OPERATIONS			
NASA Headquarters.....	2,093	2,123	2,073
TOTAL PERMANENT POSITIONS.....	31,745	31,350	30,550
POSITIONS OTHER THAN PERMANENT.....	2,196	2,300	2,300
TOTAL POSITIONS.....	33,941	33,650	32,850

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1971 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

DISTRIBUTION OF OBLIGATIONS BY FUNCTION
BY INSTALLATION
(Thousands of dollars)

FUNCTION	Total NASA	Subtotal OMSF	J. F. Kennedy Space Center, NASA	Manned Spacecraft Center	Marshall Space Flight Center	Subtotal OSSA	Goddard Space Flight Center	Wallops Station	Subtotal OART	Ames Research Center	Electronics Research Center	Flight Research Center	Langley Research Center	Lewis Research Center	Space Nuclear Propulsion Office	Headquarters
Personnel																
1969	$463,675	$204,076	$43,325	$69,285	$91,466	$61,853	$56,252	$5,601	$159,744	$28,477	$11,979	$7,522	$51,899	$57,987	$1,880	$38,002
1970	516,175	222,000	46,630	76,307	99,063	74,994	68,728	6,266	177,252	31,059	13,847	8,221	57,744	64,351	2,030	41,929
1971	515,108	222,019	46,161	77,173	98,685	77,409	70,929	6,480	173,027	32,385	3,670	8,503	59,269	67,111	2,089	42,653
Travel																
1969	14,003	6,247	566	3,562	2,119	1,782	1,665	117	3,435	694	321	200	1,134	898	188	2,539
1970	16,712	7,395	811	4,177	2,407	2,422	2,265	157	3,760	736	351	219	1,237	1,013	204	3,135
1971	18,200	7,854	874	4,463	2,517	2,759	2,584	175	4,325	921	200	234	1,669	1,088	213	3,262
Automatic Data Processing																
1969	23,808	12,453	1,044	5,501	5,908	6,066	5,987	79	2,953	324	1,206	58	933	432	---	2,336
1970	21,548	13,884	943	5,743	7,198	5,104	5,042	62	1,001	115	590	9	240	47	---	1,559
1971	22,710	14,915	943	5,930	8,042	5,788	5,723	65	433	115	---	9	256	53	---	1,574
Facilities Services																
1969	85,841	58,304	39,649	10,278	8,377	7,097	4,825	2,272	20,013	3,659	1,822	1,257	6,394	6,881	---	427
1970	80,872	54,551	38,559	8,825	7,167	6,684	4,472	2,212	19,311	3,696	2,317	1,072	6,116	6,110	---	326
1971	84,083	59,469	39,933	10,195	9,341	6,253	4,048	2,205	18,035	4,073	100	1,118	6,749	5,995	---	326
Technical Services																
1969	18,026	3,583	---	1,956	1,627	1,018	967	51	1,831	41	866	47	73	737	67	11,594
1970	15,272	3,694	---	2,317	1,377	860	801	59	1,172	9	981	73	73	36	---	9,546
1971	14,327	3,734	---	2,275	1,459	854	796	58	249	9	---	77	73	90	---	9,490
Administrative Support																
1969	42,611	26,305	11,210	8,258	6,837	4,513	3,531	987	5,914	837	1,043	613	2,512	909	---	5,879
1970	37,822	22,164	10,502	7,177	4,485	4,253	3,464	789	6.082	744	1.397	537	2,563	841	---	5,323
1971	37,872	22,592	10,239	7,722	4,631	4,398	3,590	808	5,452	745	500	608	2,718	881	---	5,430
Total																
1969	647,964	310,968	95,794	98,840	116,334	82,329	73,227	9,102	193,890	34,032	17,237	9,697	62,945	67,844	2,135	60,777
1970	688,401	323,688	97,445	104,546	121,697	94,317	84,772	9,545	208,578	36,359	19,483	10,131	67,973	72,398	2,234	61,818
1971	692,300	330,583	98,150	107,758	124,675	97,461	87,670	9,791	201,521	38,248	4,470	10,549	70,734	75,218	2,302	62,735

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1971 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

DISTRIBUTION OF OBLIGATIONS BY OBJECT CLASSIFICATION
BY FUNCTION

(Thousands of Dollars)

Object Classification	Total NASA	Personnel	Travel	Automatic Data Processing	Facilities Services	Technical Services	Administrative Support
Fiscal Year 1969							
Personnel compensation	$427,898	$427,898	---	---	---	---	---
Personnel benefits	32,564	32,564	---	---	---	---	---
Benefits for former personnel	286	286	---	---	---	---	---
Travel & transp. of persons	15,633	150	$14,003	---	---	---	$1,480
Transportation of things	3,706	387	---	---	---	$156	3,163
Rents, communications, and utilities	45,025	---	---	$12,599	$18,823	---	13,603
Printing and reproduction	6,649	---	---	---	1	534	6,114
Other services	93,575	2,385	---	9,043	55,964	16,324	9,859
Supplies and materials	15,624	---	---	---	7,885	503	7,236
Equipment	5,328	5	---	2,157	1,614	509	1,043
Lands and structures	1,554	---	---	---	1,554	---	---
Grants, subsidies and contributions	44	---	---	9	---	---	35
Insurance claims and indemnities	78	---	---	---	---	---	78
Totals	$647,964	$463,675	$14,003	$23,808	$85,841	$18,026	$42,611
Fiscal Year 1970							
Personnel compensation	$475,809	$475,809	---	---	---	---	---
Personnel benefits	37,185	37,185	---	---	---	---	---
Benefits for former personnel	24	24	---	---	---	---	---
Travel & transp. of persons	18,408	220	$16,712	---	---	---	$1,476
Transportation of things	3,953	424	---	---	---	$95	3,434
Rents, communications, and utilities	44,704	---	---	$12,338	$19,237	2	13,127
Printing and reproduction	6,120	---	---	---	3	539	5,578
Other services	84,972	2,513	---	9,169	52,229	13,840	7,221
Supplies and materials	13,520	---	---	---	6,959	447	6,114
Equipment	2,370	---	---	35	1,194	349	792
Lands and structures	1,250	---	---	---	1,250	---	---
Grants, subsidies and contributions	54	---	---	---	---	---	54
Insurance claims and indemnities	32	---	---	6	---	---	26
Totals	$688,401	$516,175	$16,712	$21,548	$80,872	$15,272	$37,822
Fiscal Year 1971							
Personnel compensation	$471,276	$471,276	---	---	---	---	---
Personnel benefits	39,311	39,311	---	---	---	---	---
Benefits for former personnel	1,460	1,460	---	---	---	---	---
Travel & transp. of persons	19,874	208	$18,200	---	---	---	$1,466
Transportation of things	3,668	416	---	---	---	$95	3,157
Rents, communications, and utilities	44,308	---	---	$13,017	$18,248	---	13,043
Printing and reproduction	5,939	---	---	---	---	475	5,464
Other services	89,568	2,437	---	9,693	56,286	13,293	7,859
Supplies and materials	13,223	---	---	---	7,035	199	6,989
Equipment	2,239	---	---	---	1,164	265	810
Lands and structures	1,350	---	---	---	1,350	---	---
Grants, subsidies and contributions	54	---	---	---	---	---	54
Insurance claims and indemnities	30	---	---	---	---	---	30
Totals	$692,300	$515,108	$18,200	$22,710	$84,083	$14,327	$37,872

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1971 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

DISTRIBUTION OF OBLIGATIONS BY OBJECT CLASSIFICATION
BY INSTALLATION

(Thousands of dollars)

Object Classification	Total NASA	Headquarters OMSF	J. F. Kennedy Space Center NASA	Manned Spacecraft Center	Marshall Space Flight Center	Subtotal OSSA	Goddard Space Flight Center	Wallops Station	Subtotal OART	Ames Research Center	Electronics Research Center	Flight Research Center	Langley Research Center	Lewis Research Center	Space Nuclear Propulsion Office	HQ OTRS.
FISCAL YEAR 1969																
Personnel compensation	423,958	202,[illegible]	46,163	64,[illegible]	84,[illegible]	17,[illegible]	21,[illegible]	3,[illegible]	147,270	26,[illegible]	11,815	6,[illegible]	47,[illegible]	53,763	1,694	34,335
Personnel benefits	32,564	14,032	2,415	4,720	6,397	4,307	3,911	396	11,263	1,995	820	521	3,684	4,066	120	2,962
Benefits to former personnel	286	175	---	---	[illegible]	---	---	---	23	---	---	---	---	23	---	108
Travel & transportation of persons	23,633	7,305	1,550	3,209	2,[illegible]	4,701	4,[illegible]	191	3,481	713	323	201	1,134	899	189	2,562
Transportation of things	3,706	1,933	1,453	356	84	1,111	990	121	387	21	54	14	193	101	4	275
Rents, communications, and utilities	45,023	21,991	7,863	8,065	6,163	8,372	7,935	437	11,958	3,041	2,116	204	2,818	3,779	---	2,704
Printing and reproduction	6,649	4,611	3,226	885	500	182	123	59	413	6	88	7	242	70	---	1,443
Other services	93,535	60,767	32,725	14,111	11,031	5,625	4,327	1,298	12,944	1,289	2,243	1,408	4,236	3,699	69	14,239
Supplies and materials	17,024	3,909	4,412	2,[illegible]	1,182	2,039	1,[illegible]	491	4,157	433	380	217	2,134	953	---	543
Equipment	5,328	1,295	841	191	263	1,276	923	353	1,231	40	196	96	423	476	---	1,526
Lands and structures	1,554	875	475	358	42	423	302	121	256	1	---	72	183	---	---	---
Grants, subsidies & contributions	44	---	---	---	---	---	---	---	9	9	---	---	---	---	---	35
Insurance claims and indemnities	78	14	13	---	1	1	1	---	18	---	---	---	1	17	---	45
Totals	647,964	310,968	95,794	98,840	116,334	82,329	73,227	9,102	193,890	34,032	17,237	9,697	62,945	67,844	2,135	60,777
FISCAL YEAR 1970																
Personnel compensation	475,809	205,018	42,995	70,631	91,392	69,074	63,332	5,742	163,784	28,835	12,695	7,609	53,187	59,611	1,847	37,933
Personnel benefits	37,185	15,607	3,243	5,263	7,101	5,383	4,930	453	12,759	2,170	986	597	4,215	4,611	180	3,436
Benefits for former personnel	24	---	---	---	---	---	---	---	24	24	---	---	---	---	---	---
Travel and transportation of persons	18,408	8,892	1,999	4,416	2,477	2,559	2,328	231	3,799	743	362	234	1,237	1,016	207	3,158
Transportation of things	3,953	1,917	1,481	356	80	1,108	981	127	697	32	340	15	210	100	---	231
Rents, communications, and utilities	44,704	22,300	7,525	8,100	6,675	7,865	7,438	427	11,471	3,102	1,998	176	2,695	3,500	---	3,068
Printing and reproduction	6,120	4,473	3,173	800	500	171	120	51	368	6	92	10	200	60	---	1,108
Other services	84,972	56,177	31,995	12,840	11,342	5,496	4,228	1,268	11,219	792	2,499	1,093	3,785	3,050	---	12,080
Supplies and materials	13,520	7,714	4,075	1,839	1,800	1,984	1,075	909	3,390	442	374	225	2,100	249	---	432
Equipment	2,370	723	344	200	179	412	200	212	918	207	137	96	278	200	---	317
Lands and structures	1,250	849	599	100	150	265	140	125	136	---	---	75	61	---	---	---
Grants, subsidies & contributions	54	---	---	---	---	---	---	---	7	6	---	1	---	---	---	47
Insurance claims and indemnities	32	19	1	1	1				5				1	1	---	8
Totals	688,401	323,688	97,445	104,946	121,697	94,317	84,772	9,545	208,578	36,359	19,483	10,131	67,973	72,398	2,234	61,818
FISCAL YEAR 1971																
Personnel compensation	421,276	204,521	42,496	71,290	90,735	71,332	65,409	5,924	157,281	29,751	2,060	1,515	54,218	61,616	1,881	38,141
Personnel benefits	39,211	16,178	3,302	5,401	7,202	5,510	5,077	433	13,353	2,002	210	534	4,[illegible]	5,352	205	3,920
Benefits for former personnel	1,460	-	-	-	-	---	-	---	1,460	---	1,460	---	---	---	---	---
Travel & transportation of persons	17,[illegible]	4,[illegible]	2,[illegible]	4,[illegible]	2,[illegible]	2,[illegible]	2,[illegible]	2[illegible]	4,[illegible]	428	200	249	1,669	1,090	216	3,287
Transportation of things	3,600	1,[illegible]	1,440	356	99	1,227	1,[illegible]	127	359	33	-	15	210	100	--	187
Rents, communications, and utilities	44,366	22,395	7,480	8,240	6,675	8,018	8,290	428	11,831	3,384	100	184	2,865	3,500	---	3,162
Printing and reproduction	5,949	4,363	3,063	800	500	172	120	52	346	6	---	10	270	60	---	1,058
Other services	89,568	62,782	33,493	14,860	14,429	4,962	3,630	1,332	9,638	844	500	1,143	4,101	3,050	---	12,180
Supplies and materials	13,223	7,[illegible]	4,040	1,739	1,900	2,054	1,100	954	3,110	462	---	252	2,127	249		380
Equipment	2,239	723	344	200	179	339	200	139	818	210	---	127	281	200	---	359
Lands and structures	1,350	750	400	100	250	340	140	166	360	---	---	79	281	---	---	---
Grants, subsidies & contributions	54	---	---	---	---		---	---	7	6	---	1	---	---	---	47
Insurance claims and indemnities	30	18	16	1	1	---	---	---	4	---	---	---	3	1	---	8
Totals	697,300	330,583	98,150	107,758	124,675	97,461	87,670	9,791	201,521	38,248	4,470	10,549	70,734	75,218	2,302	62,735

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1971 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

ANALYSIS OF REQUIREMENTS FOR GOVERNMENT-OWNED PASSENGER-CARRYING MOTOR VEHICLES

The appropriation language provides for the acquisition of thirty-nine passenger motor vehicles, for replacement purposes only. All vehicles for replacement will meet the criteria established by the General Services Administration for replacement of vehicles due to age or mileage, or both of these factors.

A summary analysis of inventory transactions by type of vehicle in FY 1971 is as follows:

	Total	Medium Sedans	Other Sedans	Station Wagons	Ambu-lances	Buses
Planned fleet, July 1, 1970	183	-	50	101	13	19
Number to be purchased in FY 1971.....	39	-	13	26	-	-
Number of disposals planned:	-39	-	-5*	34	-	-
To be replaced by identical vehicle type.....	(31)	(-)	(5)	(26)	(-)	(-)
To be replaced by another vehicle type.....	(8)	(-)	(-)	(8)*	(-)	(-)
Planned fleet, June 30, 1971.....	183	-	58	93	13	19

* Eight station wagon disposals will be replaced with "Other Sedans."

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

PERSONNEL

	1969	1970	1971	Change in 1971
Personnel.....	$463,675,000	$516,175,000	$515,108,000	$-1,067,000

DESCRIPTION:

The estimate for personnel and related costs includes the regular pay, overtime, holiday, Sunday and nightwork differential pay of NASA personnel in permanent, temporary, part-time and intermittent positions, and the cost of military personnel and personnel of other agencies detailed to NASA. It also includes the Government's contribution to the Civil Service Retirement Fund for permanent employees, the contribution to social security for other than permanent employees, the Government's share of the cost of employees' life insurance and health benefits, incentive awards and the cost of severance pay. The estimate provides for the cost of travel to initial duty station, and travel and shipment of household goods for transferred employees. Reimbursement to the Civil Service Commission for security investigations and payments to other agencies and nongovernment institutions for personnel training are also included in this activity.

DISTRIBUTION OF FUND REQUIREMENTS BY INSTALLATION:

	1969	1970	1971
Kennedy Space Center.....	$43,325,000	$46,630,000	$46,161,000
Manned Spacecraft Center.....	69,285,000	76,307,000	77,173,000
Marshall Space Flight Center.....	91,466,000	99,063,000	98,685,000
Goddard Space Flight Center.....	56,252,000	68,728,000	70,929,000
Wallops Station.....	5,601,000	6,266,000	6,480,000
Ames Research Center.....	28,477,000	31,059,000	32,385,000
Electronics Research Center.....	11,979,000	13,847,000	3,670,000
Flight Research Center.....	7,522,000	8,221,000	8,503,000
Langley Research Center.....	51,899,000	57,744,000	59,269,000
Lewis Research Center.....	57,987,000	64,351,000	67,111,000
Space Nuclear Propulsion Office....	1,880,000	2,030,000	2,089,000
NASA Headquarters.....	38,002,000	41,929,000	42,653,000
Total.....	$463,675,000	$516,175,000	$515,108,000

BASIS OF FUND REQUIREMENTS:

The planned end of year employment for NASA civil service personnel includes 31,350 permanent employees in 1970 and 30,550 permanent employees in 1971, a reduction of 800. The plan for nonpermanent employees is 2,300 in both 1970 and 1971. The total complement, therefore, is 33,650 positions in 1970 and 32,850 positions in 1971. The distribution of the permanent positions by installation is as follows:

DISTRIBUTION OF POSITIONS BY INSTALLATION

	1969	1970	1971	Change in 1971
Permanent Positions				
Kennedy Space Center	2,877	2,779	2,748	-31
Manned Spacecraft Center	4,384	4,250	4,200	-50
Marshall Space Flight Center	6,149	6,004	5,935	-69
Goddard Space Flight Center	4,141	4,412	4,412	---
Wallops Station	484	488	488	---
Ames Research Center	1,992	1,972	1,972	---
Electronics Research Center	802	600	---	-600
Flight Research Center	539	535	535	---
Langley Research Center	3,912	3,872	3,872	---
Lewis Research Center	4,268	4,215	4,215	---
Space Nuclear Propulsion Office	104	100	100	---
Headquarters	2,093	2,123	2,073	-50
Subtotal	31,745	31,350	30,550	-800
Nonpermanent Positions	2,196	2,300	2,300	---
Total	33,941	33,650	32,850	-800

The number of permanent positions requested in the 1970 budget was 31,600. During the development of the 1970 operating plan, that level was reduced by a net of 250 as a part of the overall retrenchment in the government-wide level of civil service manpower. The cut of 300 positions was partially offset by an increase in authorized ceiling to accommodate the transfer to NASA of 50 Air Force civil service reliability and inspection employees. Included in the reductions is the phase out of operations at the Electronics Research Center. The 1970 operating plan thus derived for personnel provides an end year employment level of 31,350.

The following table summarizes the changes for 1970 permanent position allocations from the 1970 budget to the current plan.

CHANGES IN THE 1970 PERMANENT POSITION PLAN

Institutional Director	Plan in 1970 Budget	Government-wide Reduction	Air Force NASA Transfer	1970 Plan in 1971 Budget
Manned Space Flight.....	13,035	-52	+50	13,033
Space Science and Applications.	4,900	---	---	4,900
Advanced Research and Technology.....	11,533	-239	---	11,294
NASA Headquarters.....	2,132	-9	---	2,123
Total.....	31,600	-300	+50	31,350

NASA is planning 30,550 permanent positions in 1971, a reduction of 800 positions from 1970. Of the reduction, 600 will result from the completion of the close out of operations at the Electronics Research Center, 150 from manned space flight centers and the remainder, 50 from Headquarters. The following table summarizes the changes in 1971:

CHANGES FROM 1970 TO THE 1971 PERMANENT POSITION PLAN

Institutional Director	1970 Plan	Changes in 1971	1971 Plan
Manned Space Flight.....	13,033	-150	12,883
Space Science and Applications.....	4,900	---	4,900
Advanced Research and Technology.....	11,294	-600	10,694
NASA Headquarters.....	2,123	-50	2,073
Total.....	31,350	-800	30,550

Nonpermanent Positions

The 1970 and 1971 plans for nonpermanent positions are 2,300. These positions are required for a variety of programs, the largest of which is the NASA summer employment program. NASA hires college students and high school and college faculty members during the summer to provide these people exposure to the NASA programs and government operations. The benefits to the participants are numerous, as are the benefits to NASA from the employment of these highly skilled individuals, and the education and training they receive is a considerable national asset.

A portion of the nonpermanent positions is used to provide for NASA's participation in the President's Youth Opportunity Campaign. This program provides underprivileged youths the opportunity to work at summer jobs at the various NASA installations, when unskilled personnel can be effectively used. Some of these positions are used during the remainder of the year to provide for the agency's participation in the President's Youth Opportunity Back to School Drive. This program continues during the school year, and

the underprivileged youths are employed at a variety of unskilled tasks during a limited workweek of not more than 16 hours.

As in the past, the agency continues to provide significant training opportunities for technically oriented college students participating in the cooperative training program throughout the year. The student employed under a cooperative training agreement works for a term at a NASA installation and then spends a term in regular study at his college or university. This work-study program combines practical experience with theory and has been a significant recruitment source for NASA.

Experts and consultants are also included under nonpermanent positions. They are usually employed for a few days at a time when their expertise is required.

The following table summarizes the planned utilization of personnel:

DISTRIBUTION OF PERMANENT POSITIONS BY PROGRAM

Direct Positions	1969	1970	1971
Manned Space Flight	10,010	9,699	9,478
Apollo	7,965	6,664	4,904
Space flight operations	1,825	2,789	4,322
Advanced missions	220	246	252
Space Science and Applications	3,441	3,606	3,519
Physics and astronomy	1,501	1,608	1,495
Lunar and planetary exploration	454	511	485
Bioscience	212	208	199
Space applications	681	702	783
Launch vehicle procurement	593	577	557
University Affairs			
Sustaining university program	12	12	9
Advanced Research and Technology	7,801	7,725	7,483
Basic research	1,172	1,129	1,058
Space vehicle systems	1,488	1,434	1,495
Electronics systems	952	863	649
Human factor systems	338	329	307
Space power and electric propulsion systems	999	987	976
Nuclear rockets	159	150	159
Chemical propulsion	277	246	246
Aeronautical vehicles	2,416	2,587	2,593

Direct Positions (Continued)	1969	1970	1971
Tracking and Data Acquisition	1,073	1,130	1,133
Technology Utilization	47	49	49
Subtotal, direct positions.....	22,384	22,221	21,671
Indirect Positions			
Director and staff.....	844	833	793
Administrative support.....	4,552	4,440	4,305
Research and development support.....	3,965	3,856	3,781
Subtotal, indirect positions.....	9,361	9,129	8,879
Total, permanent positions.....	31,745	31,350	30,550
Other than permanent positions.....	2,196	2,300	2,300
Total.....	33,941	33,650	32,850

The NASA work force may be summarized by broad occupational groupings as follows:

COMPOSITION OF PERMANENT STAFF BY OCCUPATIONAL GROUP

	1969		1970		1971	
Occupational Group	Number	Percent	Number	Percent	Number	Percent
Professional scientists and engineers.....	13,861	43.7	13,749	43.9	13,408	44.0
Technicians.....	5,123	16.1	5,873	18.7	5,818	19.0
Wage board.....	3,666	11.5	3,005	9.6	2,935	9.6
Professional administrative.....	4,367	13.8	4,341	13.8	4,194	13.7
Clerical.....	4,728	14.9	4,382	14.0	4,195	13.7
Total.....	31,745	100.0	31,350	100.0	30,550	100.0

As reflected above, professional scientists and engineers comprise forty-four percent of the NASA work force. Technicians and technically oriented wage board employees, who work in direct support of the professional technical staff, make up another twenty-nine percent of the complement. The types of positions included in each category are described below:

Professional scientists and engineers include all professional technical employees engaged in aerospace research, development, operations, and related work, including the development and operation of specialized facilities and supporting equipment.

Technician positions include scientific and engineering aids, shop superintendents, quality assurance specialists, production planners and inspectors, technicians in drafting, photography, and related positions.

Wage board positions include trade, craft and general labor positions (both supervisory and nonsupervisory) which are compensated on the basis of prevailing local wage rates.

Professional administrative positions include professional management positions in the fields of general management, financial management, procurement, contracting, personnel, security, library and editorial work, and related fields for which a university degree or the equivalent, and specialized training and experience are basic qualifications.

Clerical positions include secretarial, specialized and general clerical, administrative assistant, and related positions, the qualification requirements for which are clerical training and experience or specialized nonprofessional experience in the areas of supply, fiscal, logistics, statistics, or related activities.

SUMMARY OF PERSONNEL COSTS:

	1969	1970	1971
A. COMPENSATION AND BENEFITS			
1. COMPENSATION			
a. Permanent positions....	$411,766,000	$458,952,000	$455,140,000
b. Nonpermanent positions.	5,097,000	5,531,000	5,163,000
c. Reimbursable details...	3,531,000	3,961,000	3,907,000
d. Overtime and other compensation.....	7,504,000	7,365,000	7,066,000
Subtotal.....	$427,898,000	$475,809,000	$471,276,000
2. BENEFITS.....	32,557,000	36,932,000	40,341,000
Subtotal.....	$460,455,000	$512,741,000	$511,617,000
B. SUPPORTING COSTS			
1. Transfer of personnel.....	$814,000	$886,000	$972,000
2. Civil Service Commission services.....	95,000	110,000	120,000
3. Personnel training.....	2,311,000	2,438,000	2,399,000
Subtotal.....	$3,220,000	$3,434,000	$3,491,000
Total, Personnel.....	$463,675,000	$516,175,000	$515,108,000

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	1969	1970	1971
1. COMPENSATION.....	$427,898,000	$475,809,000	$471,276,000
a. Permanent Positions.....	411,766,000	458,952,000	455,140,000

The largest segment of personnel related costs, compensation of personnel in permanent positions, amounts to $455,140,000 in 1971, a decrease of $3,812,000 from 1970. This decrease results from netting of decreases from abolished positions in 1970 and 1971, and the closing of ERC, partially offset by increases related to the full year's cost of new positions in 1970 at Goddard for conversion of contractor operations to civil service, the 1969 general pay raise and career development in 1970, and to the partial year's cost of within grade advances and career development in 1971.

The estimate for permanent compensation is based upon the position structure at the start of the year, as modified by the addition of new positions and abolishment of existing positions, within grade advances, career development, etc. After these modifications, the year-end position structure is established and the cost effect for the year is calculated based on the estimated period that these modifications are in effect. The derivation of the cost for personnel in permanent positions is detailed below:

	1969	1970	1971
Cost of position structure - beginning of the year.....	$388,146,000	$416,865,000	$463,333,000
Cost of additions to the structure:			
New positions.....	5,179,000	5,246,000	---
Salary legislation and pay raises.....	23,831,000	39,778,000	---
Within grade advances.....	7,249,000	7,125,000	6,737,000
Career development.....	5,330,000	5,284,000	4,780,000
Structural changes.....	176,000	426,000	---
Abolished positions.....	-12,126,000	-9,733,000	-11,954,000
Effect of separation replacement policy.....	-920,000	-1,658,000	-4,747,000
Cost of position structure - end of year.....	$416,865,000	$463,333,000	$458,149,000
Offsets:			
Lapse of new positions.....	$-4,206,000	$-2,032,000	---
Delay in filling vacancies.....	-1,362,000	-2,689,000	$-3,765,000
Lapse on salary legislation and pay raises.....	-1,520,000	-1,891,000	---
Lapse on within grade advances...	-3,708,000	-3,492,000	-3,408,000
Lapse on career development increases.....	-3,038,000	-2,904,000	-2,368,000
Partial year funding of separations.....	+442,000	+1,011,000	+1,520,000

	1969	1970	1971
Offsets (Continued):			
Partial year funding of abolished positions.....	$+6,767,000	$+5,781,000	$+1,846,000
Terminal leave payments.....	+826,000	+945,000	+1,795,000
Work days in excess of 52 weeks..	+1,272,000	+1,772,000	+1,952,000
Reimbursement received from other government agencies.....	-572,000	-882,000	-581,000
Net cost of permanent positions....	$411,766,000	$458,952,000	$455,140,000

Development of Salary Structure and Cost Estimate

The cost of new positions represents the salary requirements for additional positions in 1969 and 1970. There will be no new positions in 1971.

The increased costs due to salary legislation and pay raises are the result of Congressional action, the revision of special pay provisions by the Civil Service Commission and the periodic wage surveys for Wage Board employees. The increase shown for 1969 represents the second increment of the Federal Salary Act of 1967, effective in July 1968, and the periodic wage surveys conducted in 1969. The cost in 1970 represents the final scale adjustment provided for in the Federal Salary Act of 1967 and the cost of wage surveys conducted in 1970. The cost of pending salary legislation is not included in this budget request.

The calculations for within grade advances, career development, and the effect of the separation replacement policy savings are derived through modification of the beginning inventory of grade levels and skill groups, after determining the number of separations that can be expected, based on current experience, the number who meet the time and performance criteria NASA has established for promotions, estimating within grade salary increases for employees who meet the statutory time and quality requirements and planning the replacement of vacated positions at a generally lower level than those held by the former employees.

The changing character of work patterns results in shifts in the position structure between Wage Board and General Schedule positions. These changes in structure differ from installation to installation to meet the needs of each.

The offset item, abolished positions, is the annual salary cost of the actual position reductions in 1969 and 1970, and those planned for 1971, which are the 600 at ERC, 50 at Headquarters, and 150 at the manned space flight centers. The other offset item, effect of separation replacement policy, is the savings in annual salaries resulting from the agency policy of replacing two-thirds of the separations in professional positions at the entrance level rather than at the grade of the separated employee.

The cost of the position structure at the end of the year and the net cost, that is compensation actually paid, differ because the end-year structure carries all salaries on an annual salary basis. The differences between the salary structure and compensation are generally characterized as lapse items, and may be either deductive or additive in the schedule, depending upon the type of actions.

The lapse on new positions represents the savings for the additional positions which become available to the agency during the fiscal year for the period of time required to place the new employees on the rolls.

Delays in filling vacancies represent the savings in annual salaries for the interval between the time an employee leaves the agency and the time a replacement is placed on the rolls. For 1971, this time interval is estimated at about five weeks. The estimate of savings in 1971 is higher than that for 1970 because of the higher number of positions being refilled rather than abolished after being vacated in 1971 at other installations.

The savings from lapse on salary legislation and pay raises result because they are effective for only part of the year in which they occur. Wage Board employees' increases are established at various times during the year, and vary by geographical location, and the savings amount reflects these variances.

Lapses on within grade advances and career development increases represent the savings for the period that employees were paid at salaries lower than those held at the end of the year. Partial year funding of abolished positions represents the cost of these positions before they were abolished. Partial year funding of separations is the cost of positions at the higher rate, which subsequently are filled at a lower grade because of the separation replacement policy.

Terminal leave payments are for accrued annual leave due separating employees and are an offset against the salary savings realized by the separation. The 1971 estimate reflects a large one-time cost associated with the close out of ERC.

Reimbursement received from other government agencies reflects the expected payments, chiefly from the Environmental Sciences Services Administration, for work performed by NASA. The decrease in 1971 reflects completion of certain phases of work for which NASA has been receiving reimbursements.

	1969	1970	1971
b. Nonpermanent positions.....	$5,097,000	$5,531,000	$5,163,000

The cost of nonpermanent positions is for the varied temporary employment programs carried on by NASA, such as the cooperative student training program, the summer student and faculty employment programs, participation in the President's Youth Opportunity Campaign, and other similiar programs. The reduction in cost reflects a lower average number of such positions to be filled during 1971.

	1969	1970	1971
c. Reimbursable details.....	$3,531,000	$3,961,000	$3,907,000

The services of a small group of military officers and civilian detailees from other government agencies are utilized in the conduct of NASA's programs where such use is appropriate. In accordance with existing agreements, NASA reimburses the parent organization for the salaries and related costs of the detailees. The reduction in 1971 results from a planned smaller number of detailees than in 1970, largely because of the close out of ERC.

	1969	1970	1971
d. Overtime and other compensation.....	$7,504,000	$7,365,000	$7,066,000

The reduction of $299,000 for overtime and other compensation planned for in 1971 results from the close out of ERC, reduced requirements related to the Apollo program and a continued emphasis within NASA to reduce costs in this category to the lowest level consistent with mission and legal requirements.

	1969	1970	1971
2. BENEFITS.....	$32,557,000	$36,932,000	$40,341,000

In addition to compensation, NASA makes an employer's contribution to personnel benefits as authorized and required by law. The following table indicates the costs of personnel benefits by the major categories:

Category of Cost	1969	1970	1971
Contribution to the Civil Service Retirement Fund.....	$26,787,000	$30,921,000	$32,511,000
Contribution for employee life insurance.....	1,625,000	1,745,000	1,759,000
Contribution for employee health insurance.....	2,727,000	2,859,000	2,948,000
Contribution to FICA.....	161,000	210,000	233,000
Incentive awards.....	378,000	441,000	441,000
Other personnel benefits.....	593,000	732,000	989,000
Severance pay.....	286,000	24,000	1,460,000
Total.....	$32,557,000	$36,932,000	$40,341,000

The largest part of personnel benefits is the Agency's contribution to the Civil Service Retirement fund. Until January 1970, the Agency's contribution equalled six and one-half percent of each permanent employees' salary. In January 1970, the rate of contribution was raised to seven percent as a result of P.L. 91-93. The increased cost in 1971 results from the full year's funding of that increase.

The agency contribution toward the cost of employee life and health insurance is based upon employee participation. FICA or social security contributions are for nonpermanent employees who are not covered by the Civil Service Retirement Act.

The incentive awards program provides for cash awards for outstanding contributions to NASA, employees superior performance and for improvement of the agency's operations. The cost of the program remains relatively stable. Other personnel benefits provide for reimbursement to the Department of Labor for workmen's compensation cost and such items as uniform allowances and a special commuting allowance for personnel at the Nuclear Rocket Development Station in Nevada. The increase requested in 1971 is to pay for the increased workmen's compensation billing provided by the Labor Department.

The severance pay estimate is related to the legal requirement to pay severance pay to employees who are separated from the rolls through no fault of their own. Such is the case for employees separated because of the close out of operations at the Electronics Research Center. The amount shown for 1971 is the estimated liability for severance payments at ERC.

	1969	1970	1971
B. SUPPORTING COSTS.....	$3,220,000	$3,434,000	$3,491,000

Supporting personnel costs provide for the expenses of moving employees to their initial duty station or reassignment; for security investigations and other recruitment costs; and for maintaining and expanding the skills of our employees. These costs are summarized as follows:

	1969	1970	1971
1. Transfer of personnel.....	$814,000	$886,000	$972,000

The legislation approved in 1966 provided that the government would pay for certain relocation costs, such as the expenses of selling and buying a home, the cost of one trip to the new duty station for the purpose of securing new housing, and the cost of family relocation allowances. The estimate is based on previous experience. The increase in these costs results because of the larger number of vacated positions being refilled in 1971 rather than being abolished.

	1969	1970	1971
2. Civil Service Commission services.....	$95,000	$110,000	$120,000

The Civil Service Commission conducts security investigations for NASA. The cost of security investigations is a function of two variables, the number of investigations to be conducted and the unit-charge made by the Civil Service Commission. Compilation of installation estimates of the

number to be conducted and the projected unit-charge for each year is the basis for the cost estimate.

	1969	1970	1971
3. Personnel training.....	$2,311,000	$2,438,000	$2,399,000

The maintenance and expansion of the skills of personnel is essential to an organization such as NASA which is charged with the responsibility for complex technical programs. Such training is provided within the framework of the Government Employees Training Act of 1958. Part of the training is provided by other government agencies. When employees participate in training courses of other agencies, NASA is able to benefit from existing programs. The remainder of the training is provided through nongovernmental sources; the cost is for tuition, fees and related costs for training at colleges, universities, technical institutes and related institutions; and for the cost of seminars and workshops in which groups of employees receive training in courses of agency-wide interest. Such training is used to maintain and to expand employee skills. The estimate is based on a continuation of current training programs and the growing requirements to reorient skills of employees into channels compatible with the direction of the space program in the 1970's.

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

TRAVEL

	1969	1970	1971	Change in 1971
Travel.....	$14,003,000	$16,712,000	$18,200,000	$+1,488,000

DESCRIPTION:

The estimates include the cost of transportation, per diem, and incidental costs required for employee travel for the purpose of direction and coordination of Research and Development and Construction of Facilities program activities; travel for contract management and flight mission support; travel to launching sites and tracking stations, and for administrative travel. It also includes the cost of travel to NASA-sponsored meetings and conferences, as well as meetings sponsored outside NASA, when such travel is in the interest of the agency; of travel by non-NASA employees (31 USC 22a); and of travel by unpaid members of research advisory committees. Charter, contract, or lease of passenger aircraft and the cost of local transportation by taxi, bus, or private automobile for which the employee is reimbursed are included in the estimate. Costs for travel to initial duty station and for permanent change of station are excluded from these estimates and are included under Personnel Related Costs. The major share of the increase in travel costs for 1971, $1,344,000, is related to the full year funding of the increase in per diem rates approved in November, 1969, in PL 91-114.

DISTRIBUTION OF FUND REQUIREMENTS BY INSTALLATION:

	1969	1970	1971
Kennedy Space Center.....	$566,000	$811,000	$874,000
Manned Spacecraft Center.....	3,562,000	4,177,000	4,463,000
Marshall Space Flight Center.....	2,119,000	2,407,000	2,517,000
Goddard Space Flight Center.....	1,665,000	2,265,000	2,584,000
Wallops Station.....	117,000	157,000	175,000
Ames Research Center.....	694,000	736,000	921,000
Electronics Research Center.....	321,000	351,000	200,000
Flight Research Center.....	200,000	219,000	234,000
Langley Research Center.....	1,134,000	1,237,000	1,669,000
Lewis Research Center.....	898,000	1,013,000	1,088,000
Space Nuclear Propulsion Office..	188,000	204,000	213,000
NASA Headquarters.....	2,539,000	3,135,000	3,262,000
Total.....	$14,003,000	$16,712,000	$18,200,000

BASIS OF FUND REQUIREMENTS:

SUMMARY OF TRAVEL BY MAJOR CATEGORY

	1969	1970	1971	Change in 1971
Program Related Travel				
Direction, coordination, and management of Research and Development and Construction of Facilities program activities.....	$8,441,000	$10,035,000	$11,210,000	$+1,175,000
Flight mission support.	1,214,000	1,428,000	1,485,000	+57,000
Overseas travel to launch and tracking sites.....	437,000	544,000	596,000	+52,000
Subtotal.....	$10,092,000	$12,007,000	$13,291,000	$+1,284,000
Meetings and Technical Seminars				
Government-sponsored meetings.....	$1,146,000	$1,279,000	$1,364,000	$+85,000
Other than government-sponsored meetings and technical seminars.....	937,000	993,000	1,018,000	+25,000
Subtotal.....	$2,083,000	$2,272,000	$2,382,000	$+110,000
Administrative Travel...	$1,828,000	$2,433,000	$2,527,000	$+94,000
Total, Travel.....	$14,003,000	$16,712,000	$18,200,000	$+1,488,000

	1969	1970	1971	Change in 1971
Program Related Travel....	$10,092,000	$12,007,000	$13,291,000	$+1,284,000

Program related travel is the travel most directly related to the NASA mission. It is the largest part of the travel function and accounts for approximately 73% of the travel requirements for 1971. Funding in 1971

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will increase by $1,284,000, which is largely the result of the full year funding of the cost of the increase in per diem rates approved in November, 1969. The costs are summarized as follows:

	1969	1970	1971	Change in 1971
Direction, coordination and management of programs.....	$8,441,000	$10,035,000	$11,210,000	$+1,175,000

The largest individual part of program related travel is for direction, coordination, and management of research and development and construction of facilities program activities. Because of the complexity of the programs and the distribution of contractor and subcontractor effort throughout the entire United States, coordination and management of activities requires frequent examination by personnel responsible for the program. The costs for this travel are expected to be higher in 1971 than in 1970 as the result of the full year funding of the increase in per diem rates paid to Federal employees while in travel status, approved in November, 1969 in PL 91-114. This increase is partially offset by a reduction related to the phase-out of the Electronics Research Center.

	1969	1970	1971	Change in 1971
Flight mission support.....	$1,214,000	$1,428,000	$1,485,000	$+57,000

As projects reach the flight stage, support is required for pre-launch, launch, and post-launch activities. The amount of travel required for this purpose is directly related to both the number and complexity of the launches. The increase, $57,000, results from the travel requirements for support of the approved launch schedule, and the full year funding of the increase in per diem rates.

	1969	1970	1971	Change in 1971
Overseas travel to launch and tracking sites.....	$437,000	$544,000	$596,000	$+52,000

Overseas travel to launch and tracking sites includes travel required for instrumentation of the tracking sites, and inspection of the sites prior to launch. The increase of $52,000 is related to the full year funding of conversion

of contractor functions for tracking and data acquisition effort to a civil service operation at the Goddard Space Flight Center which were formerly included as part of the contractual effort and funded under Research and Development, and to the increase in per diem rates.

	1969	1970	1971	Change in 1971
Meetings and technical seminars.....	$2,083,000	$2,272,000	$2,382,000	$+110,000

Travel to meetings and technical seminars permits employees engaged in program activities to participate at both government sponsored and non-government sponsored meetings and technical seminars with other outstanding representatives of the aerospace community. This participation allows personnel to benefit from exposure to advances in the field which arise outside NASA, as well as allowing personnel to present both accomplishments and problems to their associates. Many of the government sponsored meetings are made up of working panels convened to solve certain problems for the benefit of the government. Authorization to attend any meetings of the types described is granted only after assurance that attendance will be in the interest of NASA. The estimate for this travel in 1971 is slightly more than 1970 because of the increase in per diem rates, partially offset by a decrease related to the phase-out of the Electronics Research Center.

	1969	1970	1971	Change in 1971
Administrative travel..	$1,828,000	$2,433,000	$2,527,000	$+94,000

Administrative travel includes travel for the direction and coordination of general management matters. It includes travel by functional managers in such areas as personnel, financial management, and procurement to assure that agency policies and procedures are being implemented and carried out properly throughout the agency. Travel by senior officials to review center requirements and operations and the travel of center officials to NASA Headquarters is provided for in this category. This category also includes the cost of travel in and around the vicinity of the centers, including bus and taxi services and rental of motor vehicles, and travel of unpaid members of research advisory committees. The increase in 1971 is related to the full year cost of the increase in per diem rates.

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

AUTOMATIC DATA PROCESSING

	1969	1970	1971	Change in 1971
Automatic data processing	$23,808,000	$21,548,000	$22,710,000	$+1,162,000

DESCRIPTION:

The funds budgeted in this category provide for the acquisition of automatic data processing (ADP) equipment by lease or purchase, maintenance of NASA-owned equipment, and the procurement of programming and operation services. Both electronic data processing and ancillary electric accounting machine equipment are included. The overall requirement for ADP is divided by appropriation in accordance with the purpose served by the equipment. The Research and Program Management appropriation provides for the general purpose scientific and business data processing which support the overall installation operations and scientific and technical applications where it is impractical to distribute the funding to a directly supported program or project. Other appropriations provide for data processing systems and operations which are dedicated to specific programs or projects, or are integrated into larger systems. Additional information concerning ADP equipment requirements may be found in the special ADP analysis which appears in Volume I of this budget.

DISTRIBUTION OF FUND REQUIREMENTS BY INSTALLATION:

	1969	1970	1971
Kennedy Space Center.....	$1,044,000	$943,000	$943,000
Manned Spacecraft Center.....	5,501,000	5,743,000	5,930,000
Marshall Space Flight Center.....	5,908,000	7,198,000	8,042,000
Goddard Space Flight Center.....	5,987,000	5,042,000	5,723,000
Wallops Station.....	79,000	62,000	65,000
Ames Research Center.....	324,000	115,000	115,000
Electronics Research Center.....	1,206,000	590,000	---
Flight Research Center.....	58,000	9,000	9,000
Langley Research Center.....	933,000	240,000	256,000
Lewis Research Center.....	432,000	47,000	53,000
NASA Headquarters.....	2,336,000	1,559,000	1,574,000
Total.....	$23,808,000	$21,548,000	$22,710,000

BASIS OF FUND REQUIREMENTS:

SUMMARY OF AUTOMATIC DATA PROCESSING

	1969	1970	1971	Change in 1971
Lease of equipment.....	$12,606,000	$12,354,000	$13,017,000	$+663,000
Purchase of equipment...	2,178,000	25,000	---	-25,000
Maintenance of equipment	2,090,000	1,345,000	1,350,000	+5,000
Subtotal, equipment...	16,874,000	13,724,000	14,367,000	+643,000
Programming and operation services....	6,934,000	7,824,000	8,343,000	+519,000
Total, automatic data processing.....	$23,808,000	$21,548,000	$22,710,000	$+1,162,000

	1969	1970	1971	Change in 1971
Lease of equipment.....	$12,606,000	$12,354,000	$13,017,000	$+663,000

The lease of equipment for ADP represents approximately 57% of the total ADP costs funded from the Research and Program Management appropriation. The estimate for 1971 is $663,000 higher than the amount planned for 1970. This increase is primarily attributable to the Goddard Space Flight Center and results from the full year rental of leased peripheral equipment acquired during 1970 to support the ADP systems complex already in place at the Goddard Space Flight Center. In addition, there is a smaller increase at the Manned Spacecraft Center planned for the purpose of acquiring components for existing in-place systems. These increases are partially offset by decreases of $18,000 at the Marshall Space Flight Center and $41,000 at the Electronics Research Center. The ADP lease costs at all other installations will remain at essentially the same level as in 1970.

	1969	1970	1971	Change in 1971
Purchase of equipment.....	$2,178,000	$25,000	---	$-25,000

No purchase of ADP equipment is planned in 1971 from the Research and Program Management appropriation.

	1969	1970	1971	Change in 1971
Maintenance of equipment..	$2,090,000	$1,345,000	$1,350,000	$+5,000

The requirements for the maintenance of NASA owned ADP equipment remain about the same in 1971 as in 1970.

	1969	1970	1971	Change in 1971
Programming and operation services.....	$6,934,000	$7,824,000	$8,343,000	$+519,000

In 1971, the cost of contractor programming and operation services related to the larger and more sophisticated systems in operation is estimated to be $519,000 higher than 1970. An increase of $887,000 will be required for the Marshall Space Flight Center to provide full year funding **on the increased man year cost rate for the programming and operations support services con-**tracts currently in effect. This amount is offset, however, to a net increase of $519,000 as result of the phasing out of operations at the Electronics Research Center.

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

FACILITIES SERVICES

	1969	1970	1971	Change in 1971
Facilities services....	$85,841,000	$80,872,000	$84,083,000	$+3,211,000

DESCRIPTION:

Facilities services includes the rental of lands and buildings; the procurement of electricity, water, gas, and other utilities; maintenance of buildings and grounds; and minor construction and facility modifications. It also includes custodial services consisting of security services, janitorial services, cleaning, exterminating, and refuse handling, laundry and fire protection. Funds required also provide for the maintenance and repair of general purpose instruments, research equipment, and shop equipment. Requirements for general purpose building materials, hardware, electronics supplies and materials, as well as procurement of mechanical, laboratory and shop equipment are also included in the estimate. The requirements for major contractual service effort at the Merritt Island Launch Area and reimbursement to the Air Force for services provided to the Kennedy Space Center are also covered in this category.

DISTRIBUTION OF FUND REQUIREMENTS BY INSTALLATION:

	1969	1970	1971
Kennedy Space Center.....	$39,649,000	$38,559,000	$39,933,000
Manned Spacecraft Center.....	10,278,000	8,825,000	10,195,000
Marshall Space Flight Center.....	8,377,000	7,167,000	9,341,000
Goddard Space Flight Center.....	4,825,000	4,472,000	4,048,000
Wallops Station.....	2,272,000	2,212,000	2,205,000
Ames Research Center.....	3,659,000	3,696,000	4,073,000
Electronics Research Center.....	1,822,000	2,317,000	100,000
Flight Research Center.....	1,257,000	1,072,000	1,118,000
Langley Research Center.....	6,394,000	6,116,000	6,749,000
Lewis Research Center.....	6,881,000	6,110,000	5,995,000
NASA Headquarters.....	427,000	326,000	326,000
Total.....	$85,841,000	$80,872,000	$84,083,000

BASIS OF FUND REQUIREMENTS:

SUMMARY OF FACILITIES SERVICES

	1969	1970	1971	Change in 1971
Acquisition of Facilities				
Rental of real property.....	$1,821,000	$1,819,000	$373,000	$-1,446,000
Minor construction and modifications.	1,554,000	1,250,000	1,350,000	+100,000
Subtotal.....	$3,375,000	$3,069,000	$1,723,000	$-1,346,000
Maintenance and Related Services				
Maintenance, repair and alteration of buildings and grounds.....	$11,050,000	$9,388,000	$10,012,000	$+624,000
Maintenance and repair of equipment.....	2,023,000	2,002,000	2,160,000	+158,000
Custodial services..	10,318,000	8,044,000	9,667,000	+1,623,000
Subtotal.....	$23,391,000	$19,434,000	$21,839,000	$+2,405,000
Operation of Facilities				
Utilities.....	$13,294,000	$13,666,000	$14,050,000	$+384,000
Supplies and equipment.....	10,051,000	9,795,000	9,970,000	+175,000
Subtotal.....	$23,345,000	$23,461,000	$24,020,000	$+559,000
Range Operations.....	$35,730,000	$34,908,000	$36,501,000	$+1,593,000
Total, Facilities Services.....	$85,841,000	$80,872,000	$84,083,000	$+3,211,000

	1969	1970	1971	Change in 1971
Rental of real property.	$1,821,000	$1,819,000	$373,000	$-1,446,000

Rental of land and property is required to house personnel and provide storage and warehouse space for supplies and materials where space is not available in government-owned facilities. Funds required for this purpose

are estimated at $373,000 in 1971, a decrease of $1,446,000 under the 1970 estimate. The decrease results largely because of the phase out of the Electronics Research Center in 1971.

	1969	1970	1971	Change in 1971
Minor construction and modifications.....	$1,554,000	$1,250,000	$1,350,000	$+100,000

This activity provides for additions, modifications, and minor construction of facilities within statutory limitations. The requirements are of a continuing nature which are generated by changes in the research and development program, as well as development of new technology. The estimate for 1971 includes an increase of $325,000 at the Langley Research and the Marshall Space Flight Centers for projects deferred from 1970, partially offset by a $224,000 reduction in requirements at the Kennedy Space and the Goddard Space Flight Centers.

	1969	1970	1971	Change in 1971
Maintenance, repair and alteration of buildings and grounds.....	$11,050,000	$9,388,000	$10,012,000	$+624,000

The amount estimated for maintenance and repair of buildings and grounds is estimated at $10,012,000 for 1971, an increase of $624,000 from 1970. The estimate provides twelve months' funding at the increased man year cost rate contained in current support service contracts. The increase is partially offset by savings from the phase out of operations at the Electronics Research Center and the completion of the conversion from contractor operation of certain services at the Goddard Space Flight Center to civil service operations.

	1969	1970	1971	Change in 1971
Maintenance and repair of equipment.....	$2,023,000	$2,002,000	$2,160,000	$+158,000

Maintenance and repair of equipment consists of work necessary to keep mechanical, electrical, electronic laboratory, and shop equipment operational. The cost of these services is estimated to be $2,160,000 in 1971, an increase of $158,000 from 1970. This increase results from increased requirements at the Marshall Space Flight Center related to increased service contract cost rates for 1970 carried into 1971.

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	1969	1970	1971	Change in 1971
Custodial services..	$10,318,000	$8,044,000	$9,667,000	$+1,623,000

The estimate for custodial services, which includes janitorial, cleaning, protective, security fire protection and refuse handling services is $9,667,000 for 1971. This estimate provides twelve months funding at the increased man year cost rate contained in current support services contracts. The increase of $1,623,000 is partially offset by savings from the phase out of ERC.

	1969	1970	1971	Change in 1971
Utilities.....	$13,294,000	$13,666,000	$14,050,000	$+384,000

Funds required for utilities in 1971 are $14,050,000, an increase of $384,000. This increase results from the increased utility rate schedule charged the Marshall Space Flight Center by the Redstone Arsenal, the increased operations of wind tunnels, and the operation of other new research facilities at the Ames and Langley Research Centers in support of the aeronautics research program, being partially offset by savings due to the phase out of the Electronics Research Center.

	1969	1970	1971	Change in 1971
Supplies and equipment.....	$10,051,000	$9,795,000	$9,970,000	$+175,000

The estimate for supplies, materials, and equipment in support of the operation of NASA in-house facilities is estimated to increase by $175,000 in 1971. This increase, which is the sum of minor increases for most installations, results from the need to procure equipment replacements not made in 1970 and to replenish supply and material inventories depleted in 1970.

	1969	1970	1971	Change in 1971
Range operations.....	$35,730,000	$34,908,000	$36,501,000	$+1,593,000

Over 40 percent of the estimate for all of NASA facilities services relates to services procured at the Kennedy Space Center through major support contractors for services, utilities, and for support received from the Air Force Eastern Test Range. Services received through contractors are

primarily utilized at the Merritt Island Launch Area. These services are provided by three major support contractors and cover facilities engineering and planning, maintenance, repair and operation of facilities and utilities; maintenance of roads and grounds; supply operations; publication and graphics support; and library services. Reimbursements to the Air Force, except for utilities, are primarily for requirements at the Cape Kennedy Air Force Station complex; including maintenance and repair of buildings and equipment; security; exterminating; printing; medical services; and supply support. For convenience in understanding the total requirements, these activities are consolidated under Facilities Services, and not distributed to other categories. The estimate for range operations in 1971 is $36,501,000, an increase of $1,593,000 from the 1970 level. The following table summarizes funding requirements by purpose:

	1969	1970	1971	Change in 1971
ADP operations....	$2,746,000	$2,454,000	$2,599,000	$+145,000
Utilities.....	3,705,000	3,752,000	3,825,000	+73,000
Maintenance, repair, alterations, and operation of facilities...	12,376,000	12,905,000	14,226,000	+1,321,000
Protective services.....	6,291,000	5,800,000	5,800,000	---
Janitorial and cleaning services.....	923,000	748,000	771,000	+23,000
Support services..	9,689,000	9,249,000	9,280,000	+31,000
Total.....	$35,730,000	$34,908,000	$36,501,000	$+1,593,000

The increased fund requirements of $1,593,000 required in 1971 provide for twelve months' funding at the increased man year cost rate contained in current support service contracts, partially offset by decreased man years of effort. The increase in utilities is due to a higher rate paid to the Air Force for utilities services.

TECHNICAL SERVICES

	1969	1970	1971	Change in 1971
Technical services...	$18,026,000	$15,272,000	$14,327,000	$-945,000

DESCRIPTION:

The estimate for technical services provides for the costs of engineering services, and of scientific and technical information and educational/informational programs. Included in the engineering services are the costs of engineering design and reliability and quality assurance studies. The scientific and technical information programs, which furnish up-to-date reporting of scientific and technical programs, provide for the support of the technical libraries located at various installations, the acquisition and dissemination of scientific and technical literature, and for educational/informational programs.

DISTRIBUTION OF FUND REQUIREMENTS BY INSTALLATION:

	1969	1970	1971
Manned Spacecraft Center.....	$1,956,000	$2,317,000	$2,275,000
Marshall Space Flight Center....	1,627,000	1,377,000	1,459,000
Goddard Space Flight Center.....	967,000	801,000	796,000
Wallops Station.....	51,000	59,000	58,000
Ames Research Center.....	41,000	9,000	9,000
Electronics Research Center.....	866,000	981,000	---
Flight Research Center.....	47,000	73,000	77,000
Langley Research Center.....	73,000	73,000	73,000
Lewis Research Center.....	737,000	36,000	90,000
Space Nuclear Propulsion Office.	67,000	---	---
NASA Headquarters.....	11,594,000	9,546,000	9,490,000
Total.....	$18,026,000	$15,272,000	$14,327,000

SUMMARY OF TECHNICAL SERVICES

	1969	1970	1971	Change in 1971
ENGINEERING SERVICES	$1,845,000	$1,144,000	$552,000	$-592,000
SCIENTIFIC AND TECHNICAL INFORMATION AND EDUCATIONAL PROGRAMS				
Operation of NASA technical library	1,563,000	1,965,000	1,568,000	-397,000
Educational/informational programs	4,905,000	3,539,000	3,510,000	-29,000
Scientific and technical information.....	9,713,000	8,624,000	8,697,000	+73,000
Subtotal.....	$16,181,000	$14,128,000	$13,775,000	$-353,000
Total.....	$18,026,000	$15,272,000	$14,327,000	$-945,000
ENGINEERING SERVICES.	$1,845,000	$1,144,000	$552,000	$-592,000

Engineering services provide for reliability and quality assurance studies; engineering design services for the design of minor construction, repair and alteration projects, special tooling, equipment and machine parts; and other related engineering services.

The $552,000 requested for 1971 is $592,000 less than the $1,144,000 planned for 1970. Included in the decrease is $476,000 which relates to the phase out of the Electronics Research Center; $42,000 at the Manned Spacecraft Center, $40,000 at the Marshall Space Flight Center, $40,000 at Headquarters and $2,000 at other locations which are related to reduced requirements for these services.

	1969	1970	1971	Change in 1971
SCIENTIFIC AND TECHNICAL INFORMATION AND EDUCATIONAL PROGRAMS.....	$16,181,000	$14,128,000	$13,775,000	$-353,000

Included in these programs are the costs of the technical libraries, educational/informational programs and the scientific and technical

information services. The funding required to finance these programs is $13,775,000 in 1971, a decrease of $353,000 from the 1970 level. The costs are summarized as follows:

	1969	1970	1971	Change in 1971
Operation of technical libraries.....	$1,563,000	$1,965,000	$1,568,000	$-397,000

The cost of the operation of technical libraries in 1971 will be $1,568,000 which is a decrease of $397,000 under 1970. This decrease occurs largely at the Electronics Research Center (ERC) because of its phase out in 1971 and at Headquarters.

	1969	1970	1971	Change in 1971
Educational/Informational Programs.....	$4,905,000	$3,539,000	$3,510,000	$-29,000

The educational/informational programs provide for the gathering and dissemination of information about the agency's programs to the mass communication media, the general public, and to the educational community at the elementary and secondary levels. The cost for these programs in 1971 is estimated to be $3,510,000, $29,000 less than the estimate for 1970, which results largely from the phase out of ERC. Assistance to the mass communications media includes the gathering and exposition of newsworthy material in support of their requests. This material and assistance is in several forms such as press kits, news releases, television and radio information tapes and clips, and feature material.

Research, development, and operational missions in aeronautics and space continue to serve as an educational stimulus to students and teachers, as well as providing substantive knowledge. Response to expressed needs from students and teachers is provided by developing curriculum supplements in space-related areas such as physics, biology, chemistry, and math; assistance to over 1,000 teacher workshops and professional education meetings with over 30,000 teachers participating; sponsorship of the Youth Science Congresses and participation in science fairs. The largest single program is the Spacemobile, a touring space-science education lecture demonstration unit. Budget restraints have forced retrenchments in some of these areas. For example, the number of publications ordered for free distribution has been cut back to a few thousand, or only enough to announce their availability for purchase from the Superintendent of Documents. The number of operating Spacemobile units is reduced to 26 from 30. The staffing has been cut back and consequently, the number of bookings will decrease to approximately 10,000 from 12,000 lecture-demonstrations

a year. The program will still include over 400 demonstrations for teachers at workshops and other in-service training sessions. The estimated live spacemobile audience is over two million people with an additional eight million seeing or hearing the program on television or radio.

	1969	1970	1971	Change in 1971
Scientific and technical information.....	$9,713,000	$8,624,000	$8,697,000	$+73,000

The scientific and technical information activity includes the cost of the NASA Scientific and Technical Information Facility, documentation services, publication services, systems development and translation services. The cost of these services is estimated to increase by $73,000 in 1971 to $8,697,000. An increase of $122,000 at the Marshall Space Flight Center is partially offset by savings due to the phase out of ERC. The remaining effort will remain essentially at the same funding level as planned for 1970. The largest requirement is the NASA Scientific and Technical Information Facility under the cognizance of Headquarters, which will cost $4.1 million in 1971. The level of cost for all other information services, estimated at $4.6 million, is essentially the same as 1970. These costs are for the documentation of worldwide aerospace journal and report literature; monographs, and technical reviews; analyzing, evaluating, and testing new methods and systems in the field of scientific communications to increase the effectiveness of the technical information program; and translating foreign language technical books, reports, and journal articles required to meet the needs of NASA and its contractor scientific personnel which are used to keep abreast of world developments in the space sciences and related fields.

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

ADMINISTRATIVE SUPPORT

	1969	1970	1971	Change in 1971
Administrative support services.....	$42,611,000	$37,822,000	$37,872,000	$+50,000

DESCRIPTION:

Included in Administrative Support Services are general services which support overall installation operations. The administrative expenses for communications, printing and reproduction, supplies, materials and equipment, transportation (motor pool, administrative aircraft services and operations, and movements by common carrier), and other services (installation operations and medical services), are provided for in this function.

DISTRIBUTION OF FUND REQUIREMENTS BY INSTALLATION:

	1969	1970	1971
Kennedy Space Center.....	$11,210,000	$10,502,000	$10,239,000
Manned Spacecraft Center.....	8,258,000	7,177,000	7,722,000
Marshall Space Flight Center..	6,837,000	4,485,000	4,631,000
Goddard Space Flight Center...	3,531,000	3,464,000	3,590,000
Wallops Station.....	982,000	789,000	808,000
Ames Research Center.....	837,000	744,000	745,000
Electronics Research Center...	1,043,000	1,397,000	500,000
Flight Research Center.....	613,000	537,000	608,000
Langley Research Center.....	2,512,000	2,563,000	2,718,000
Lewis Research Center.....	909,000	841,000	881,000
NASA Headquarters.....	5,879,000	5,323,000	5,430,000
Total.....	$42,611,000	$37,822,000	$37,872,000

BASIS OF FUND REQUIREMENTS:

SUMMARY OF ADMINISTRATIVE SUPPORT SERVICES

	1969	1970	1971	Change in 1971
COMMUNICATIONS				
Leased lines and long distance tolls.....	$4,480,000	$4,311,000	$4,308,000	$-3,000
Local telephone service.....	5,754,000	5,615,000	5,440,000	-175,000
Other communications.	1,981,000	1,955,000	2,022,000	+67,000
Subtotal.....	12,215,000	11,881,000	11,770,000	-111,000
ADMINISTRATIVE PRINTING	6,191,000	5,578,000	5,464,000	-114,000
SUPPLIES, MATERIALS AND EQUIPMENT				
Supplies and materials.....	7,171,000	5,868,000	5,758,000	-110,000
Equipment.....	1,808,000	1,408,000	1,361,000	-47,000
Subtotal.....	8,979,000	7,276,000	7,119,000	-157,000
TRANSPORTATION				
Center operations...	6,565,000	5,647,000	5,622,000	-25,000
Common carrier.....	645,000	641,000	625,000	-16,000
Subtotal.....	7,210,000	6,288,000	6,247,000	-41,000
ADMINISTRATIVE SUPPORT SERVICES				
Installation support services..	6,635,000	5,913,000	6,306,000	+393,000
Medical services....	1,381,000	886,000	966,000	+80,000
Subtotal.....	8,016,000	6,799,000	7,272,000	+473,000
Total, Administrative Support Services....	$42,611,000	$37,822,000	$37,872,000	$+50,000

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	1969	1970	1971	Change in 1971
COMMUNICATIONS.....	$12,215,000	$11,881,000	$11,770,000	$-111,000

The funds required for communications are estimated at $11,770,000 for 1971, a decrease of $111,000 from 1970. Included in this estimate are the costs of leased lines, long distance tolls, local telephone exchange services, and other communications, such as TWX and postage. Installations and their major subinstallations are located in twelve states and the District of Columbia. In addition, business is conducted with companies and institutions in all the states. Consequently, the cost of communications to integrate these centers of work is large. Costs for certain operational communications related to flight activities and dedicated leased lines are excluded from the Research and Program Management appropriation, but are included in the relevant program in the Research and Development appropriation. A summary of communication costs follows:

	1969	1970	1971	Change in 1971
Leased lines and long distance tolls.....	$4,480,000	$4,311,000	$4,308,000	$-3,000

The cost of leased lines and long distance tolls provides for the intercity telephone services for the various installations. The cost of leased lines includes the leasing of the circuits and associated equipment for rapid and reliable contact with contractor plants and other key sites. Long distance toll costs are in addition to the cost of leased lines and include both commercial tolls and reimbursement to the General Services Administration for NASA's use of the Federal Telecommunications System. The slight decrease of $3,000 estimated for 1971 is primarily attributable to the termination of the Electronics Research Center.

	1969	1970	1971	Change in 1971
Local telephone services.	$5,754,000	$5,615,000	$5,440,000	$-175,000

Local telephone service includes not only the cost of providing on-site telephone exchange services, but also the cost of off-site service in the area immediately surrounding our installations. The amount of service provided each installation is determined by the number of personnel, both civil service and contractor, served by the exchange. The decrease in 1971 is mainly due to the planned program reductions in the manned space flight activities as well as the closing of the Electronics Research Center.

	1969	1970	1971	Change in 1971
Other communications.....	$1,981,000	$1,955,000	$2,022,000	$+67,000

Other communications costs provide for costs for cable services, TWX services, and postage. The increase is primarily at Headquarters which pays postage and related fees centrally for the entire agency and is principally related to an anticipated increase in the cost of postage, as indicated by revised samples of usage.

	1969	1970	1971	Change in 1971
ADMINISTRATIVE PRINTING.....	$6,191,000	$5,578,000	$5,464,000	$-114,000

Estimates for administrative printing include funds for contractual printing and the related composition and binding operations. This includes services performed by other agencies, chiefly the Government Printing Office, or by commercial printing firms. All common processes of duplicating, including photostating, blueprinting, microfilming, and other photographic reproductions, are included. In 1971, the costs for printing are $114,000 less than in 1970. This reduction is primarily attributable to reduction in requirements at the Kennedy Space Center associated with the reduced launch schedule planned for FY 1971, and with the termination of the Electronics Research Center.

	1969	1970	1971	Change in 1971
SUPPLIES, MATERIALS AND EQUIPMENT.....	$8,979,000	$7,276,000	$7,119,000	$-157,000

Administrative supplies, materials, and equipment include those items of a general nature which service the entire installation. Excluded are supplies, materials, equipment, and related services which are related directly to a specific project (funded in the R&D appropriation) and those that are facility oriented (included in Facilities Services). Of the amount required in 1971, $5,758,000 is for supplies and materials, and $1,361,000 for purchased and rented equipment. The overall requirement decreases by $157,000. This reduction is primarily attributable to the termination of the Electronics Research Center.

	1969	1970	1971	Change in 1971
TRANSPORTATION.....	$7,210,000	$6,288,000	$6,247,000	$-41,000

Transportation services include local motor pool operations and associated services, center aircraft operations and services, as well as the movement of supplies, materials, equipment, and related items by common carrier.

The $41,000 decrease for 1971 consists of a major reduction of $320,000 due to the closing of the Electronics Research Center offset by small increases at several other installations.

	1969	1970	1971	Change in 1971
ADMINISTRATIVE SUPPORT SERVICES.....	$8,016,000	$6,799,000	$7,272,000	$+473,000

Administrative support services include installation support services and center medical services. The funding required for 1971 is $7,272,000, $473,000 more than in 1970. These costs are summarized as follows:

	1969	1970	1971	Change in 1971
Installation support services.....	$6,635,000	$5,913,000	$6,306,000	$+393,000

Installation support services include those services which support the installation generally; such as logistics support, supply operations, mail and messenger services, and other related services. The cost estimate is based on twelve months funding of the increased man year cost rate for support service contracts currently in effect.

	1969	1970	1971	Change in 1971
Medical services.....	$1,381,000	$886,000	$966,000	$+80,000

Medical services include the cost of the installations' health units and of employee health maintenance programs. The cost estimate for medical services is based on twelve months funding of the increased man year cost rate for support services contracts at installations where health units are not staffed with civil service personnel.

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

JOHN F. KENNEDY SPACE CENTER

MISSION:

The Kennedy Space Center, was established at Cape Kennedy, Florida, as a separate Center within NASA in July 1962. It serves as the primary Center within NASA for the test, checkout, and launch of space vehicles. This presently includes launch of manned and unmanned vehicles at Kennedy Space Center, Florida, and unmanned vehicles at the Air Force Western Test Range. The Center is now concentrating on Apollo manned launches, preparations for Apollo Applications launches, as well as research and operational unmanned launches. Kennedy Space Center is specifically responsible for:

1. Launch vehicle checkout and preparation.

2. Spacecraft and payload checkout and preparation.

3. Launch facility design, construction, maintenance, and operations, including advanced planning and studies leading to development of new launch operation concepts and techniques.

4. Final integration and integrated checkout of vehicle, spacecraft and launch facilities, and the conduct of actual launch operations.

5. Operation and coordination of supporting facilities, ground support equipment, and tracking and data acquisition and logistics support required for operation of all NASA activities at the Eastern and Western Test Ranges.

6. Technical and administrative support services for all NASA elements located in the area.

In fulfilling its assigned programs, the Kennedy Space Center has developed into a highly flexible "space port" capable of handling a wide variety of launch activities for present and future manned and unmanned space missions.

DESCRIPTION:

The Kennedy Space Center is situated approximately 50 miles east of Orlando, Florida, in northeast Brevard County.

The total land area occupied by the installation is 87,760 acres, including 83,783 acres owned by NASA. In addition to the land area occupied, the state

of Florida has dedicated to the United States exclusive use rights to some 53,553 acres of State-owned submerged lands.

In addition to the operation and maintenance of all facilities at the Kennedy Space Center, the Center is responsible for certain facilities within the national Eastern Test Range launch area. The total capital investment at the Kennedy Space Center, including fixed assets in progress and contractor held facilities at various locations as of June 30, 1969, was $1,047,293,000.

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

Functions	1969	1970	1971
Personnel	$43,325,000	$46,630,000	$46,161,000
Travel	566,000	811,000	874,000
Automatic data processing	1,044,000	943,000	943,000
Facilities services	39,649,000	38,559,000	39,933,000
Administrative support	11,210,000	10,502,000	10,239,000
Total, fund requirements	$95,794,000	$97,445,000	$98,150,000

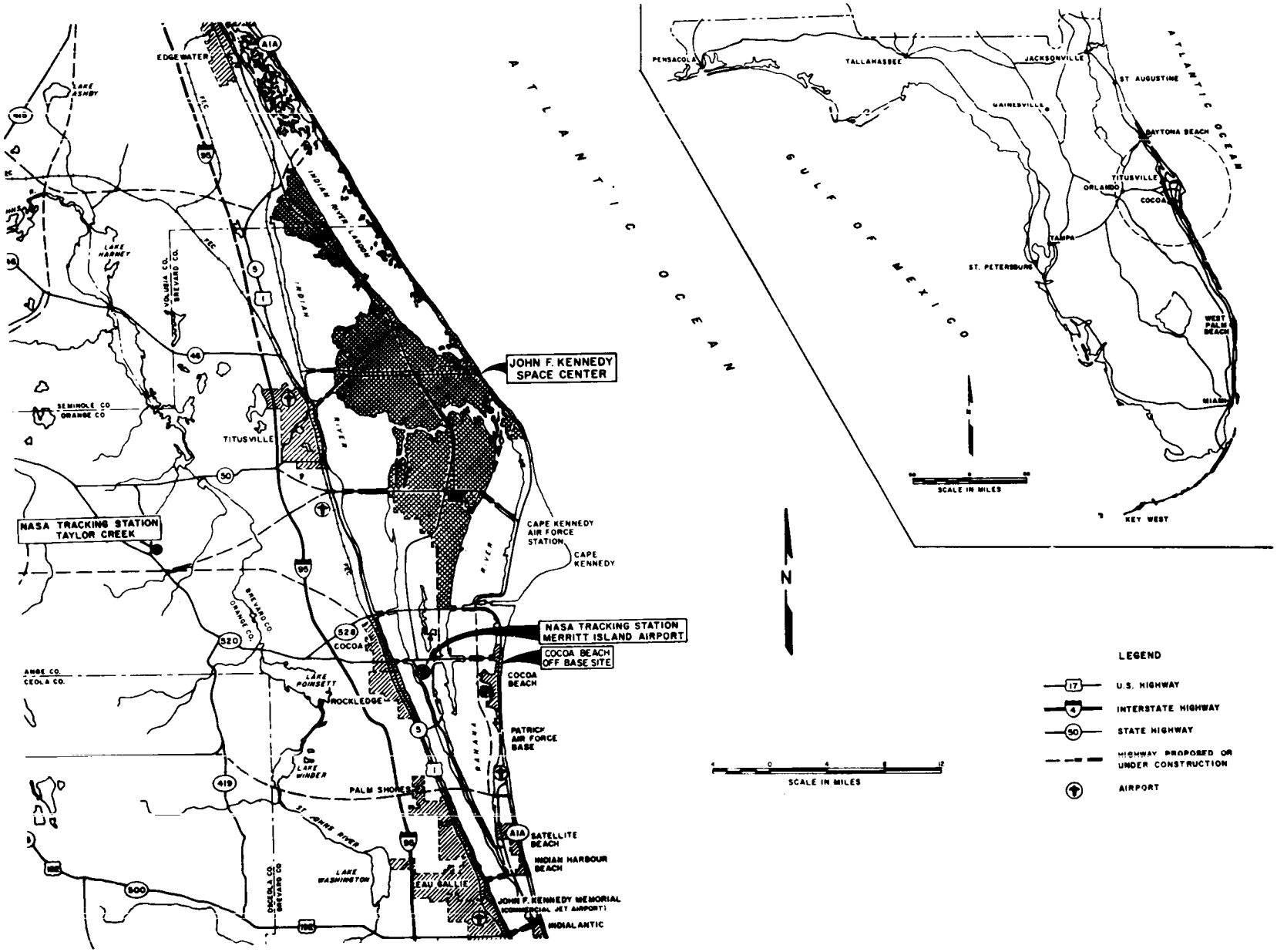
PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	1,848	1,695	1,439
Space flight operations	48	145	370
Advanced missions	8	27	27
Space Science and Applications			
Launch vehicle procurement	149	143	143
Subtotal, positions by program	2,053	2,010	1,979

	1969	1970	1971
2. Indirect Positions:			
Director and staff.....	103	95	95
Administrative support.....	518	473	473
Research and development support.....	203	201	201
Subtotal, indirect positions.....	824	769	769
Total, permanent positions.....	2,877	2,779	2,748

JOHN F. KENNEDY SPACE CENTER, NASA

VICINITY PLAN



JOHN F. KENNEDY SPACE CENTER, NASA

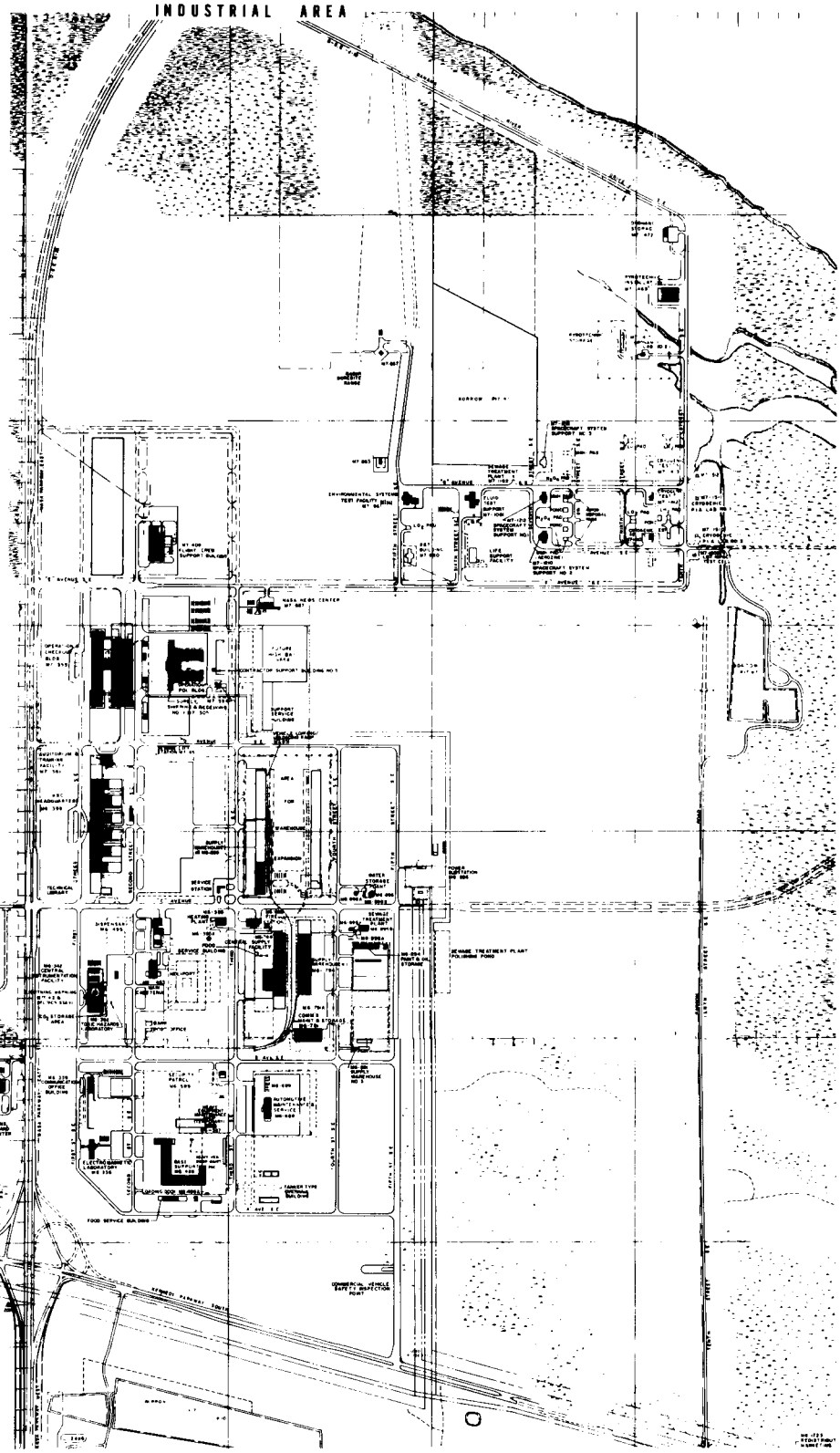
FISCAL YEAR 1971 ESTIMATES

LOCATION PLAN

LEGEND

EXISTING FACILITIES

M6-38	PARKING SHEDS
M6-88	SOUTHERN BELL T. & T. PLANT WORK CENTER
M6-138	COMMUNICATIONS, DISTRIBUTION AND SWITCHING CENTER
M6-336	ELECTROMAGNETIC LABORATORY
M6-339	COMMUNICATIONS OFFICE BUILDING
M6-342	CENTRAL INSTRUMENTATION FACILITY
M6-392	TOXIC HAZARDS LABORATORY
M6-399	K S C HEADQUARTERS
M6-486	BASE SUPPORT
M6-486A	LOADING DOCK
M6-493	MAIN CAFETERIA
M6-495	DISPENSARY
M6-587	HEAVY EQUIPMENT MAINTENANCE SHOP
M6-589	SECURITY PATROL
M6-595	HEATING PLANT
M6-595A	FUEL OIL STORAGE TANK
M6-688	AUTOMOTIVE MAINTENANCE SERVICE
M6-695	FIRE STATION
M6-698	SUPPLY WAREHOUSE NO. 2
M6-744	CENTRAL SUPPLY FACILITY
M6-791	COMMUNICATIONS MAINTENANCE AND STORAGE
M6-794	SUPPLY WAREHOUSE NO. 1
M6-891	SUPPLY WAREHOUSE NO. 3
M6-894	PAINT AND OIL STORAGE
M6-895	SEWAGE TREATMENT PLANT
M6-895A	SEWAGE LIFT STATION
M6-895B	SEWAGE TREATMENT PLANT
M6-896	WATER STORAGE PLANT
M6-896A	ELEVATED WATER STORAGE TANK
M6-896B	GROUND WATER STORAGE TANK
M6-996	POWER SUBSTATION
M7-351	AUDITORIUM AND TRAINING FACILITY
M7-355	OPERATION AND CHECKOUT BUILDING
M7-409	FLIGHT CREW SUPPORT BUILDING
M7-451	SEWAGE LIFT STATION
M7-505	SUPPLY, SHIPPING AND RECEIVING NO.1
M7-554	OPERATIONS P O L BUILDING
M7-657	NASA NEWS CENTER
M7-863	RADAR BORESITE RANGE, TOWER
M7-867	RADAR BORESITE RANGE, CONTROL BUILDING
M7-961	ENVIRONMENTAL SYSTEMS TEST FACILITY
M7-1061	FLUID TEST SUPPORT
M7-1162	SEWAGE TREATMENT PLANT
M7-1210	SPACECRAFT SYSTEM SUPPORT NO.2
M7-1212	SPACECRAFT SYSTEM SUPPORT NO.1
M7-1410	CRYOGENIC TEST NO.2
M7-1412	CRYOGENIC TEST NO.1
M7-1417	ORDNANCE LABORATORY NO.2
M7-1469	PYROTECHNIC INSTALLATION
M7-1472	ORDNANCE STORAGE
M7-1509	LOX IMPACT TEST CELL



FACILITIES AUTHORIZED AND UNDER CONSTRUCTION
1. MANNED SPACECRAFT FACILITIES
2. UTILITY INSTALLATIONS

PROPOSED FISCAL YEAR 1971 PROJECT
1. ADDITION TO COMMUNICATIONS, DISTRIBUTION AND SWITCHING CENTER

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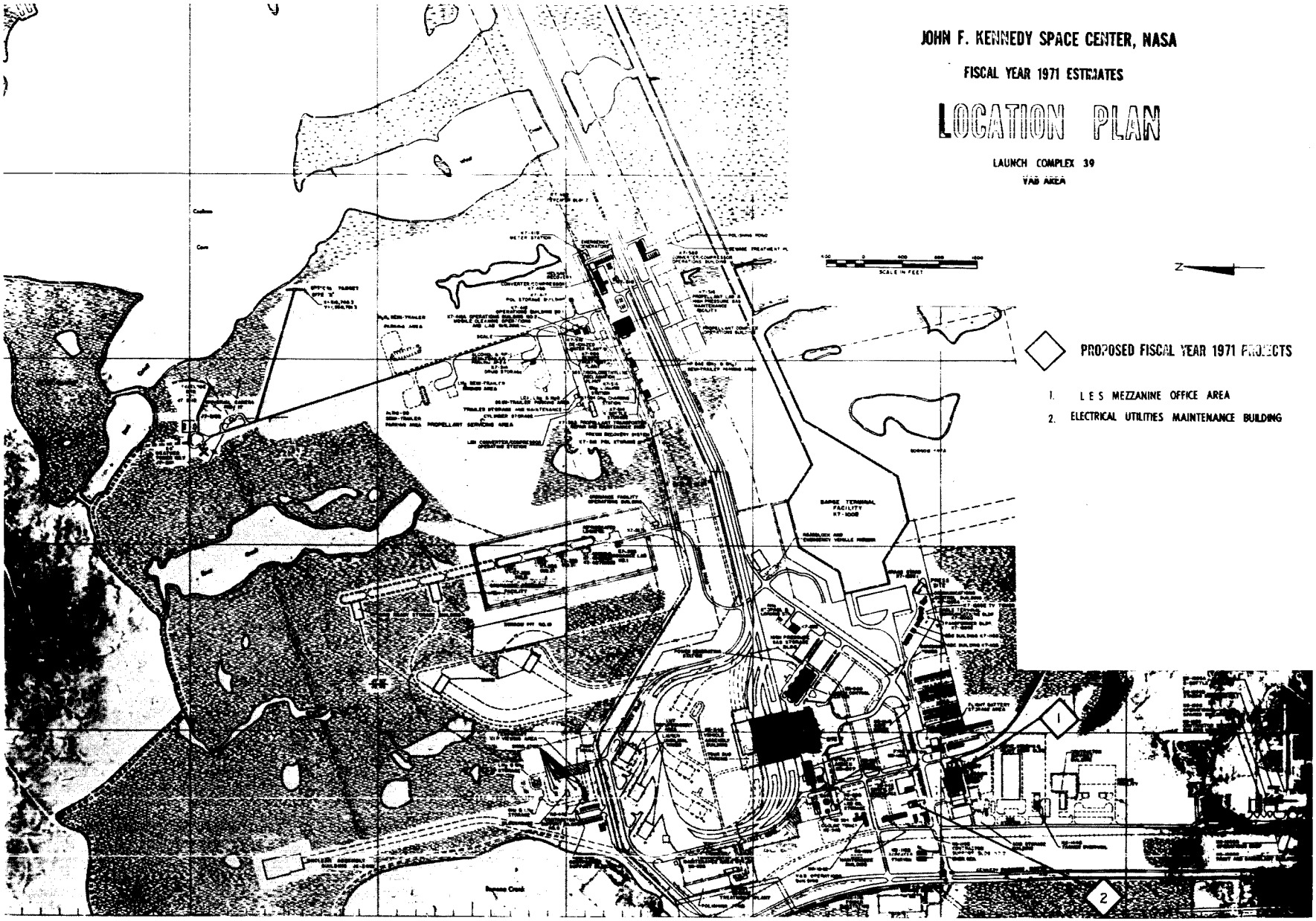
JOHN F. KENNEDY SPACE CENTER, NASA
FISCAL YEAR 1971 ESTIMATES
LOCATION PLAN
LAUNCH COMPLEX 39
VAB AREA
SCALE IN FEET
PROPOSED FISCAL YEAR 1971 PROJECTS
1. L E S MEZZANINE OFFICE AREA
2. ELECTRICAL UTILITIES MAINTENANCE BUILDING
BARGE TERMINAL FACILITY
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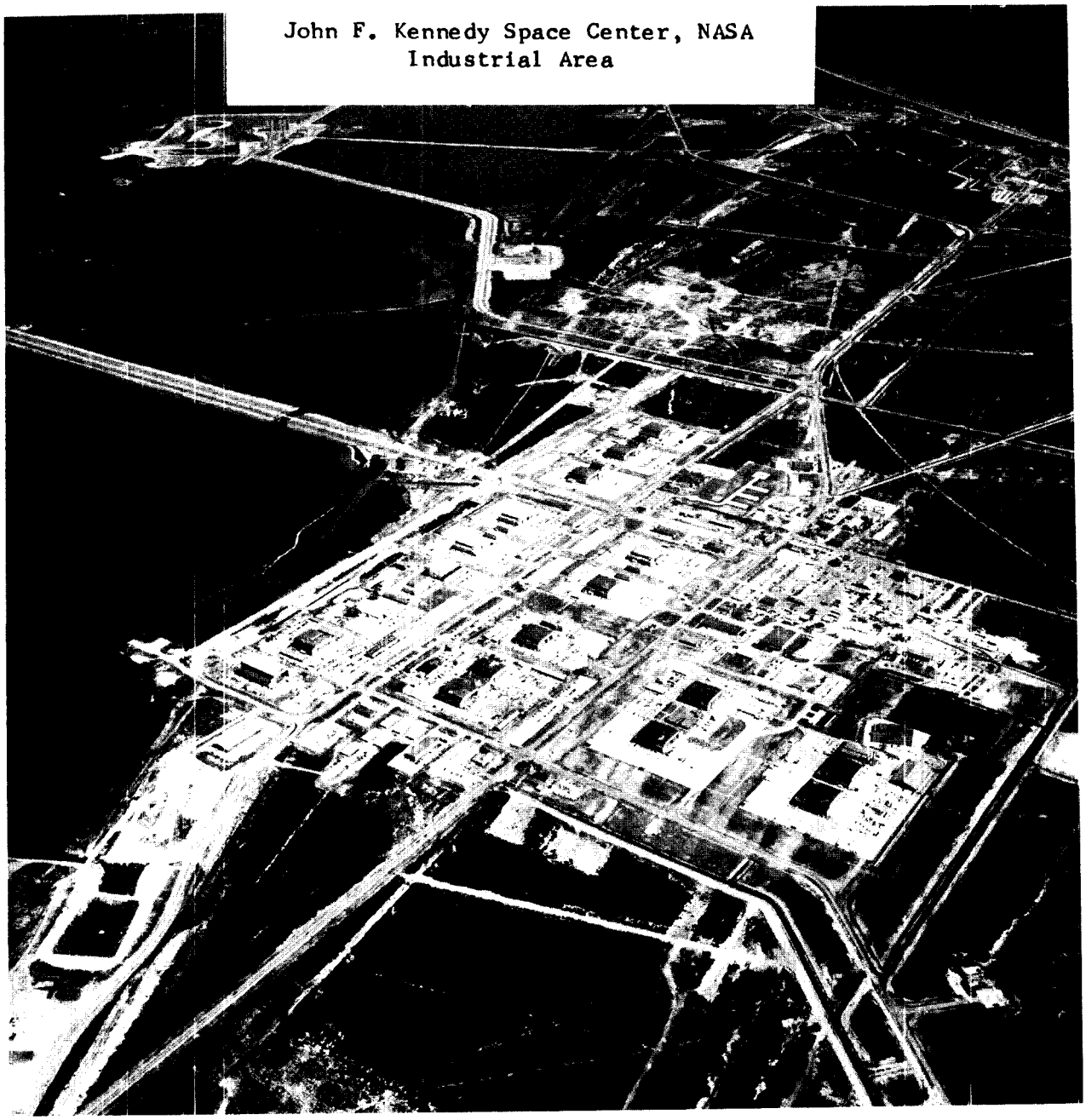
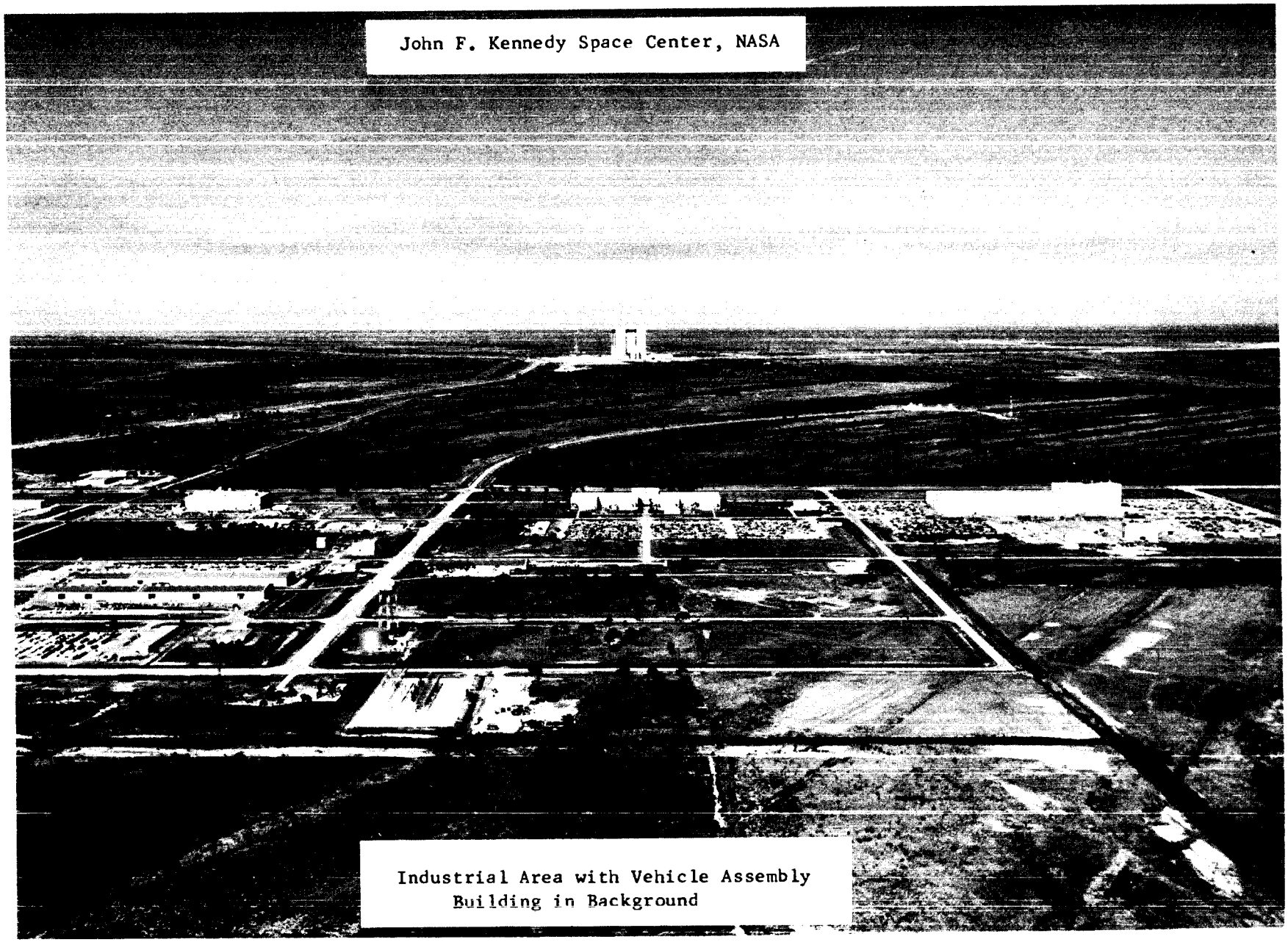
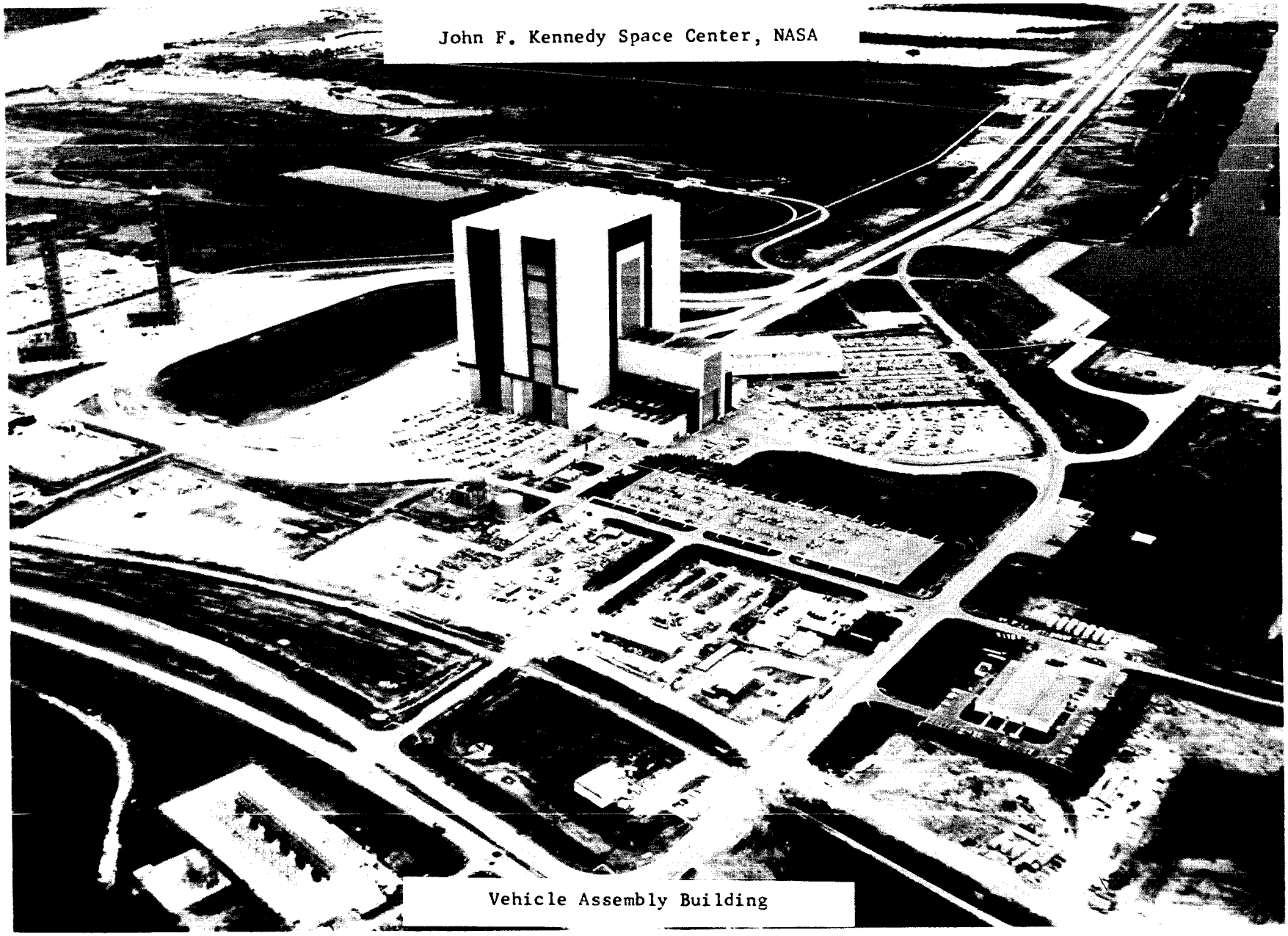
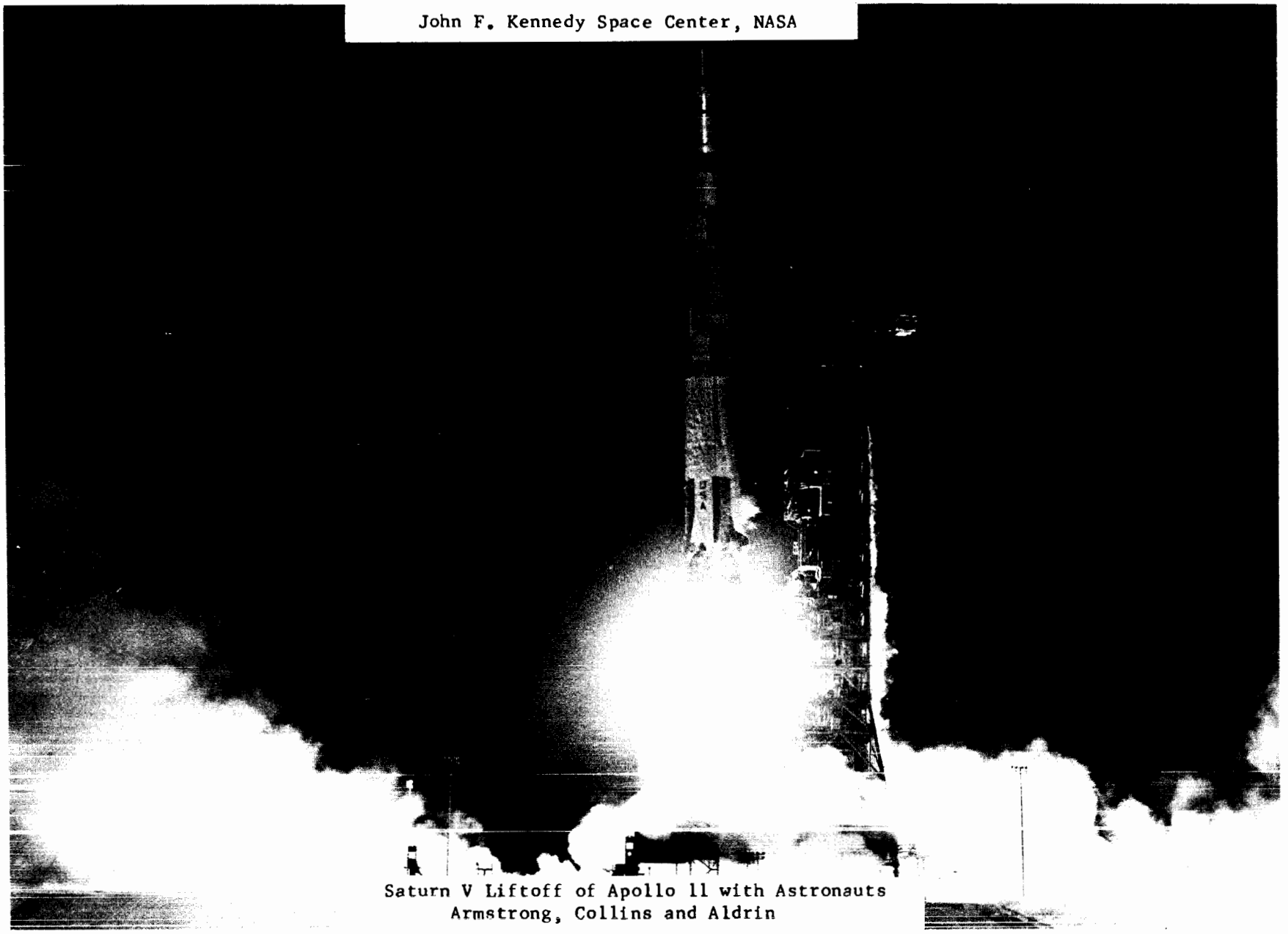

John F. Kennedy Space Center, NASA
Industrial Area



Industrial Area with Vehicle Assembly Building in Background


John F. Kennedy Space Center, NASA
Vehicle Assembly Building

John F. Kennedy Space Center, NASA



Saturn V Liftoff of Apollo 11 with Astronauts
Armstrong, Collins and Aldrin

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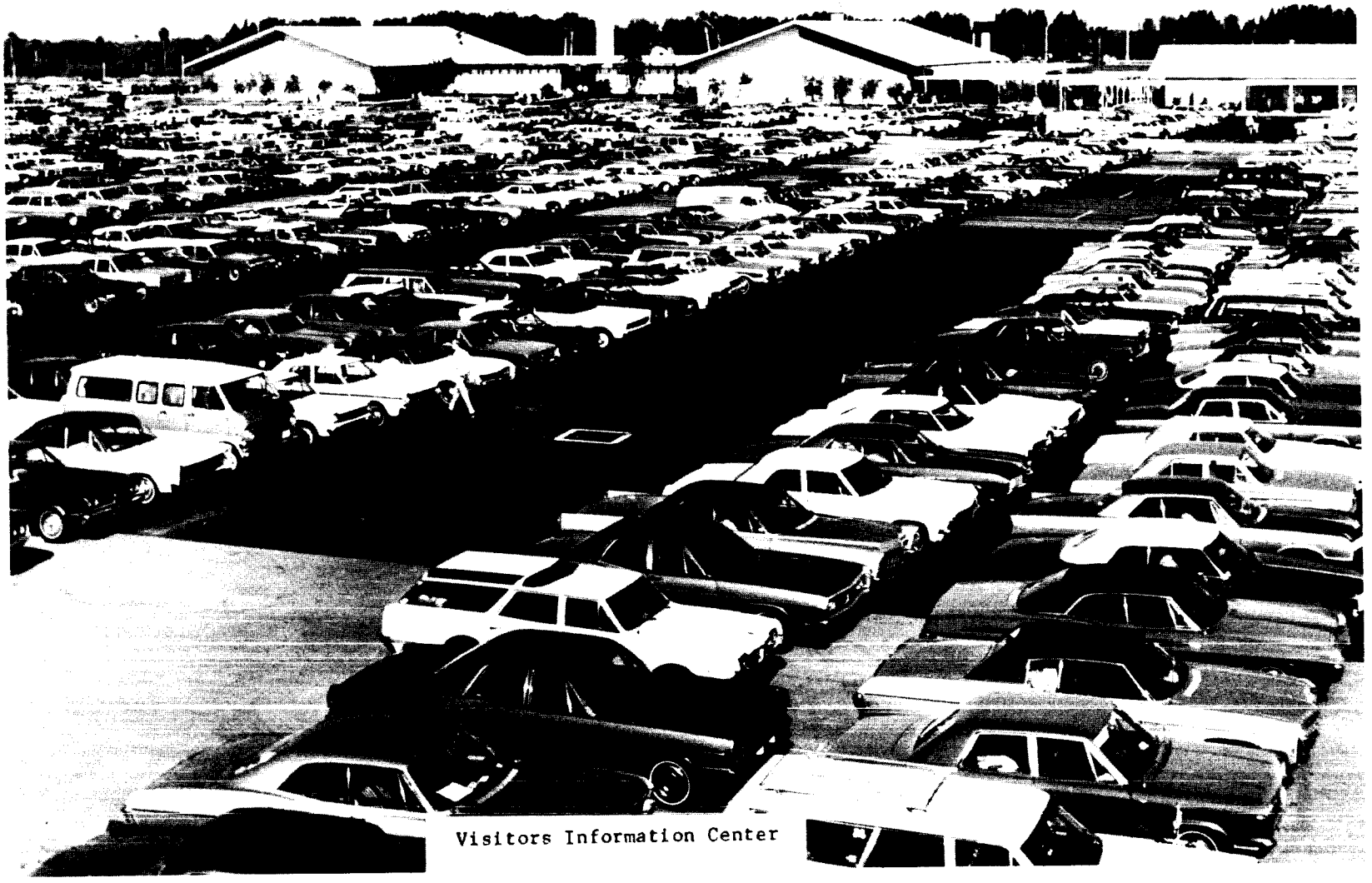

Visitors Information Center

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

MANNED SPACECRAFT CENTER

MISSION:

The Manned Spacecraft Center (MSC) was established in November 1961 in Houston, Texas, as NASA's primary Center for the design, development, and manufacture of manned spacecraft, and for selection and training of astronaut crews and the conduct of space flight missions. The MSC mission further embraces an engineering, development, and operations capability to support and to generate the knowledge required to advance the technology of manned space flight. Engineering and development efforts focus on applied research and development in the area of space research, space physics, life systems, and test and evaluation. Space science efforts are devoted to experiments in flights, scientific lunar exploration, research on returned lunar material, space environment studies, and development of a capability for surveying earth resources from space. The medical capabilities include experiments in flight, flight crew monitoring, and development of physiological requirements for spacecraft systems.

MSC is now engaged in Apollo Lunar Exploration and is proceeding with necessary spacecraft modifications for limited extension of exploration capabilities. Spacecraft are also being modified to support the requirements of the Apollo Applications project. MSC is responsible for:

1. The design, development, and fabrication of the manned spacecraft including the command and service modules, and the lunar module.

2. Overall program management and control of the spacecraft including module integration, testing, and qualification.

3. Conduct of a program of spacecraft environmental testing.

4. Selection and training of astronauts and preparation of primary and backup crews for each mission.

5. Operation of the Mission Control Center and control of the space flight missions from lift-off to recovery.

6. Development of scientific and medical experiments to be flown on manned space flight missions.

7. Operation of the Lunar Receiving Laboratory, which provides a central complex where samples of materials brought to earth by lunar exploration teams are received, quarantined, processed, undergo limited experiments, and distributed to the scientific community for further analysis.

8. Development and exploitation of aeronautical and aerospace photographic and remote sensor systems to provide and interpret scientific data on the physical sciences with emphasis on geography, geology, oceanography and hydrology.

In the period ahead, MSC will participate in Manned Space Flight efforts to produce a preliminary design and design verification of a space shuttle engine and air frame, and a space station module. Additional supporting studies will be required for these efforts.

DESCRIPTION:

The Manned Spacecraft Center is located two miles east of the town of Webster, Texas. The site is approximately 20 miles southeast of downtown Houston and 25 miles northwest of Galveston, Texas. Total NASA-owned land at Houston consists of 1,620 acres. The Center also occupies an additional 55,861 acres at the White Sands Test Facility. The total capital investment of the Manned Spacecraft Center, including fixed assets in progress and contractor held facilities at various locations, and the White Sands Test Facility, as of June 30, 1969, was $472,737,000.

SUMMARY OF RESOURCES REQUIREMENTS:

	FUNDS		
Functions	1969	1970	1971
Personnel.....	$69,285,000	$ 76,307,000	$ 77,173,000
Travel.....	3,562,000	4,177,000	4,463,000
Automatic data processing.....	5,501,000	5,743,000	5,930,000
Facilities services.....	10,278,000	8,825,000	10,195,000
Technical services.....	1,956,000	2,317,000	2,275,000
Administrative support.....	8,258,000	7,177,000	7,722,000
Total, fund requirements....	$98,840,000	$104,546,000	$107,758,000

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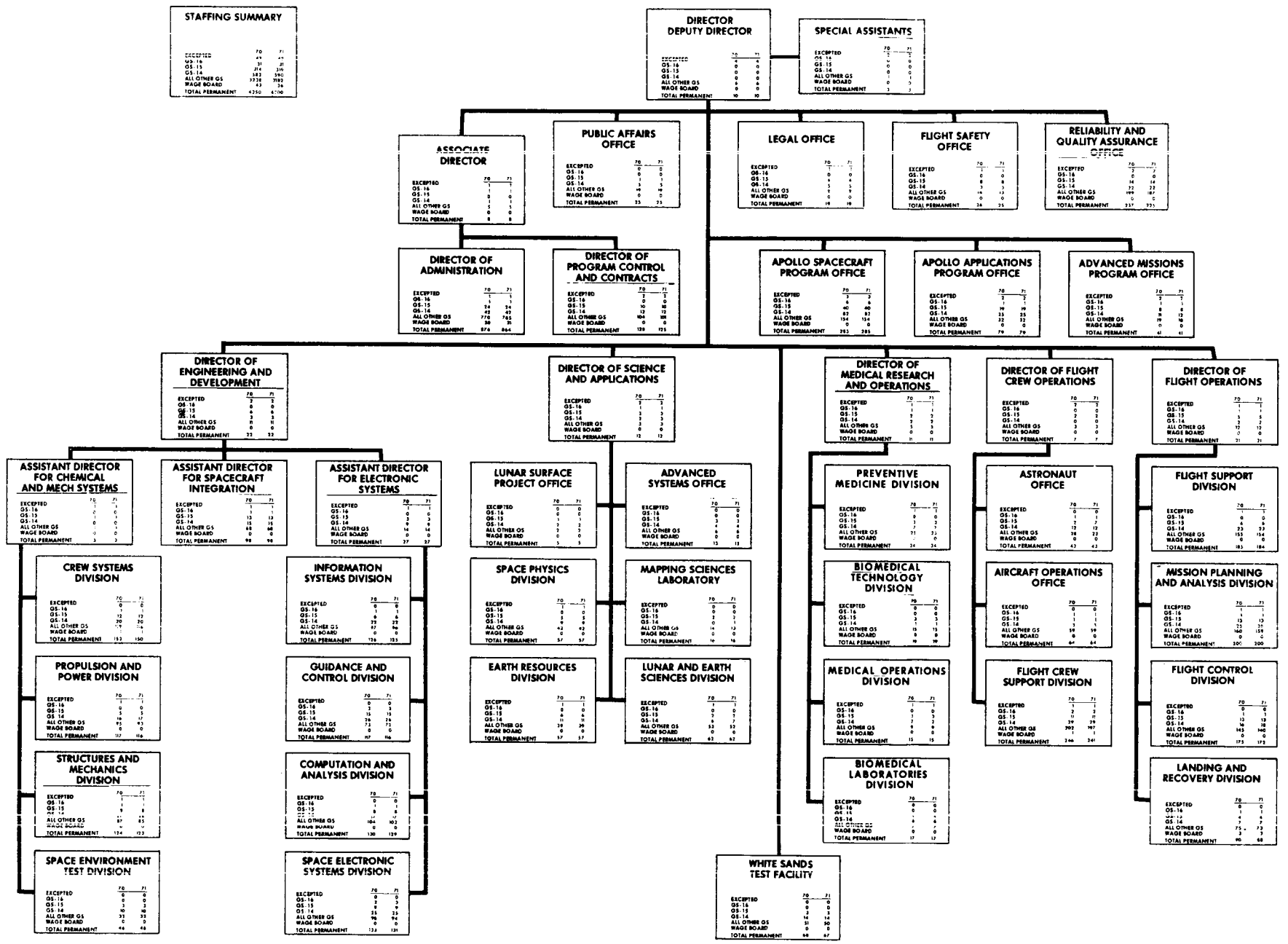
PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	2,664	2,228	1,879
Space flight operations	373	712	1,011
Advanced missions	14	43	43
Space Science and Applications			
Physics and astronomy	30	24	20
Lunar and planetary exploration	---	5	9
Space applications	95	93	95
Advanced Research and Technology			
Space vehicle systems	16	16	12
Human factor systems	11	12	14
Subtotal, positions by program	3,203	3,133	3,083
2. Indirect Positions:			
Director and staff	100	92	92
Administrative support	662	625	625
Research and development support	419	400	400
Subtotal, indirect positions	1,181	1,117	1,117
Total, permanent positions	4,384	4,250	4,200

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MANNED SPACECRAFT CENTER

HOUSTON, TEXAS



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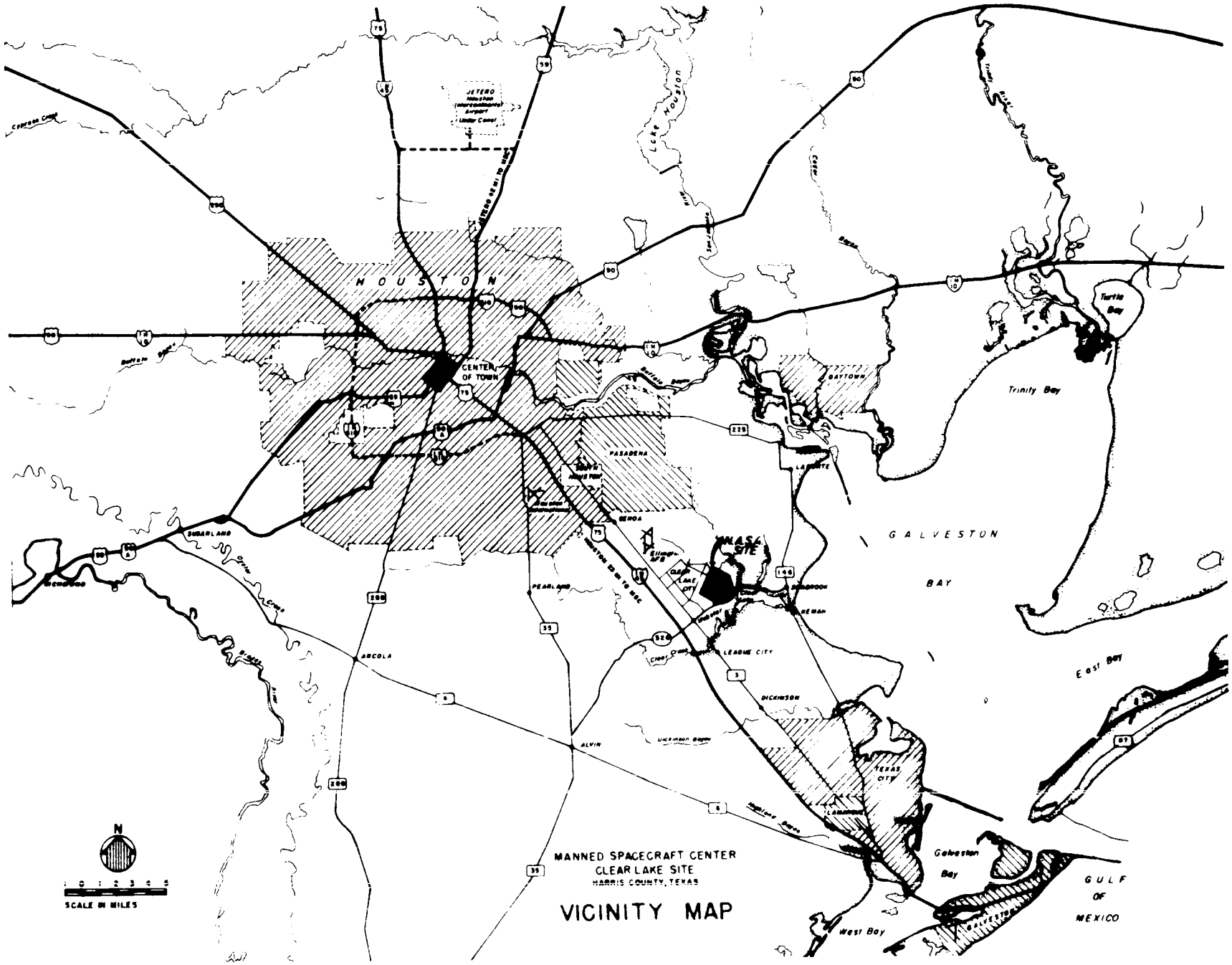
HOUSTON
CENTER OF TOWN
Lake Houston
Trinity Bay
Turtle Bay
GALVESTON BAY
East Bay
Galveston Bay
West Bay
GULF OF MEXICO
BAYTOWN
PASADENA
SUGARLAND
ARCOLA
ALVIN
PEARLAND
DICKINSON
LEAGUE CITY
TEXAS CITY
LA MARQUE
GENOA
CLEAR LAKE CITY
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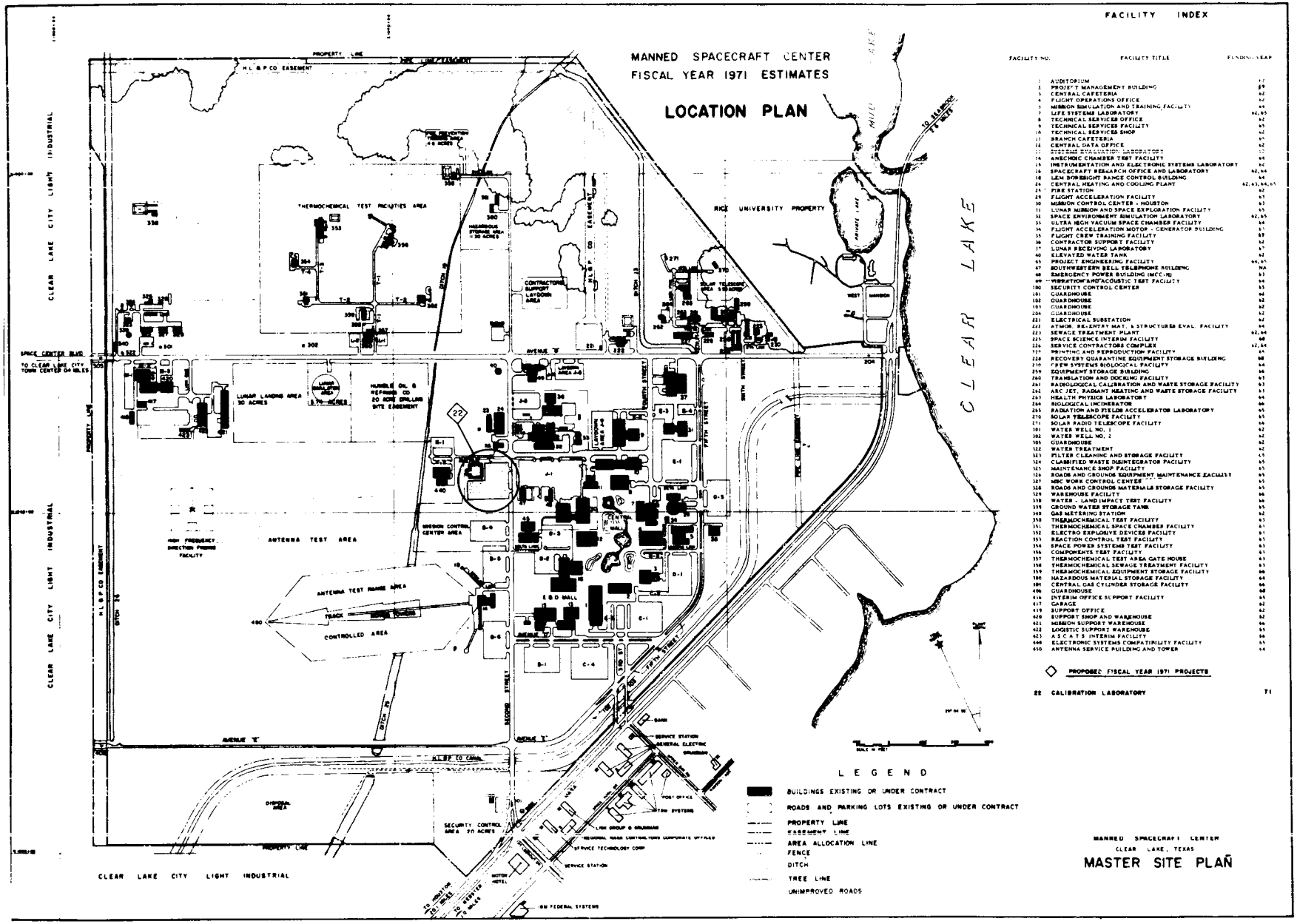
SCALE IN MILES
MANNED SPACECRAFT CENTER
CLEAR LAKE SITE
HARRIS COUNTY, TEXAS
VICINITY MAP



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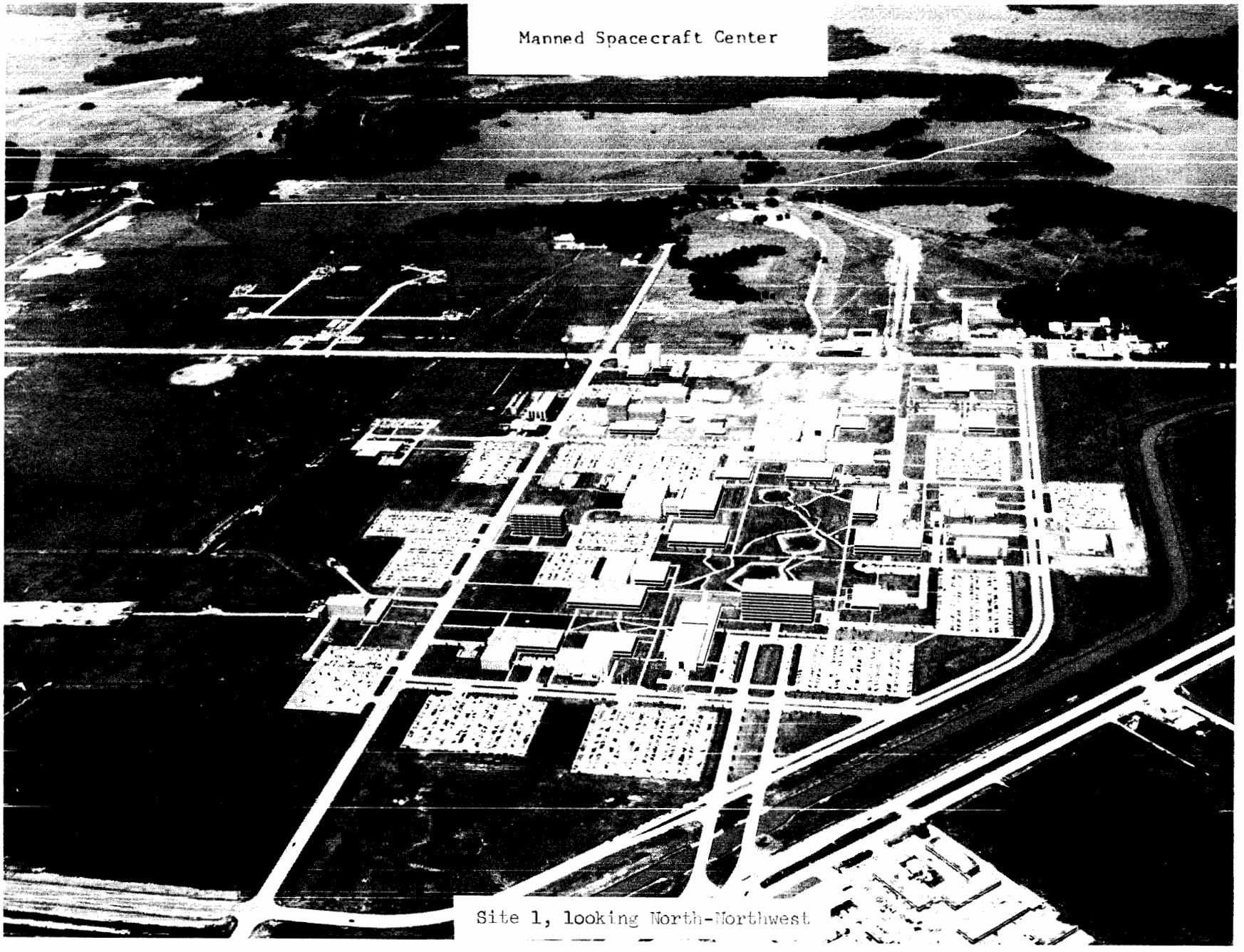

Site 1, looking North-Northwest

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

GEORGE C. MARSHALL SPACE FLIGHT CENTER

MISSION:

The Marshall Space Flight Center (MSFC) at Huntsville, Alabama, became a part of NASA in July 1960, and serves as NASA's primary center for the design, development, and testing of large launch vehicles and space transportation systems. MSFC is also engaged in program management and payload integration of the Apollo Applications flights. MSFC includes the component field activities at Michoud Assembly Facility (MAF) at New Orleans, Louisiana; the Slidell Central Computer Facility nearby; and the Mississippi Test Facility (MTF) in southwest Mississippi. The Center is now proceeding with the direction and management of the following on-going programs:

1. The Saturn vehicles which serve to launch manned lunar and earth orbital missions, and very large earth orbital payloads.

2. The Apollo Applications Saturn workshop mission including selected scientific payloads such as the Apollo Telescope Mount.

3. The Lunar Roving Vehicle, which will provide mobility for lunar exploration.

In the period ahead, MSFC will participate in Manned Space Flight efforts on a preliminary design and design verification of a space shuttle engine and air frame, and a space station module. Additional supporting studies will be required for these efforts.

In carrying out its management responsibilities, the Marshall Space Flight Center has developed the capability to:

1. Design and develop large launch vehicle systems, including vehicle systems test and integration, tailored to manned and unmanned payload requirements.

2. Design and develop scientific payloads, space stations, and systems required for on-going and future space exploration.

3. Develop and integrate scientific experiment payload packages to be flown on Saturn/Apollo and AAP or subsequent missions.

4. Conduct systems engineering and overall systems integration of vehicles and payloads as assigned.

5. Technical and business management of industrial programs involving space vehicles, payloads and systems.

In support of its assigned programs, Marshall also maintains the research and development capability to conduct advanced studies on launch vehicle and space systems, space navigation techniques, astronautics, and space science investigations. Its capability for research and for management of large industrial programs gives the Marshall Space Flight Center a highly flexible base for space programs.

DESCRIPTION:

Operations of the Marshall Space Flight Center are conducted at three primary locations.

The first location, the main Marshall Space Flight Center site, is near Huntsville, Alabama, on Army property at the Redstone Arsenal. The Center occupies 1,797 acres under a nonrevocable use permit from the Army. The capital investment as of June 30, 1969, was $353,942,000. Certain facilities such as the Redstone Arsenal Air Field and some utilities are used jointly by NASA and the Army. The Huntsville location has deep-water access via the Tennessee, Ohio and Mississippi Rivers.

The second location, the Michoud Assembly Facility, is located 15 miles east of New Orleans, Louisiana. The main facility occupies approximately 897 acres and the Slidell Central Computer Facility, a satellite facility 20 miles to the northeast, occupies 14 additional acres. The capital investment as of June 30, 1969, was $147,190,000. Michoud facility space totals about 3.5 million square feet, including the main assembly plant, covering an area of 43 acres under one roof. MSFC exercises overall management of the facility, while a support contractor provides administrative and technical services, and the vehicle prime contractors produce the booster stages at this location. The Michoud Assembly Facility is on the Gulf Intra-Coastal Waterway, and has deepwater access via the Mississippi River.

The third location, the Mississippi Test Facility, is in southwest Mississippi, approximately 50 miles northeast of New Orleans, Louisiana. Total land area is 138,870 acres of which 13,428 acres make up the actual test area owned by NASA. The remaining 125,442 acres are held as a buffer zone. In the buffer area, 7,558 acres are owned by NASA, and 117,884 acres are under restrictive easement. Capital investment for the Mississippi Test Facility as of June 30, 1969, was $276,203,000. Test stands include a dual-position stand for testing the Saturn V first stage (S-IC), and two stands for testing the 1,000,000 pound thrust Saturn V second stage (S-II). MSFC exercises overall management of the facility, while a support contractor provides administrative and technical services, and the vehicle prime contractors are responsible for conducting tests on the stands. The site has deepwater access for transporting large boosters via the Pearl River and the Intra-Coastal Waterway.

The total capital investment of the Marshall Space Flight Center, including fixed assets in progress and contractor-held facilities at various locations, as of June 30, 1969, was $943,682,000.

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

Functions	1969	1970	1971
Personnel	$ 91,466,000	$ 99,063,000	$ 98,685,000
Travel	2,119,000	2,407,000	2,517,000
Automatic data processing	5,908,000	7,198,000	8,042,000
Facilities services	8,377,000	7,167,000	9,341,000
Technical services	1,627,000	1,377,000	1,459,000
Administrative support	6,837,000	4,485,000	4,631,000
Total, fund requirements	$116,334,000	$121,697,000	$124,675,000

PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	3,181	2,531	1,400
Space flight operations	1,276	1,744	2,753
Advanced missions	133	123	123
Space Science and Applications			
Physics and astronomy	15	40	34
Lunar and planetary exploration	7	15	15
Bioscience	3	3	3
Space applications	2	5	5
Advanced Research and Technology			
Basic research	33	41	48
Space vehicle systems	186	221	275
Human factor systems	5	13	16
Nuclear rockets	6	25	38
Aeronautical vehicles	1	7	13
Tracking and Data Acquisition	10	14	14
Technology Utilization	12	14	14
Subtotal, positions by program	4,870	4,796	4,751

	1969	1970	1971
2. **Indirect Positions:**			
Director and staff.....	81	79	70
Administrative support.....	690	640	634
Research and development support..	508	489	480
Subtotal, indirect positions....	1,279	1,208	1,184
Total, permanent positions.....	6,149	6,004	5,935

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MARSHALL SPACE FLIGHT CENTER

JANUARY 16, 1970

OFFICE OF DIRECTOR

	70	71
EXCEPTED	[illegible]	[illegible]
GS-16	1	1
GS-15	1	1
GS-14	[illegible]	[illegible]
ALL OTHER GS	1	1
WAGEBOARD		
TOTAL PERMANENT	14	14

ASSOCIATE DIR. FOR SCIENCE

	70	71
EXCEPTED	1	1
GS-16		
GS-15	1	1
GS-14	2	2
ALL OTHER GS	[illegible]	[illegible]
WAGEBOARD		
TOTAL PERMANENT	[illegible]	[illegible]

MSFC SUMMARY

	70	71
EXCEPTED	44	44
GS-16	54	56
GS-15	383	375
GS-14	711	709
ALL OTHER GS	4562	4303
WAGEBOARD	248	248
TOTAL PERMANENT	6004	5935

SAFETY

	70	71
EXCEPTED	1	1
GS-16		
GS-15	4	4
GS-14	1	1
ALL OTHER GS	8	8
WAGEBOARD		
TOTAL PERMANENT	14	14

UNIVERSITY AFFAIRS

	70	71
EXCEPTED		
GS-16		
GS-15	1	1
GS-14		
ALL OTHER GS	1	1
WAGEBOARD		
TOTAL PERMANENT	2	2

PUBLIC AFFAIRS

	70	71
EXCEPTED		
GS-16		
GS-15	1	1
GS-14	3	3
ALL OTHER GS	20	19
WAGEBOARD		
TOTAL PERMANENT	24	23

PROCUREMENT POLICY & REVIEW

	70	71
EXCEPTED		
GS-16		
GS-15	1	1
GS-14		
ALL OTHER GS	1	1
WAGEBOARD		
TOTAL PERMANENT	2	2

CHIEF COUNSEL

	70	71
EXCEPTED	1	1
GS-16		
GS-15	2	2
GS-14	2	2
ALL OTHER GS	11	11
WAGEBOARD		
TOTAL PERMANENT	16	16

DIRECTOR OF PROGRAM DEVELOPMENT

	70	71
EXCEPTED	2	2
GS-16	1	1
GS-15	1	1
GS-14	2	2
ALL OTHER GS	6	6
WAGEBOARD		
TOTAL PERMANENT	12	12

MANAGEMENT SUPPORT OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15		
GS-14	1	1
ALL OTHER GS	6	6
WAGEBOARD		
TOTAL PERMANENT	7	7

RESEARCH PLANNING OFFICE

	70	71
EXCEPTED	1	1
GS-16	3	3
GS-15	3	3
GS-14	17	17
ALL OTHER GS		
WAGEBOARD		
TOTAL PERMANENT	24	24

PRODUCTS OFFICE

	70	71
EXCEPTED	1	1
GS-16		
GS-15	2	2
GS-14	5	5
ALL OTHER GS	6	6
WAGEBOARD		
TOTAL PERMANENT	14	14

PLANNING & RESOURCES OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15	1	1
GS-14	2	2
ALL OTHER GS	22	22
WAGEBOARD		
TOTAL PERMANENT	25	25

SPACE SHUTTLE TASK FORCE

Staffing by time limited assignment from other organizations.

SPACE STATION TASK FORCE

Staffing by time limited assignment from other organizations.

CENTRAL SYSTEMS ENGINEERING

	70	71
EXCEPTED	3	3
GS-16	3	3
GS-15	8	8
GS-14	22	22
ALL OTHER GS	117	116
WAGEBOARD		
TOTAL PERMANENT	153	152

AERO-ASTRODYNAMICS LABORATORY

	70	71
EXCEPTED	1	1
GS-16	7	7
GS-15	28	27
GS-14	32	32
ALL OTHER GS	194	193
WAGEBOARD		
TOTAL PERMANENT	262	260

PROGRAM PLANNING OFFICE

	70	71
EXCEPTED	1	1
GS-16		
GS-15	4	4
GS-14	6	6
ALL OTHER GS	15	15
WAGEBOARD		
TOTAL PERMANENT	26	26

ADVANCED PROGRAM SUPPORT OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15	5	5
GS-14	6	6
ALL OTHER GS	8	8
WAGEBOARD		
TOTAL PERMANENT	19	19

ASTRIONICS LABORATORY

	70	71
EXCEPTED	2	2
GS-16	5	5
GS-15	98	96
GS-14	90	90
ALL OTHER GS	517	513
WAGEBOARD		
TOTAL PERMANENT	692	686

ASTRONAUTICS LABORATORY

	70	71
EXCEPTED	1	1
GS-16	11	11
GS-15	93	94
GS-14	115	116
ALL OTHER GS	653	650
WAGEBOARD	6	6
TOTAL PERMANENT	879	868

ADVANCED SYSTEMS ANALYSIS OFFICE

	70	71
EXCEPTED	[illegible]	[illegible]
GS-16	3	3
GS-15	4	4
GS-14	[illegible]	[illegible]
ALL OTHER GS	22	21
WAGEBOARD		
TOTAL PERMANENT	36	35

MISSION & PAYLOAD PLANNING

	70	71
EXCEPTED	1	1
GS-16	1	1
GS-15	4	4
GS-14	[illegible]	[illegible]
ALL OTHER GS	24	23
WAGEBOARD		
TOTAL PERMANENT	30	28

COMPUTATION LABORATORY

	70	71
EXCEPTED	4	4
GS-16	1	1
GS-15	12	12
GS-14	26	26
ALL OTHER GS	104	103
WAGEBOARD		
TOTAL PERMANENT	145	144

MANUFACTURING ENGINEERING LABORATORY

	70	71
EXCEPTED	3	3
GS-16	1	1
GS-15	15	15
GS-14	52	52
ALL OTHER GS	728	722
WAGEBOARD	12	12
TOTAL PERMANENT	812	805

PRELIMINARY DESIGN OFFICE

	70	71
EXCEPTED	1	1
GS-16	1	1
GS-15	10	10
GS-14	17	17
ALL OTHER GS	84	83
WAGEBOARD		
TOTAL PERMANENT	[illegible]	112

ADVANCED PROJECTS OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15		
GS-14		
ALL OTHER GS	2	2
WAGEBOARD		
TOTAL PERMANENT	2	2

QUALITY ASSURANCE & RELIABILITY LABORATORY

	70	71
EXCEPTED	4	4
GS-16	4	4
GS-15	52	51
GS-14	53	55
ALL OTHER GS	418	415
WAGEBOARD	6	6
TOTAL PERMANENT	528	526

SPACE SCIENCE LABORATORY

	70	71
EXCEPTED	1	1
GS-16		
GS-15		
GS-14	16	16
ALL OTHER GS	18	19
WAGEBOARD	[illegible]	85
TOTAL PERMANENT	171	170

DIRECTOR OF SCIENCE AND ENGINEERING

	70	71
EXCEPTED	1	1
GS-16		
GS-15		
GS-14	1	1
ALL OTHER GS	6	6
WAGEBOARD		
TOTAL PERMANENT	8	8

DIRECTOR OF PROGRAM MANAGEMENT

	70	71
EXCEPTED	2	2
GS-16		
GS-15	1	1
GS-14	1	1
ALL OTHER GS	9	9
WAGEBOARD		
TOTAL PERMANENT	13	13

CONTRACT OFFICE

	70	71
EXCEPTED	1	1
GS-16		
GS-15	4	4
GS-14	13	13
ALL OTHER GS	95	94
WAGEBOARD		
TOTAL PERMANENT	113	112

PROJECT LOGISTICS OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15	2	2
GS-14	4	4
ALL OTHER GS	9	9
WAGEBOARD		
TOTAL PERMANENT	15	15

PLANNING & RESOURCES OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15	4	4
GS-14	4	4
ALL OTHER GS	22	22
WAGEBOARD		
TOTAL PERMANENT	30	30

SYSTEM SAFETY & MANNED FLIGHT AWARENESS OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15	1	1
GS-14		
ALL OTHER GS	7	7
WAGEBOARD		
TOTAL PERMANENT	8	8

SATURN PROGRAM OFFICE

	70	71
EXCEPTED	3	3
GS-16	6	6
GS-15	27	26
GS-14	68	67
ALL OTHER GS	152	149
WAGEBOARD		
TOTAL PERMANENT	256	251

APOLLO APPLICATIONS PROGRAM OFF.

	70	71
EXCEPTED	1	1
GS-16	5	5
GS-15	22	22
GS-14	41	41
ALL OTHER GS	119	114
WAGEBOARD		
TOTAL PERMANENT	188	183

ENGINE PROGRAM OFFICE

	70	71
EXCEPTED	1	1
GS-16	4	4
GS-15	8	8
GS-14	23	23
ALL OTHER GS	[illegible]	[illegible]
WAGEBOARD		
TOTAL PERMANENT	60	59

MISSION OPERATIONS OFFICE

	70	71
EXCEPTED	1	1
GS-16	5	5
GS-15	8	8
GS-14	13	13
ALL OTHER GS	[illegible]	[illegible]
WAGEBOARD		
TOTAL PERMANENT	27	27

MICHOUD ASSEMBLY FACILITY

	70	71
EXCEPTED	[illegible]	[illegible]
GS-16	1	1
GS-15	7	7
GS-14	11	11
ALL OTHER GS	112	111
WAGEBOARD		
TOTAL PERMANENT	131	130

MISSISSIPPI TEST FACILITY

	70	71
EXCEPTED	1	1
GS-16	4	4
GS-15	5	5
GS-14	5	5
ALL OTHER GS	58	57
WAGEBOARD		
TOTAL PERMANENT	74	73

DIRECTOR OF ADMIN & TECHNICAL SER

	70	71
EXCEPTED	2	2
GS-16	1	1
GS-15	1	1
GS-14	1	1
ALL OTHER GS	1	1
WAGEBOARD		
TOTAL PERMANENT	7	7

COST REDUCTION OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15	1	1
GS-14		
ALL OTHER GS	2	2
WAGEBOARD		
TOTAL PERMANENT	3	3

PATENT COUNSEL

	70	71
EXCEPTED		
GS-16		
GS-15	1	1
GS-14	4	4
ALL OTHER GS	1	1
WAGEBOARD		
TOTAL PERMANENT	6	6

TECHNOLOGY UTILIZATION OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15	2	2
GS-14	6	6
ALL OTHER GS	9	9
WAGEBOARD		
TOTAL PERMANENT	17	17

CENTER PLANS & RESOURCES OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15		
GS-14	6	6
ALL OTHER GS	48	48
WAGEBOARD		
TOTAL PERMANENT	55	54

FACILITIES OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15	3	3
GS-14	10	10
ALL OTHER GS	36	35
WAGEBOARD		
TOTAL PERMANENT	49	48

FINANCIAL MANAGEMENT OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15		
GS-14	4	3
ALL OTHER GS	10	10
WAGEBOARD	123	118
TOTAL PERMANENT	137	131

MANAGEMENT SERVICES OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15		
GS-14	3	3
ALL OTHER GS	7	7
WAGEBOARD	108	105
TOTAL PERMANENT	118	115

MANPOWER OFFICE

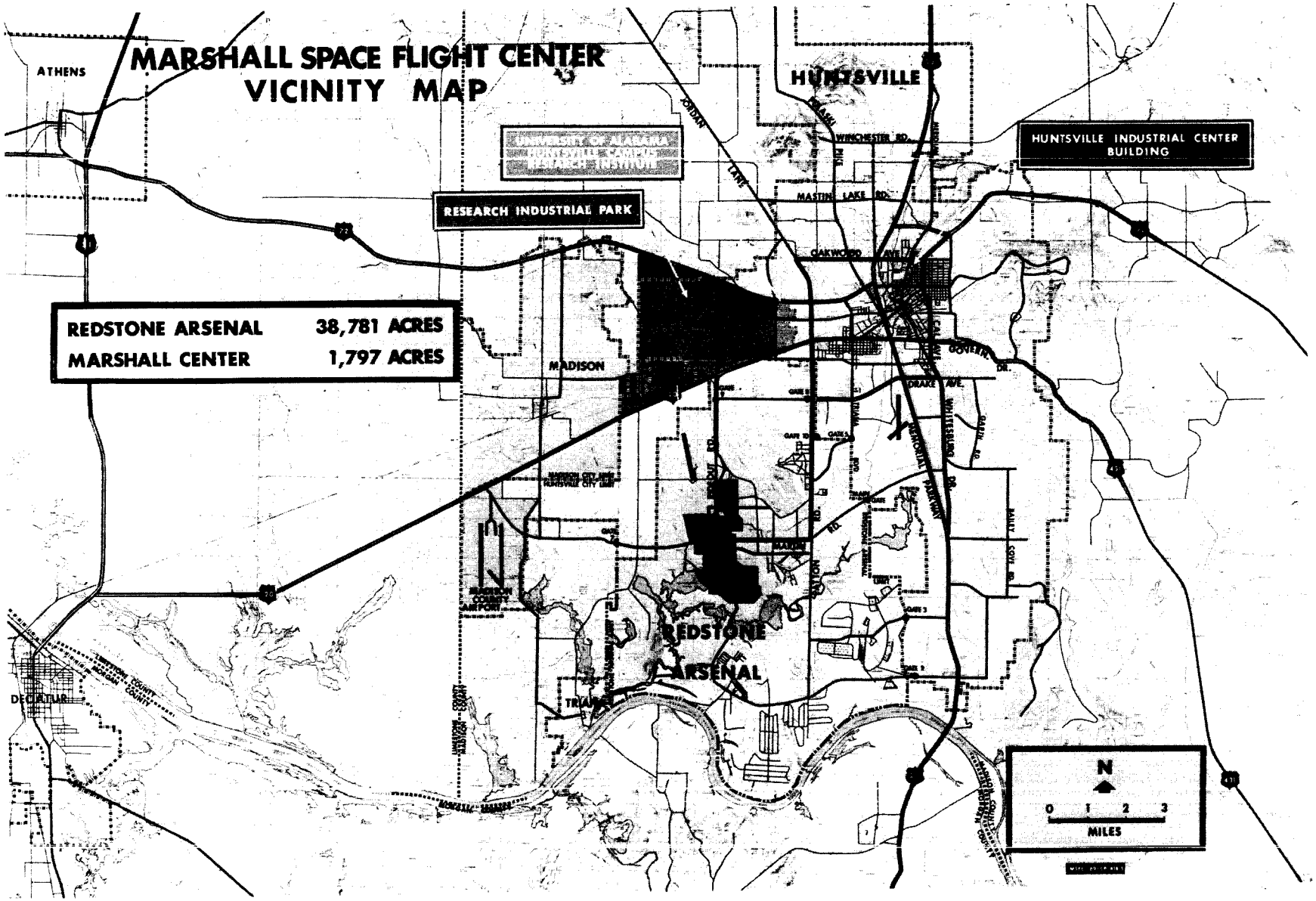
	70	71
EXCEPTED		
GS-16		
GS-15		
GS-14	3	3
ALL OTHER GS	9	9
WAGEBOARD	94	91
TOTAL PERMANENT	106	103

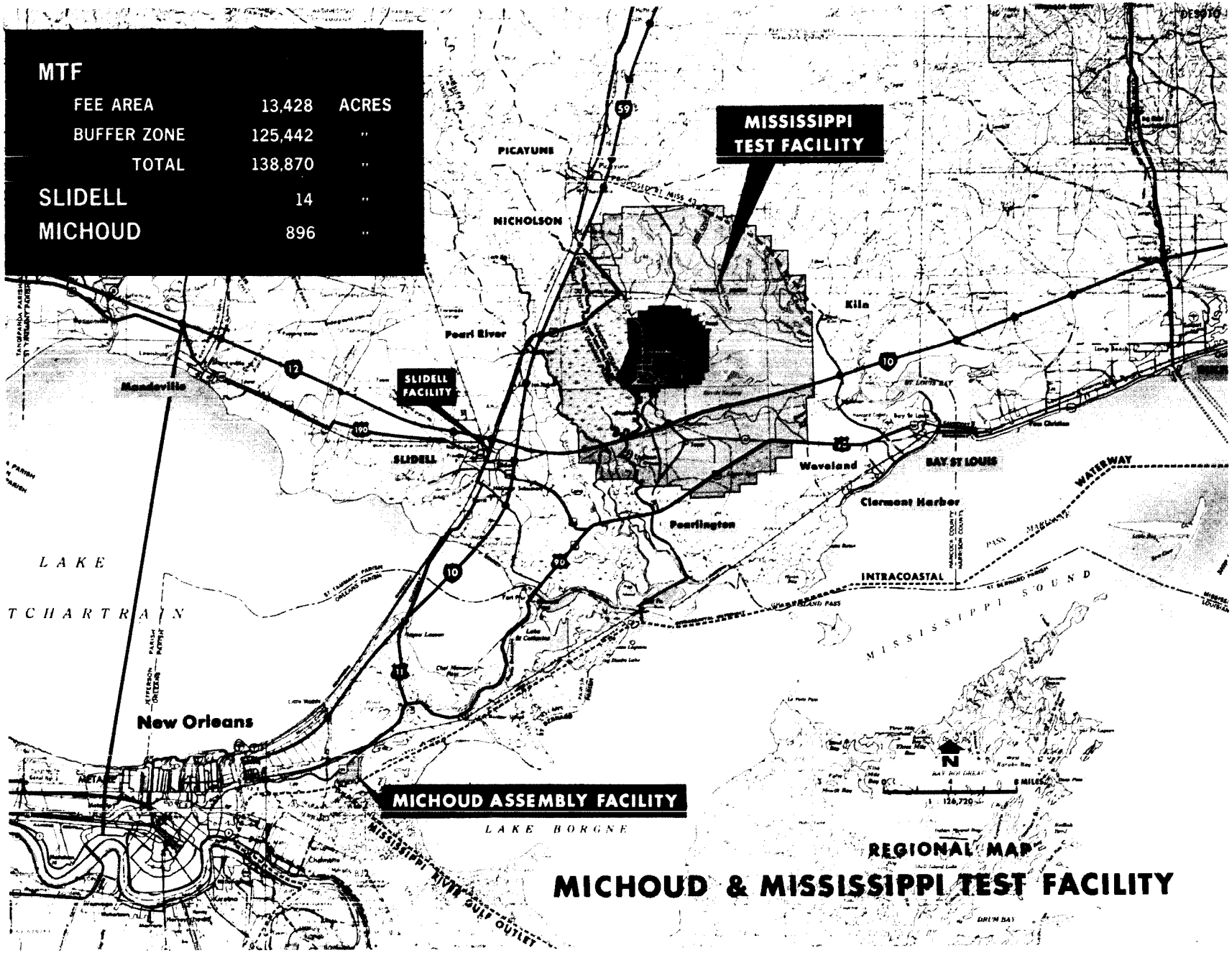
PURCHASING OFFICE

	70	71
EXCEPTED	1	1
GS-16		
GS-15	3	3
GS-14	6	6
ALL OTHER GS	157	156
WAGEBOARD		
TOTAL PERMANENT	167	166

TECHNICAL SERVICES OFFICE

	70	71
EXCEPTED		
GS-16		
GS-15	4	4
GS-14	5	5
ALL OTHER GS	235	227
WAGEBOARD	199	199
TOTAL PERMANENT	442	435


MARSHALL SPACE FLIGHT CENTER
VICINITY MAP
ATHENS
HUNTSVILLE
RESEARCH INDUSTRIAL PARK
HUNTSVILLE INDUSTRIAL CENTER BUILDING
REDSTONE ARSENAL 38,781 ACRES
MARSHALL CENTER 1,797 ACRES
MADISON
REDSTONE ARSENAL
DECATUR
TRIANA
WINCHESTER RD.
MASTIN LAKE RD.
OAKWOOD AVE.
DRAKE AVE.
N
0 1 2 3
MILES



MICHOUD & MISSISSIPPI TEST FACILITY

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MARSHALL SPACE FLIGHT CENTER

FISCAL YEAR 1971 ESTIMATES

LOCATION PLAN

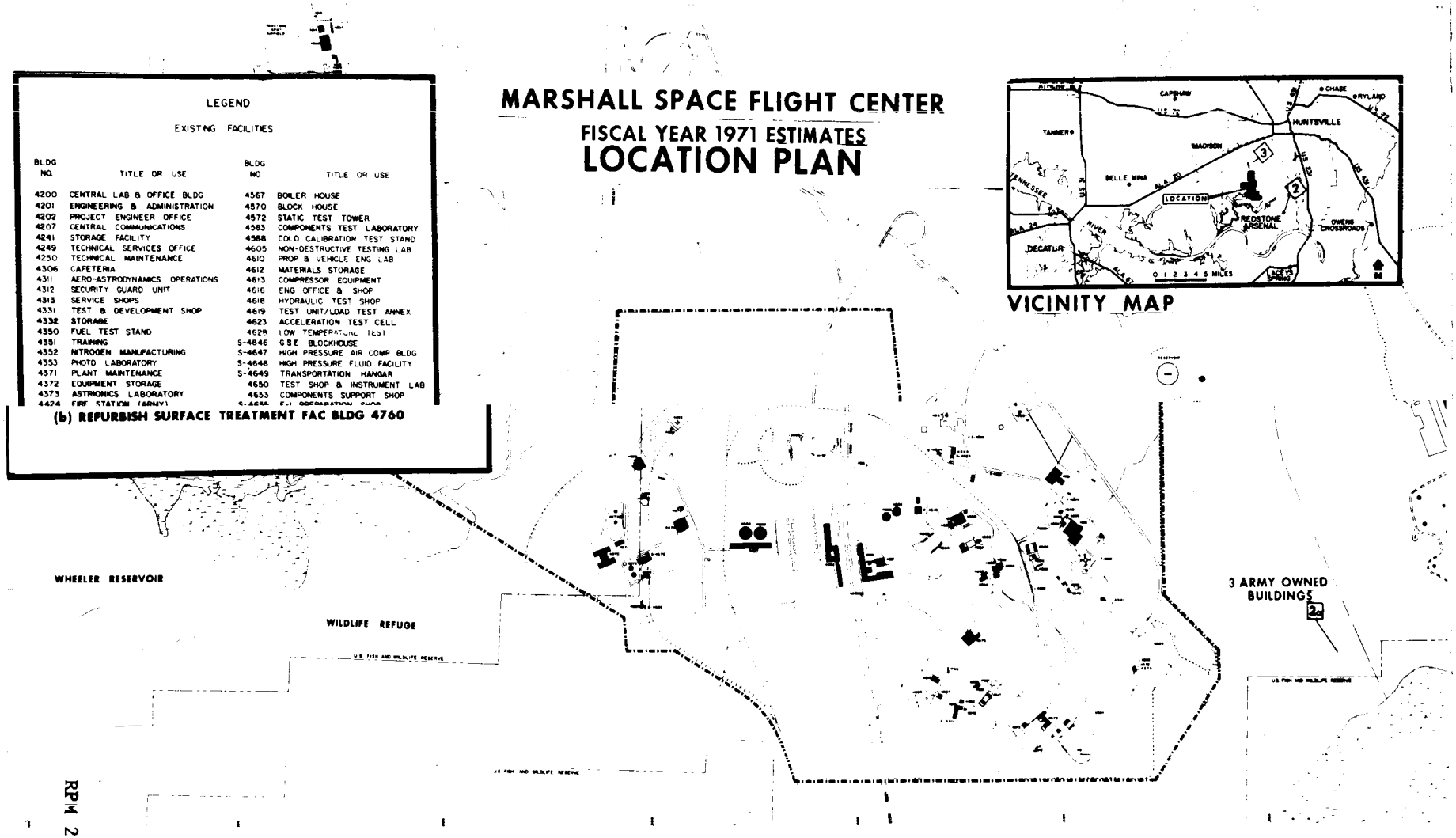
LEGEND

EXISTING FACILITIES

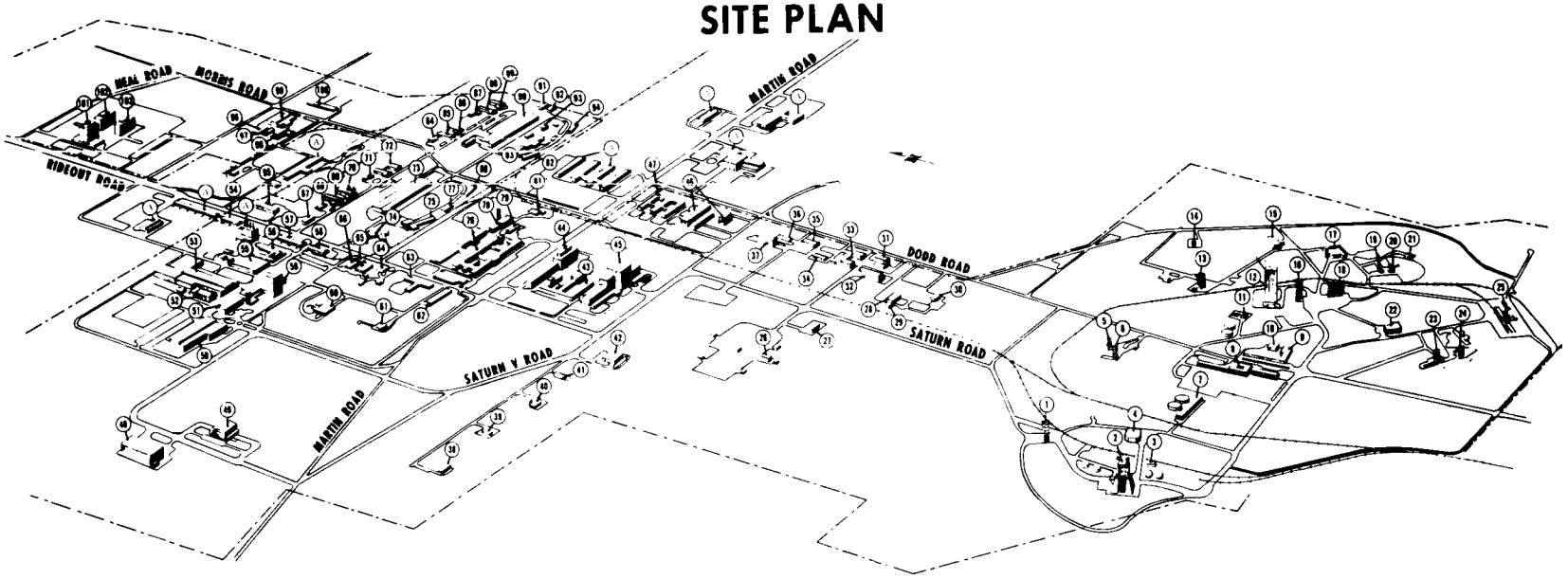
BLDG NO.	TITLE OR USE	BLDG NO	TITLE OR USE
4200	CENTRAL LAB & OFFICE BLDG	4567	BOILER HOUSE
4201	ENGINEERING & ADMINISTRATION	4570	BLOCK HOUSE
4202	PROJECT ENGINEER OFFICE	4572	STATIC TEST TOWER
4207	CENTRAL COMMUNICATIONS	4583	COMPONENTS TEST LABORATORY
4241	STORAGE FACILITY	4588	COLD CALIBRATION TEST STAND
4249	TECHNICAL SERVICES OFFICE	4605	NON-DESTRUCTIVE TESTING LAB
4250	TECHNICAL MAINTENANCE	4610	PROP & VEHICLE ENG LAB
4306	CAFETERIA	4612	MATERIALS STORAGE
4311	AERO-ASTRODYNAMICS OPERATIONS	4613	COMPRESSOR EQUIPMENT
4312	SECURITY GUARD UNIT	4616	ENG OFFICE & SHOP
4313	SERVICE SHOPS	4618	HYDRAULIC TEST SHOP
4331	TEST & DEVELOPMENT SHOP	4619	TEST UNIT/LOAD TEST ANNEX
4332	STORAGE	4623	ACCELERATION TEST CELL
4350	FUEL TEST STAND	4628	LOW TEMPERATURE TEST
4351	TRAINING	S-4846	G S E BLOCKHOUSE
4352	NITROGEN MANUFACTURING	S-4647	HIGH PRESSURE AIR COMP BLDG
4353	PHOTO LABORATORY	S-4648	HIGH PRESSURE FLUID FACILITY
4371	PLANT MAINTENANCE	S-4649	TRANSPORTATION HANGAR
4372	EQUIPMENT STORAGE	4650	TEST SHOP & INSTRUMENT LAB
4373	ASTRIONICS LABORATORY	4653	COMPONENTS SUPPORT SHOP
4424	FIRE STATION (ARMY)	S-4648	F-1 OPERATION SHOP

(b) REFURBISH SURFACE TREATMENT FAC BLDG 4760

VICINITY MAP



MARSHALL SPACE FLIGHT CENTER
SITE PLAN



HEADQUARTERS AREA

95	4207	CENTRAL COMMUNICATIONS FACILITY
96	4241	STORAGE BUILDING
97	S-4244	BUTLER BUILDING (STORAGE AND SHOPS)
98	S-4251	SUPPORT SERVICES EQUIPMENT SHED
99	4250	TECHNICAL SERVICES OPERATIONS BUILDING
100	4249	SUPPORT SERVICES OPERATIONS AND MEDICAL CENTER
101	4200	CENTRAL LABORATORY AND OFFICE BUILDING
102	4202	PROJECT ENGINEERING BUILDING
103	4201	ENGINEERING AND ADMINISTRATION BUILDING

LAB AND SUPPORT AREA

38	4628	LOW TEMPERATURE TEST FACILITY
39	4622	LIQUID HYDROGEN TEST PAD
40	4623	ACCELERATOR AND TEST CELL FACILITY
41	4624	HYDROGEN PEROXIDE STATION
42	4625	NON-DESTRUCTIVE TEST LABORATORY
43	4612	MATERIALS LABORATORY
44	4616	PROPULSION & VEHICLE ENG. LAB
45	4619	STRUCTURES AND MECHANICS LABORATORY
46	4650	TEST SHOP & INSTRUMENT LAB
47	4663	COMPUTATION LABORATORY
48	S-4755	VEHICLE COMPONENTS HANGER
49	S-4752	COMPONENTS AND SUBASSEMBLY ACCEPTANCE BLDG.
50	4708	ASSEMBLY AND INSPECTION HANGER
51	4760	SURFACE TREATMENT FACILITY
52	S-4706	C-5 MOCK-UP SHELTER
53	4705	ASSEMBLY SHOP AND HANGER
54	4723	MATERIAL TEST LABORATORY
55	4711	PRECISION MACHINE SHOP
56	4712	FIELD OFFICE BUILDING
57	4727	MACHINE SHOP AND OFFICE BUILDING
58	4728	EQUIPMENT TEST SHOP
59	4707	COMPONENT HANGER & HYDROSTATIC TEST
60	4750	HIGH ALTITUDE TEST FACILITY
61	4748	LIQUID PROPELLANT TEST SUPPORT BUILDING
62	S-4747	AIR COMPRESSOR STATION
63	4746	OFFICE, TEST DIVISION
64	4741	BERYLLIUM FACILITY
65	4732	WIND TUNNEL FACILITY
66	4733	VACUUM TANK FACILITY
67	4306	SUPPORT OFFICES
68	4312	OFFICE BUILDING
69	[illegible]	SHOCK TUNNEL FACILITY
70	4313	STRUCTURAL TESTING LABORATORY STORAGE
71	4332	ENVIRONMENTAL TEST LABORATORY
72	4331	TESTING AND DEVELOPMENT SHOP
73	4471	STORAGE AND OFFICE BUILDING
74	4485	FINANCIAL MANAGEMENT OFFICE BUILDING
75	4491	COMPUTATION/ADP LABORATORY
76	4487	GUIDANCE AND CONTROL BUILDING ASTRIONICS LAB
77	S-4479	STORAGE SHED
78	4476	ACCELERATION AND ENVIRONMENTAL TEST FACILITY
79	S-4436	AUTOMATION CHECKOUT BUILDING
80	4492	ELECTRICAL SYSTEM LABORATORY
81	4475	HAZARDOUS OPERATIONS LABORATORY
82	4493	MACHINE AND SHEET METAL SHOP
83	4483	VEHICLE MAINTENANCE SHOP
84	4382	NITROGEN STORAGE BUILDING
85	4381	ADMINISTRATIVE BUILDING
86	4383	PHOTOGRAPHIC LABORATORY
87	4372	EQUIPMENT STORAGE
88	4371	STORAGE AND OFFICES
89	4373	GSE LABORATORY
90	4461	ENGINEERING AND MACHINE SHOP/OFFICE
91	S-4470	STORAGE BUILDING (QUONSET)
92	S-4499	STORAGE BUILDING (QUONSET)
93	4432	OPERATIONS SUPPORT BUILDING
94	4494	TECHNICAL DOCUMENTATION CENTER

TEST AREA

WEST AREA

1	4696	F-1 ENGINE TEST STAND
2	4670	SATURN STATIC TEST STAND (S-IC)
3	[illegible]	HELIUM COMPRESSOR BUILDING
4	4674	CONTROL CENTER BUILDING
5		INTERIM TEST STAND
6		JUPITER "HOP" TEST STAND
7	4667	PUMP HOUSE
8	4666	TEST DIVISION ENGINEERING BUILDING

EAST AREA

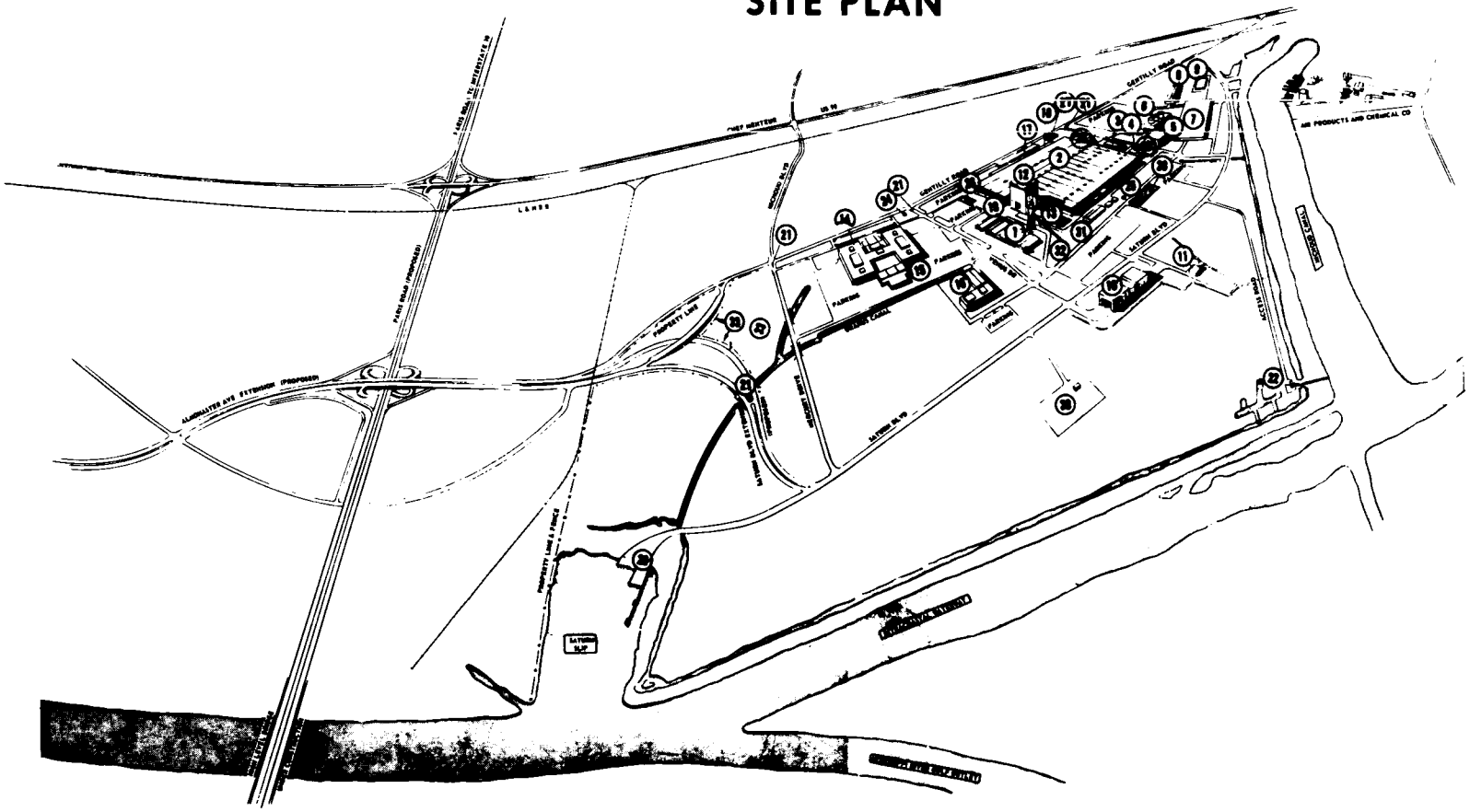
9	4566	ENGINEERING BUILDING
10	4567	BOILER HOUSE AND PUMP STATION
11	S-4549	DEIONIZED WATER TREATMENT PLANT
12	4550	ADVANCED SATURN DYNAMIC TEST STAND
13	4522	TEST STAND (LOX-LH_2 COMPONENTS)
14	4530	TEST STAND (LOX-RP COMPONENTS)
15	4561	CONTROL AND SERVICE CENTER
16	4557	DYNAMIC TEST STAND (SATURN I/IB)
17	4523	COMPONENTS TEST LABORATORY
18	4548	F-1 TURBO TEST FACILITY
19	S-4539	TEST PREPARATION BUILDING
20	4540	ACOUSTIC MODEL TEST FACILITY
21	4541	CONTROL BUILDING
22	4570	BLOCKHOUSE
23	4564	POWER PLANT TEST STAND (H-1 ENGINE)
24	4514	LIQUID HYDROGEN FACILITY (S-IVB)
25	4572	STATIC TEST TOWER (S-I/IB)

TEST SUPPORT AREA

26	4646	GSE TEST CONTROL CENTER
27	4648	HIGH PRESSURE FLUID TEST FACILITY
28	S-4659	SUPPORT BUILDING (N2 VAPORIZATION FAC)
29	S-4661	BOILER HOUSE
30	S-4647	GAS STORAGE & COMPRESSOR BLDG
31	S-4655	ENGINE PREPARATION BUILDING
32	S-4656	SATURN V GSE ASSEMBLY BUILDING
33	S-4653	COMPONENTS SUPPORT BUILDING
34	4678	SUB-STORES BUILDING
35	S-4654	TECHNICAL SYSTEMS WAREHOUSE
36	S-4651	SHOP BUILDING (QUONSET)
37	4649	TRANSPORTATION HANGER
		A - - ARMY BUILDINGS

MICHOUD ASSEMBLY FACILITY

SITE PLAN



MANUFACTURING AND ASSEMBLY

1	303	BOOSTER HANGAR
2	103	MANUFACTURING
3	111	LABORATORY
4	104	BATTERY CHARGING & STORAGE
5	207	BOILER HOUSE
6	202	COOLING TOWER
7	220	VEHICLE COMPONENT SUPPLY
8	203	MAINTENANCE SUPPLY
9	221	HAZARDOUS MATERIAL STORAGE

TEST FACILITIES

10	420	S-IC STAGE TEST & CHECKOUT FACILITY
11	404	HIGH PRESSURE TEST FACILITY
12	110	VERTICAL ASSEMBLY & HYDROSTATIC TEST
13	130	SYSTEMS ENGINEERING

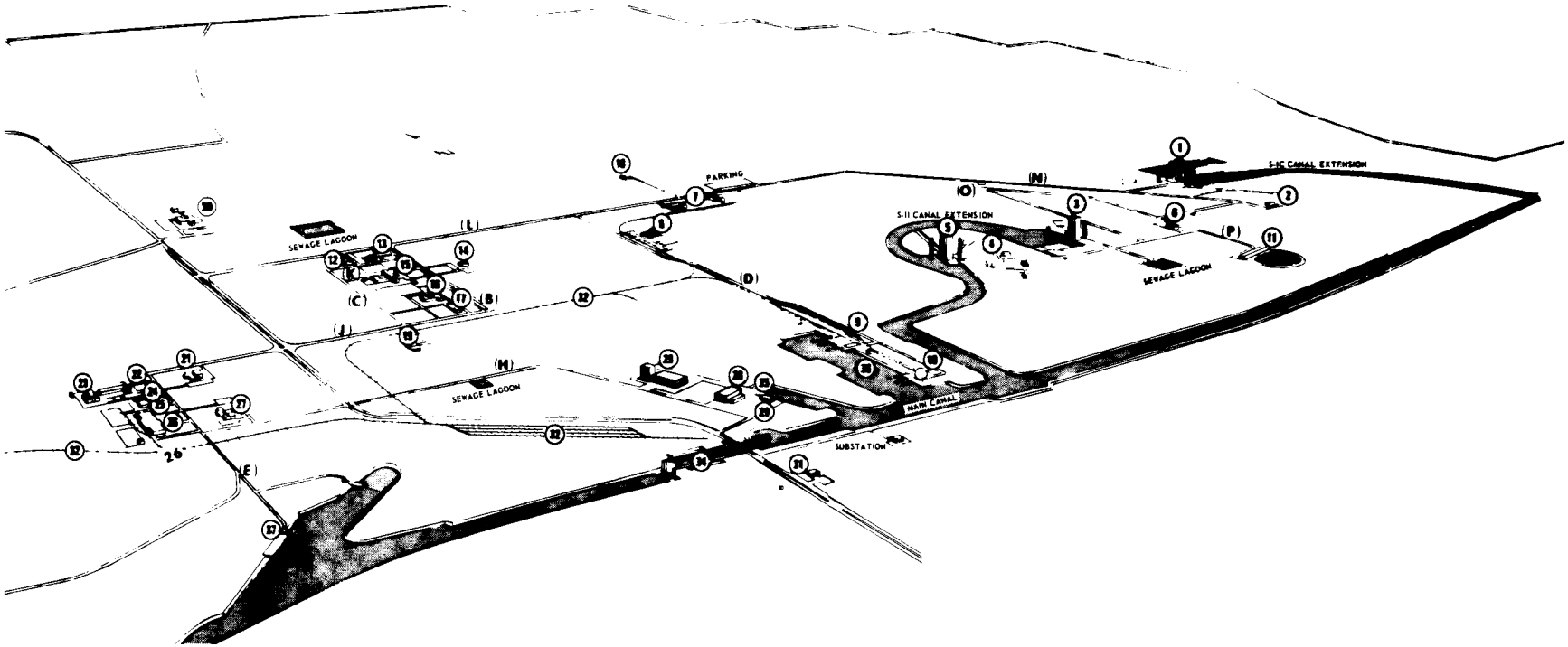
ENGINEERING & ADMINISTRATION

14	350	OFFICE AND ENGINEERING BUILDING
15	351	CAFETERIA
16	320	CONTRACTOR SERVICES BUILDING
17	101	ADMINISTRATION
18	102	ENGINEERING
19	301	MAINTENANCE SHOP

TRANSPORTATION, UTILITIES & MISC

20	480	SATURN BARGE DOCK
21		GUARD HOUSE
22	450	MAIN PUMP STATION
23	201	PUMP STATION NO 1
24	304	PUMP STATION NO 3
25	143	PUMP STATION NO 4
26	308	WEST MASTER SUBSTATION
27	121	MAIN SUBSTATION
28		CHEMICAL WASTE LAGOON
29	119	PAINT SHOP
30	403	SALVAGE YARD
31	105	TRANSPORTATION
32		ELEVATED WATER TOWER
33		SATURN BOULEVARD EXTENSION

MISSISSIPPI TEST FACILITY
SITE PLAN



SATURN V TEST COMPLEX

1	4220	SATURN S-IC STATIC TEST FAC. (DUAL POSITION)
2	4210	S-IC TEST CONTROL CENTER
3	4122	S-II POSITION A-2
4	4110	S-II TEST CONTROL CENTER
5	4120	S-II POSITION A-1
6	4995	DATA ACQUISITION CENTER
7	3305	HIGH PRESSURE GAS COMPRESSOR FACILITY
8		RP-1 STORAGE AND TRANSFER AREA
9		LH_2 TRANSFER AREA
10		LOX STORAGE AND TRANSFER AREA
11	4400	HI PR WATER STORAGE, PUMP, & DISTR SYSTEM

ENGINEERING AND ADMINISTRATION COMPLEX

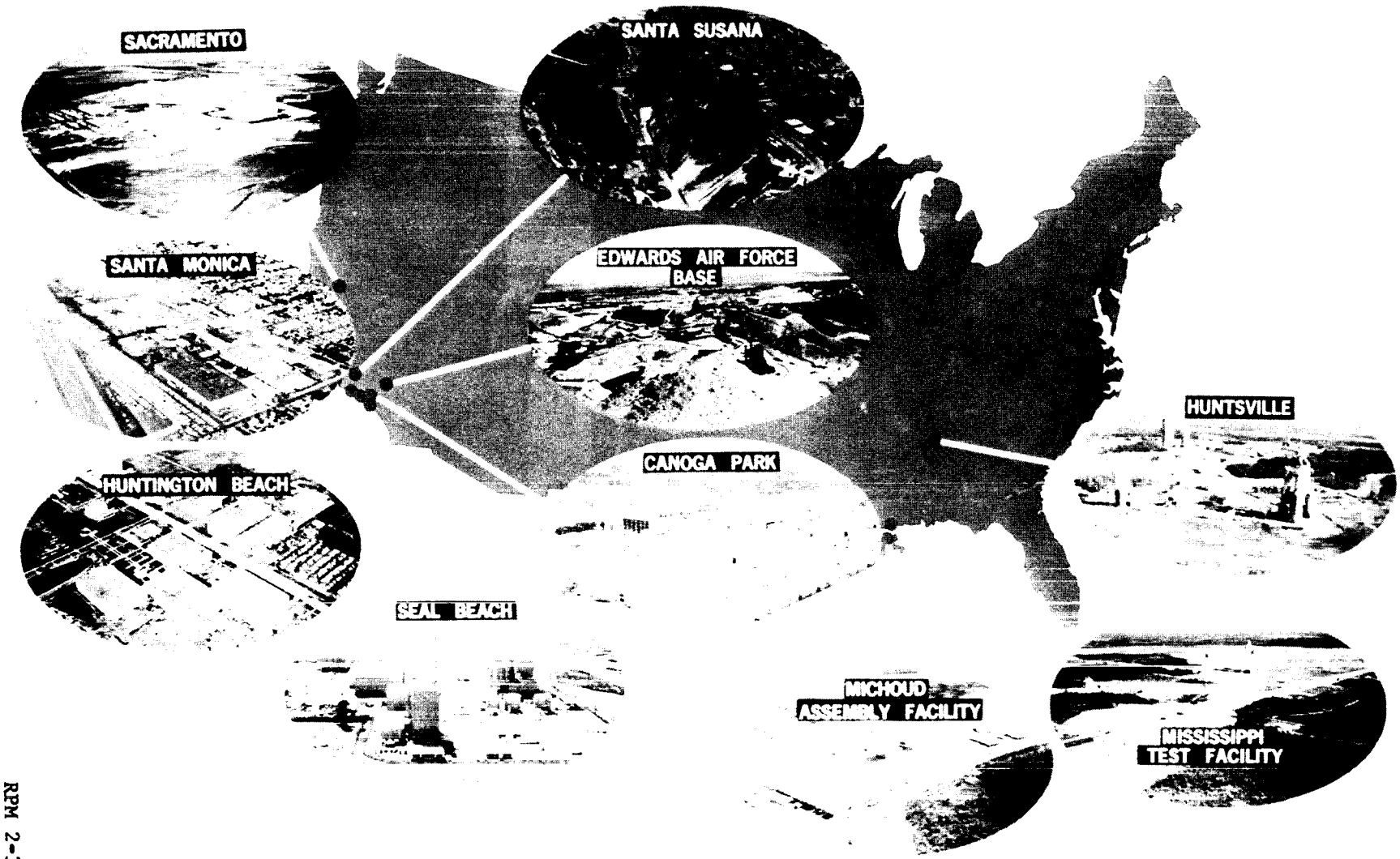
12	1201	COMMUNICATIONS & TELEPHONE BUILDING
13	1200	TEST AREA CONTROL CENTER
14	1000	DATA HANDLING CENTER
15	1100	ENGINEERING AND ADMINISTRATION BUILDING
16	1105	ELECTRONICS INSTR & MATERIALS LAB
17	1110	SONIC MEASURING FACIL - ACOUSTIC LAB
18	8201	SONIC MEASURING FACIL - METEOROLOGY LAB
19	3204	CENTRAL HEATING PLANT

INDUSTRIAL COMPLEX

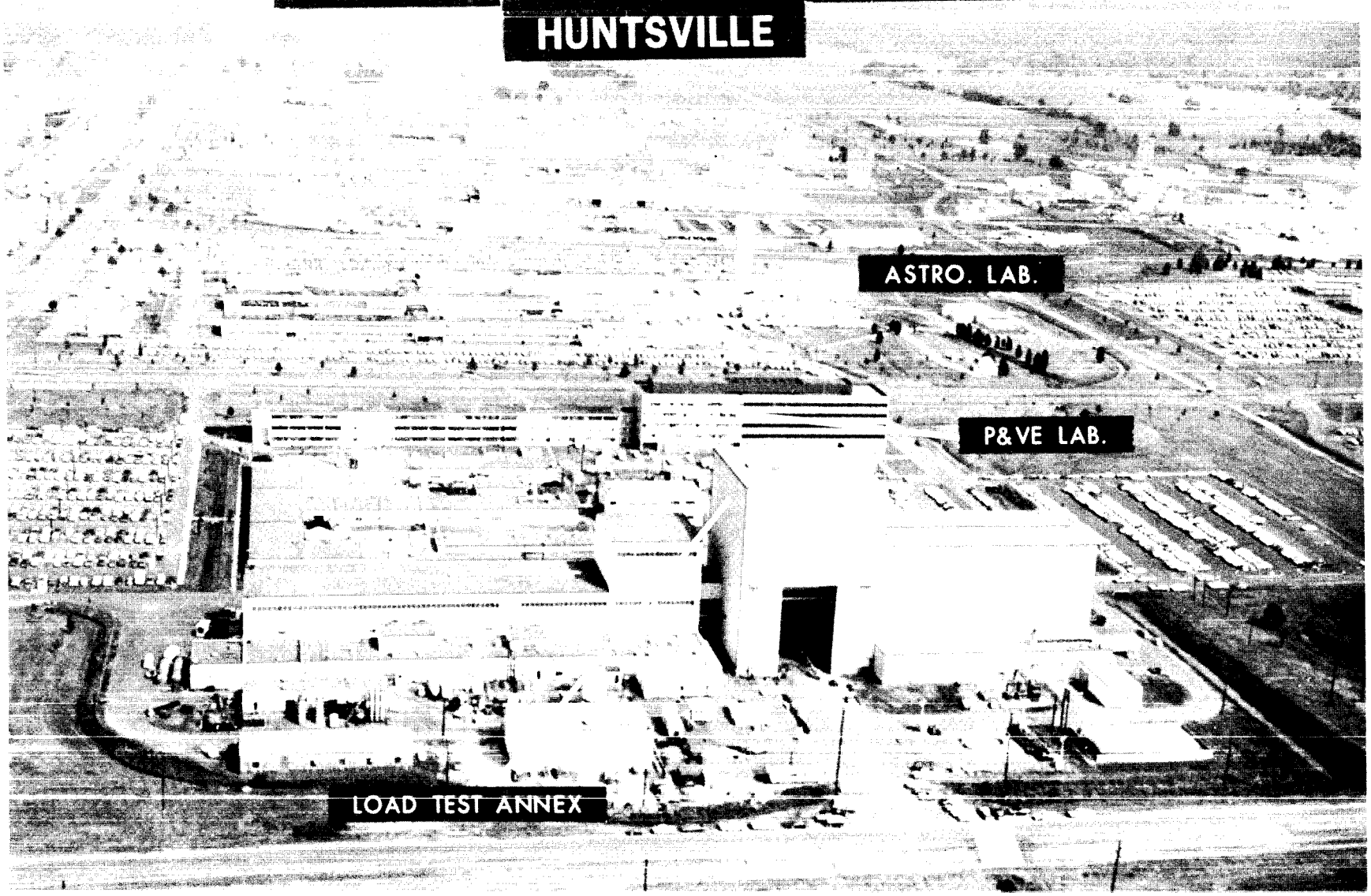
20	8100	COMPONENTS SERVICE FACILITY
21	2101	EMERGENCY SERVICES BLDG.
22	2201	SITE MAINTENANCE BLDG.
23	2205	TEST MAINTENANCE BLDG
24	2202	COMPRESSED GAS CYLINDER STORAGE
25	2203	INFLAMMABLE MATERIAL STORAGE
26	2204	WAREHOUSE
27	2105	MOBILE EQUIPMENT OPERATION BLDG.
28	3202	S-IC STAGE STORAGE BUILDING
29	3203	S-II STAGE STORAGE & C/O FAC.
30	3201	CRYOGENIC BARGE SERVICE BUILDING
31	3102	SECURITY CONTROL FACILITY

TRANSPORTATION & MISC.

32		RAILROAD & SWITCHING YARD
33	2402	RP-1 TRANSFER DOCK
34	2315	NAVIGATION LOCK & BRIDGE
35		BOOSTER TRANSFER DOCK
36		CRYOGENIC DOCK & CANAL EXTEN
37	2401	CONSTRUCTION DOCK


SACRAMENTO
SANTA SUSANA
SANTA MONICA
EDWARDS AIR FORCE BASE
HUNTSVILLE
CANOGA PARK
HUNTINGTON BEACH
SEAL BEACH
MICHOUD ASSEMBLY FACILITY
MISSISSIPPI TEST FACILITY

AERIAL VIEW OF LOAD TEST ANNEX HUNTSVILLE



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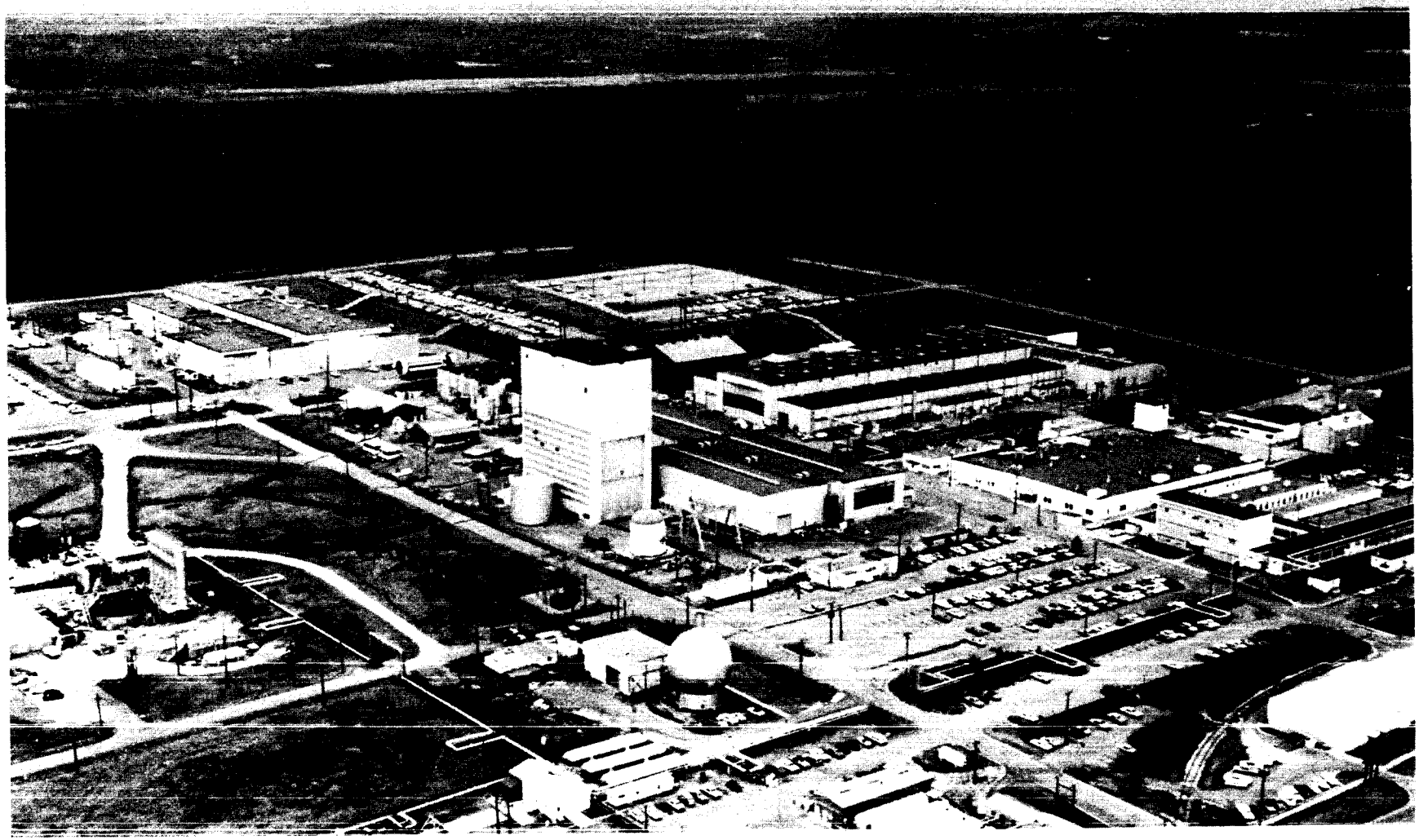
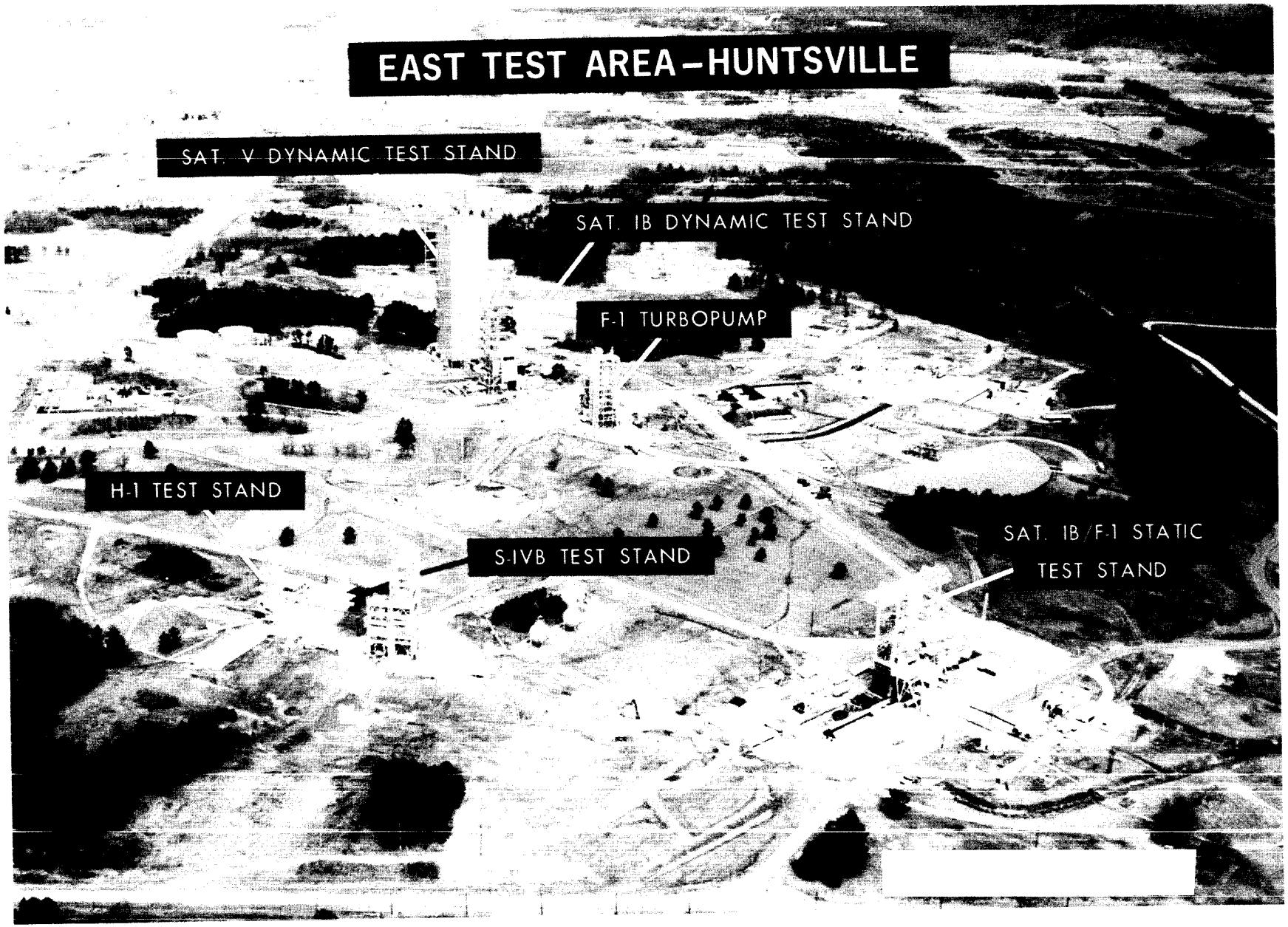
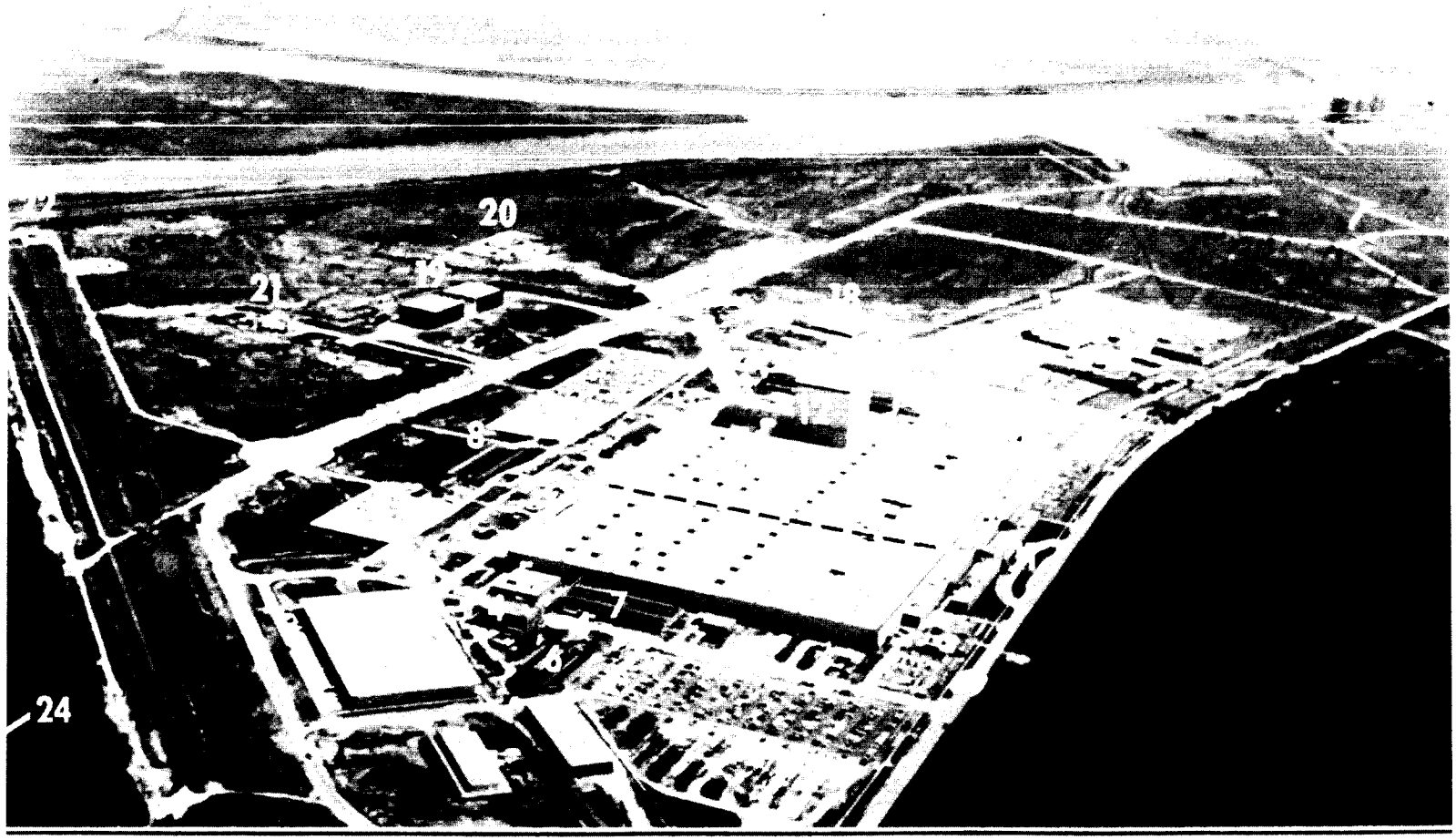
MANUFACTURING ENGINEERING LABORATORY
HUNTSVILLE

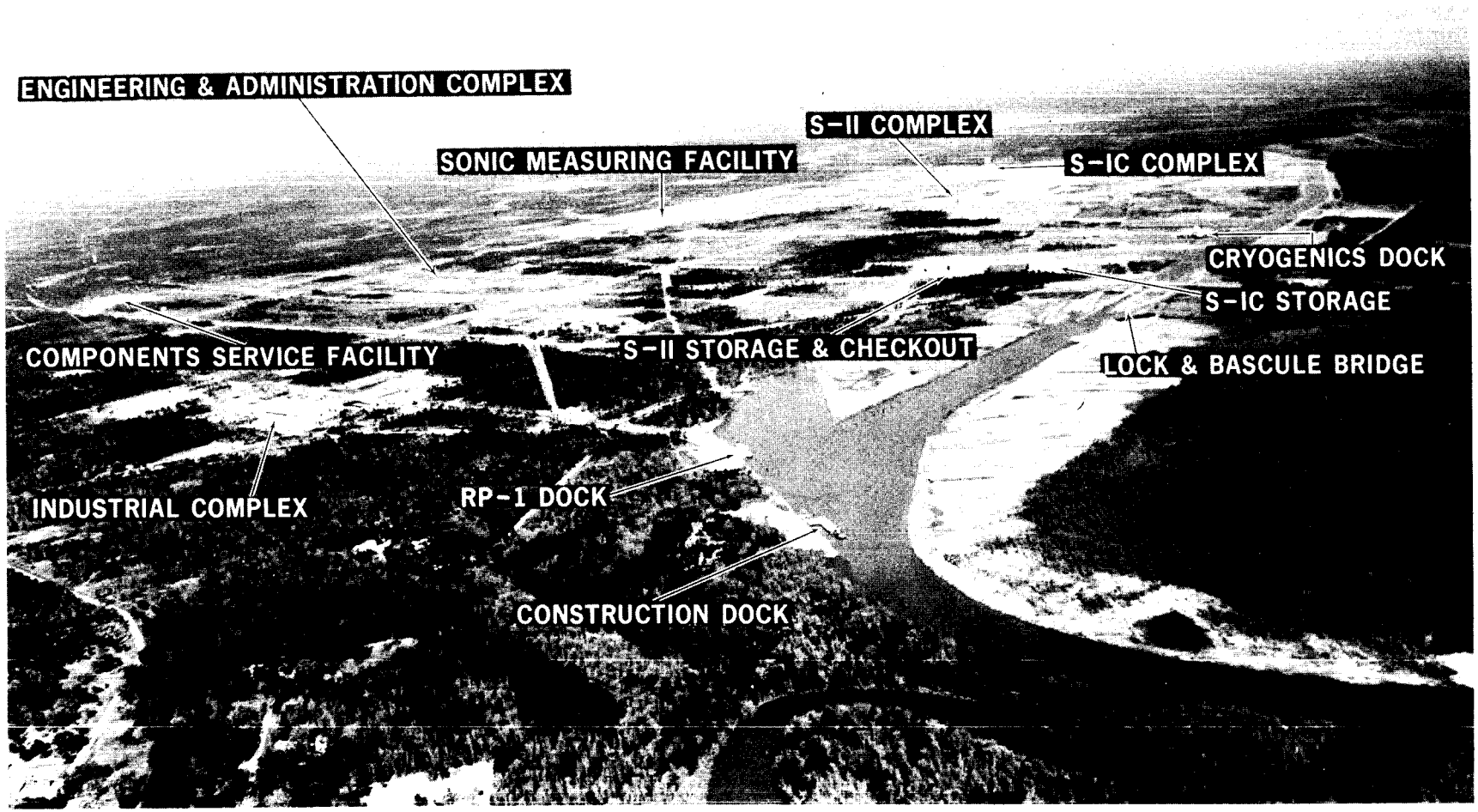



EAST TEST AREA–HUNTSVILLE
SAT. V DYNAMIC TEST STAND
SAT. IB DYNAMIC TEST STAND
F-1 TURBOPUMP
H-1 TEST STAND
S-IVB TEST STAND
SAT. IB/F-1 STATIC
TEST STAND



1. MAINTENANCE SUPPLY
2. HAZARDOUS MATLS
3. VEHICLE COMPONENT SUPPLY
4. BOILER PLANT & FUEL TANKS
5. BATTERY CHARGING
6. COOLING TOWER
7. LABORATORY
8. CHEMICAL WASTE RESERVOIR
9. CHRYSLER FAB AREA (S-IB)
10. BOEING FAB AREA (S-IC)
11. ENGINEERING BUILDINGS
12. VERT ASSY & HYDROSTATIC TEST
13. SYSTEMS ENGINEERING BLDG
14. BOOSTER HANGAR
15. MAINTENANCE
16. ENGINEERING & OFFICE BLDG
17. CAFETERIA
18. CONTRACTOR SERVICES BLDG
19. STAGE TEST & CHECK OUT
20. SALVAGE YARD
21. HIGH PRESSURE TEST FACILITY
22. MAIN PUMPING STATION
23. BARGE DOCK
24. LOX & LH_2 PLANT

MISSISSIPPI TEST FACILITY—AERIAL VIEW



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

GODDARD SPACE FLIGHT CENTER

MISSION:

The Goddard Space Flight Center, established in 1959 as the first major United States laboratory devoted to the investigation and exploration of space, conducts a wide-ranging program of experimentation in the space sciences and space applications. As a result, Goddard Space Flight Center has developed many diverse capabilities: the management of complex satellite projects; the development of wholly integrated spacecraft, ranging from systems engineering to development, integration, and testing; the development and operation of satellite tracking networks; data acquisition and analysis; and scientific research to include both theoretical studies and the development of many significant scientific experiments flown in satellites.

Although the majority of Goddard Space Flight Center's personnel are at the Greenbelt site, other personnel are located at the Goddard Institute for Space Studies in New York City, and throughout the world, managing the operation of satellite tracking and communications network stations.

Goddard Space Flight Center is responsible for the management of communications and meteorological satellite programs, such as the Applications Technology and Nimbus Satellites; the management of scientific satellite projects to include the Orbiting Geophysical (OGO), Orbiting Solar (OSO), and the Orbiting Astronomical (OAO) Observatories and the Explorer series; project management of NASA's Delta launch vehicle; management and operation of two worldwide tracking and data acquisition networks, the Space Tracking and Data Acquisition Network and the Manned Space Flight Network; and the development of the sounding rocket program.

During 1969, twenty-two major spacecraft launchings were conducted by NASA of which fourteen were directly managed by the Goddard Space Flight Center. Of the remaining eight missions, including four Apollo flights, two Mariner space probes and two scientific satellites, Goddard played a major data acquisition, tracking and/or launch vehicle management role.

Major Goddard achievements during the year included:

Scientific Satellites - Launch of the sixth and last spacecraft in the Orbiting Geophysical Observatory (OGO) series, bringing to more than 120 individual experiments orbited in the series to conduct inter-disciplinary, time-correlated studies of Earth-Sun relationships; launch of two Orbiting Solar Observatories (OSO 5 and OSO 6), to continue the pioneering solar studies during the current solar cycle; launch of the Goddard-built Explorer

41 (Interplanetary Monitoring Platform) to continue a highly successful series designed primarily to study the Earth's magnetosphere; completion of first year operation of Orbiting Astronomical Observatory (OAO) II providing the most prolonged astronomical observations above the Earth's atmosphere ever conducted.

International Scientific Satellites - An increasingly important mission for the Center is its responsibility for carrying out the international cooperative space program under NASA auspices. During the year three international scientific satellites were successfully launched. These included the Canadian-built International Satellite for Ionosphere Studies (ISIS) I; a spacecraft for the European Space Research Organization (ESRO) to study energetic particles in space; the first satellite in a cooperative program with the Federal Republic of Germany called Azur I to make measurements of the Earth's radiation belt, the aurorae and solar particle events. Additionally, numerous sounding rocket launchings were conducted in cooperation with scientists throughout the world, often from foreign launch sites.

Applications Satellites - Goddard is the primary NASA Center for weather, communications and Earth resources satellite efforts. During the year the third Nimbus research and development spacecraft was successfully launched carrying several advanced weather sensing devices which may eventually provide the technology to make possible long-range computerized weather predictions on a global basis; two other weather satellites in the TIROS Operational System were orbited for the U.S. Weather Bureau. In the communications area two synchronous orbit satellites were launched for the Communications Satellite Corporation, and the first British-built Skynet military communications satellite was successfully placed in synchronous orbit. A major milestone was achieved with the initiation of a program for development of the first two U.S. Earth Resources Technology Satellites.

Sounding Rockets - During 1969 more than 120 sounding rocket launchings were conducted by Goddard, bringing to more than 1,270 the number of launchings in the program since 1959.

Tracking and Data Acquisition - The Goddard-managed Space Tracking and Data Acquisition Network provided communications and tracking coverage for all of NASA's scientific and applications satellites launched during the year. The Manned Space Flight Network provided global tracking support for four Apollo manned flights, including the historic first landing of man on the Moon during Apollo 11.

DESCRIPTION:

The Goddard Space Flight Center, located 15 miles northeast of Washington, D. C. at Greenbelt, Maryland, is situated on a 554-acre main site. Three additional plots of 639 acres comprise the remote site area and contain the Goddard Antenna Test Range, the Goddard Optical Facility, the Propulsion Research Facility, the Magnetic Fields Component Test Facility, the Attitude Control Test Facility, and the Network Training and Test Facility.

The total capital investment for the Goddard Space Flight Center, including fixed assets in progress and contractor held facilities at various locations as of June 30, 1969, was $563,331,000 (includes capital type facilities of the MSF and STADAN network and other supporting activities including equipment aboard ships and aircraft).

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

Functions	1969	1970	1971
Personnel.....	$56,252,000	$68,728,000	$70,929,000
Travel.....	1,665,000	2,265,000	2,584,000
Automatic data processing.....	5,987,000	5,042,000	5,723,000
Facilities services.....	4,825,000	4,472,000	4,048,000
Technical services.....	967,000	801,000	796,000
Administrative support.....	3,531,000	3,464,000	3,590,000
Total, fund requirements.....	$73,227,000	$84,772,000	$87,670,000

PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo.....	5	3	3
Space flight operations.....	1	---	---
Space Science and Applications			
Physics and astronomy.....	1,245	1,334	1,237
Lunar and planetary exploration..	104	117	104
Bioscience.....	11	5	---
Space applications.....	445	476	564
Launch vehicle procurement.....	43	41	41

	1969	1970	1971
1. Permanent Positions by Program (Cont'd.):			
Advanced Research and Technology			
Basic research.....	2	2	3
Space vehicle systems.....	60	48	54
Electronics systems.....	60	83	92
Human factor systems.....	---	1	---
Space power and electric propulsion systems.....	45	36	44
Chemical propulsion.....	13	5	6
Tracking and Data Acquisition.....	828	884	888
Subtotal, positions by program..	2,862	3,035	3,036
2. Indirect Positions:			
Director and staff.....	16	16	16
Administrative support.....	826	941	942
Research and development support....	437	420	418
Subtotal, indirect positions.....	1,279	1,377	1,376
Total, permanent positions.....	4,141	4,412	4,412

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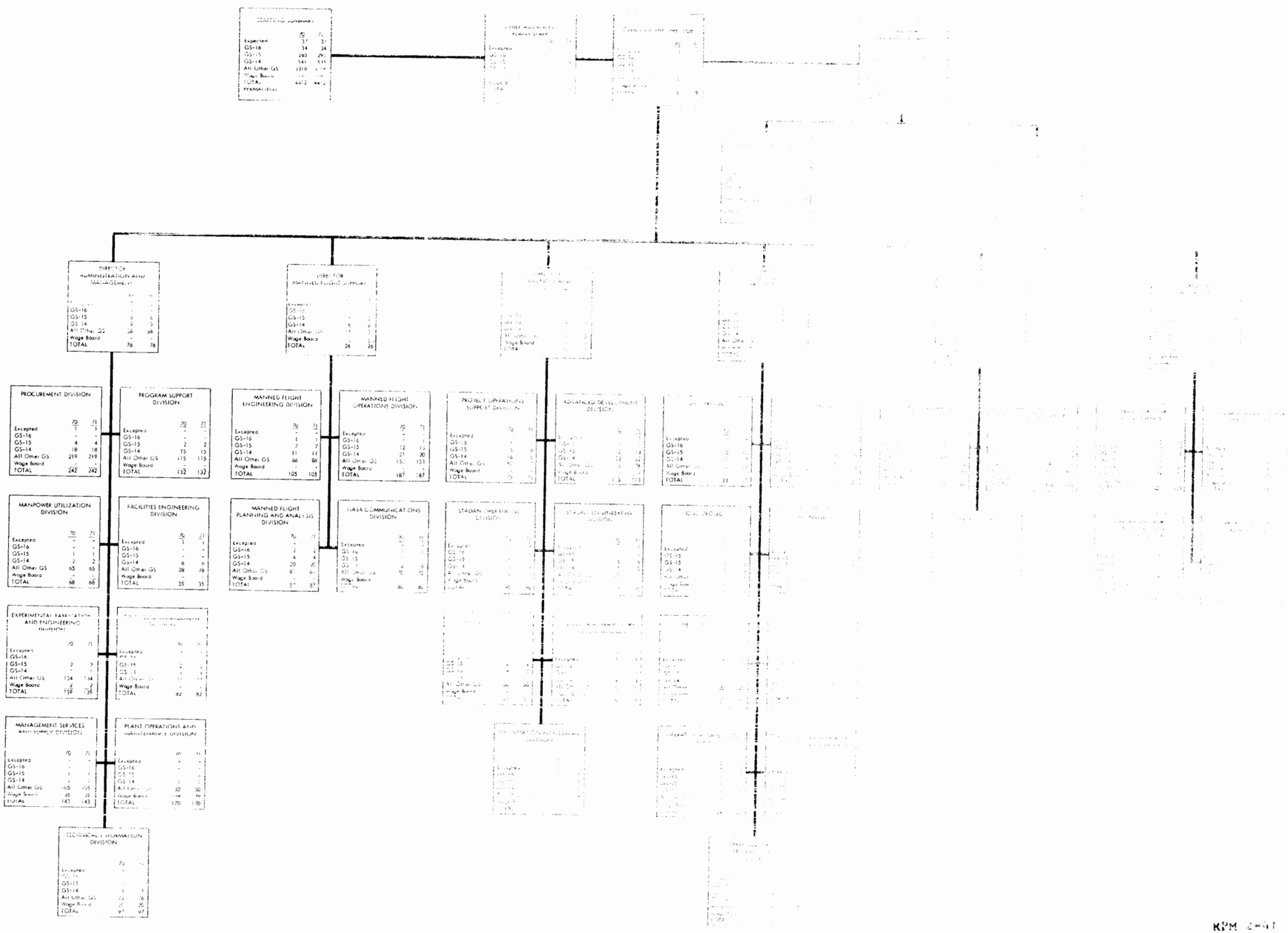
GODDARD SPACE FLIGHT CENTER

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ORGANIZATION AND STAFFING SUMMARY



KPM 2-41

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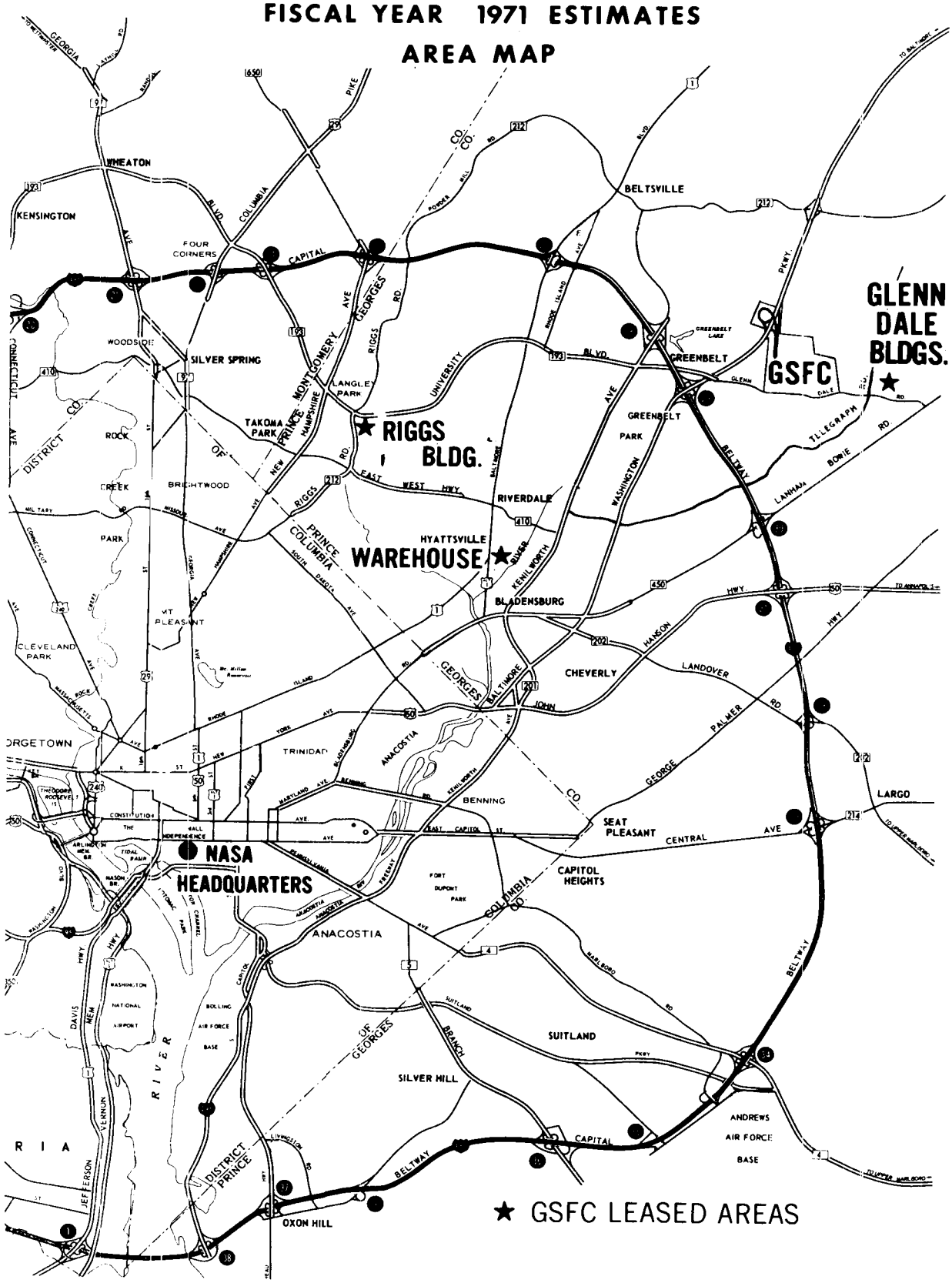
GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1971 ESTIMATES
AREA MAP



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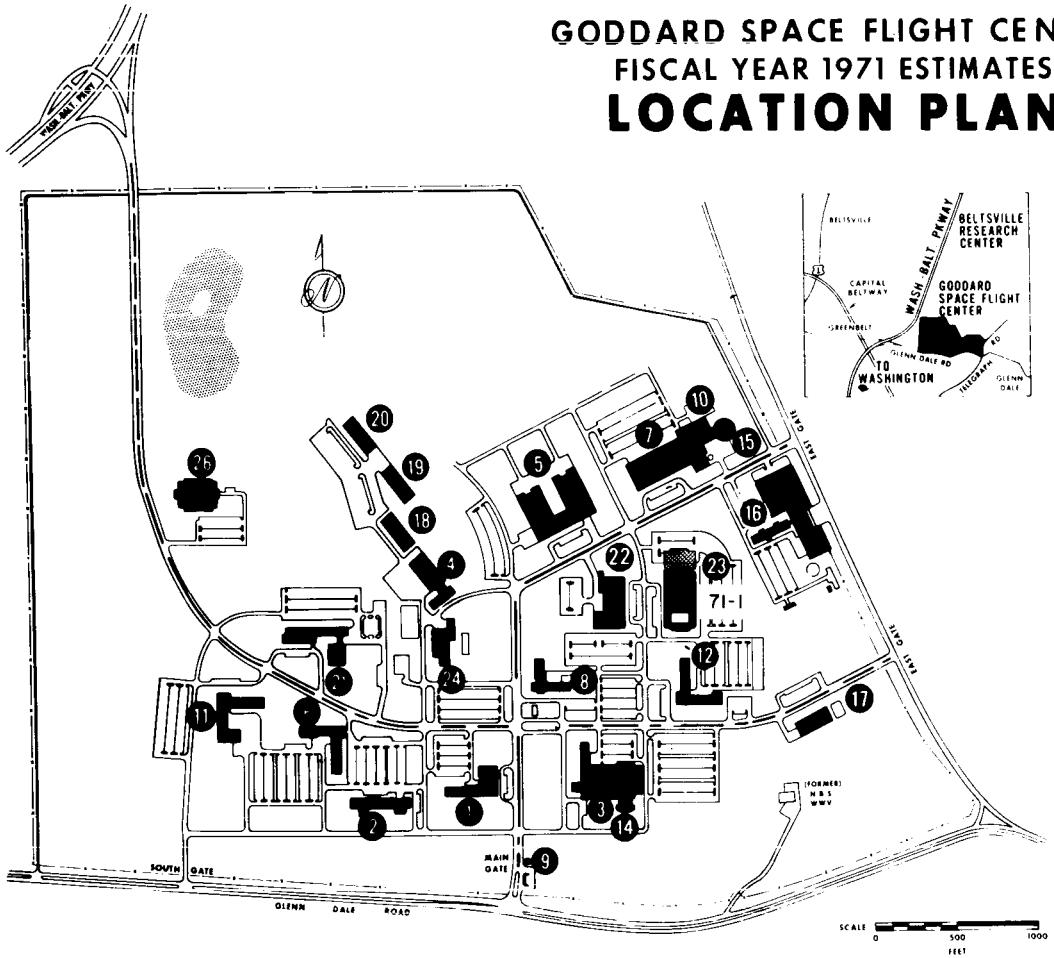
GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1971 ESTIMATES
LOCATION PLAN



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

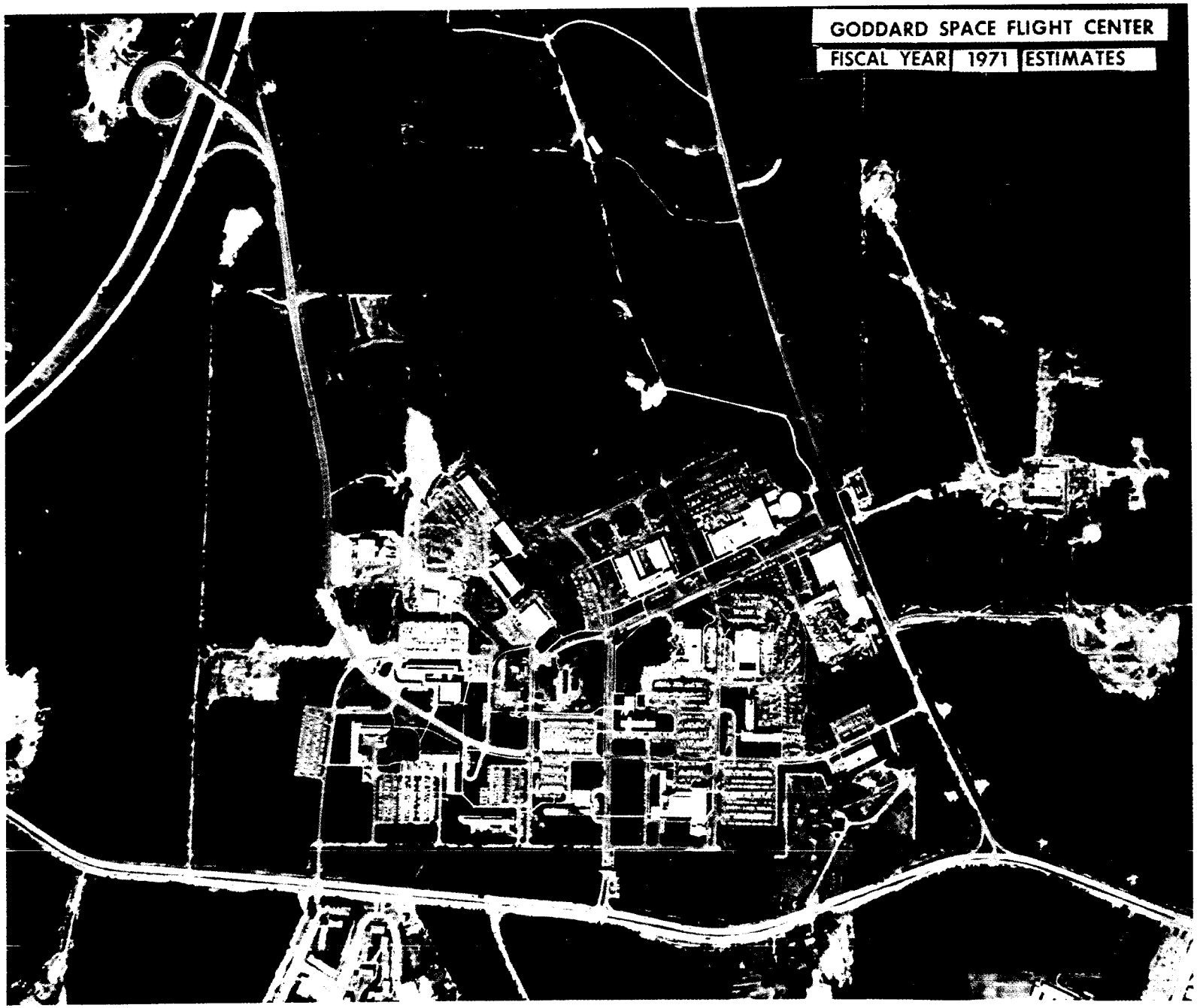
FACILITIES PROPOSED IN 1971 ESTIMATES

71-1 Earth Resources Technology Laboratory

EXISTING FACILITIES

FACILITIES UNDER CONSTRUCTION

FACILITIES PROPOSED IN 1971 ESTIMATES


GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1971 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

WALLOPS STATION

MISSION:

Wallops Station is primarily an operational base for launching rockets, satellites, space probes and other scientific experiments and for conducting aeronautical research. Its basic mission is to prepare, assemble, launch, and track space vehicles and to acquire scientific data. The facilities of Wallops Station are used by scientists and engineers from the laboratories and research centers of NASA, other government agencies, colleges and universities, and the world-wide scientific community. Wallops Station personnel assist these scientific research teams with their project; develop, as necessary, special types of instrumentation and equipment to complement the missions; and manage NASA sponsored research projects. Research at Wallops is directed toward gathering information about the Earth's atmosphere, its near-space environment, and in the field of aeronautics.

In addition to supporting the rocket-propelled experiments, Wallops uses its facilities for many other research projects, such as space component tests utilizing helicopter or aircraft drops, helicopter and aircraft noise abatement projects, slow speed landing techniques for jet aircraft, anti-skid tests on grooved runways, V/STOL terminal area research, collision avoidance program, and laser and radar tracking of aircraft and satellites. A portion of Wallops' effort is devoted to NASA's program of international cooperation in space research. Sixty countries have sent representatives to observe operations and procedures. Wallops has assisted 17 of these countries with training of personnel, activation of their launch sites, or launching their experiments. Wallops' mission also includes management of several NASA sponsored projects, such as the Orbiting Frog Otolith (OFO) project, the Experimental Inter-American Meteorological Rocket Network (EXAMETNET), the 1970 Solar Eclipse project, the German barium project, a Bio-Space Technology Training Program for bioscientists, operation of remote site launching and tracking facilities, and an Arctic launch site at Point Barrow, Alaska.

In the early years, research at Wallops was concentrated on obtaining aerodynamic data at transonic and low supersonic speeds as part of the effort to penetrate the sound barrier of flight. Today, the facility is obtaining scientific data about the atmosphere and the space environment utilizing launch vehicles ranging in size from the small Arcas and Hasp meteorological rockets to the 72-foot Scout with orbital capability. Twelve satellites have been launched. Wallops has launched more than 7,500 research vehicles consisting of from one to seven stages in the quest for scientific knowledge.

Wallops Station's achievements during the past calendar year include: the

launching of 309 sounding rockets, conducting the fifth annual Bio-Space Technology Training Program, launching the last in a series of four Gravity Preference experiments, the 5 1/2-ton Astrobee cosmic radio noise experiment, the Aerobee 350 artificial auroras experiment, the Pacemaker materials experiment, and the first two launchings of the Canadian Black Brant IIIB vehicle. Four 175-foot diameter research balloons were launched with a variety of experiments on board in a joint AFCRL/NASA project. Wallops air recovery team successfully completed another aerial recovery. One hundred forty-five foreign nationals representing 18 countries visited the installation to observe its operations or seek assistance in establishing a sounding rocket facility of their own.

DESCRIPTION:

Wallops Station includes three separate areas on the Atlantic Coast of Virginia's eastern shore: the main base (formerly Chincoteague Naval Air Station), the Wallops Island launching site and the Wallops mainland. The administrative offices, the range control center, support shops and the main telemetry buildings are located on the main base. Wallops Island is about seven miles southeast of the main base and is connected to the mainland by a causeway and bridge. The island is about five miles long and its widest point is only one-half mile. Located on the island are rocket storage buildings, blockhouses, assembly shops and the launch sites. The Wallops mainland is a one-half mile strip west of the island and houses the radar and optical tracking sites. An additional Wallops holding is the Eastville tracking site located about 50 miles south of Wallops Station.

Wallops Station, totaling 6,561 acres, consists of 2,313 acres on the main base; 3,000 acres on Wallops Island, 108 acres on the mainland tracking site; and 1,140 acres of unusable marsh land. The Eastville tracking site consists of an additional 53 acres of government-owned property. The total capital investment at Wallops Station, including fixed assets in progress and contractor held facilities at various locations as of June 30, 1969, was $108,521,000.

SUMMARY OF RESOURCES REQUIREMENTS:

	FUNDS		
Functions	1969	1970	1971
Personnel.....	$5,601,000	$6,266,000	$6,480,000
Travel.....	117,000	157,000	175,000
Automatic data processing.....	79,000	62,000	65,000
Facilities services.....	2,272,000	2,212,000	2,205,000
Technical services.....	51,000	59,000	58,000
Administrative support.....	982,000	789,000	808,000
Total, fund requirements.....	$9,102,000	$9,545,000	$9,791,000

PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Space Science and Applications			
Physics and astronomy.....	71	71	71
Bioscience.....	17	17	17
Space applications.....	18	18	26
Launch vehicle procurement.....	1	1	1
Advanced Research and Technology			
Space vehicle systems.....	7	7	7
Electronics systems.....	8	8	8
Human factor systems.....	8	8	---
Aeronautical vehicles.....	9	9	9
Tracking and Data Acquisition.....	118	118	118
Subtotal, positions by program...	257	257	257
2. Indirect Positions:			
Director and staff.....	6	6	6
Administrative support.....	95	95	95
Research and development support.....	126	130	130
Subtotal, indirect positions.....	227	231	231
Total, permanent positions.....	484	488	488

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ORGANIZATION AND STAFFING CHART

WALLOPS STATION

STAFFING CHART

	70 CY	71 BY
Excepted	2	2
GS-16	1	1
GS-15	9	9
GS-14	22	22
All Other GS	374	384
Wage Board	80	70
Total Permanent	488	488

DIRECTOR

	70 CY	71 BY
Excepted	2	2
GS-15	1	1
GS-14	1	1
All Other GS	2	2
Total Permanent	6	6

FLIGHT TEST DIVISION

	70 CY	71 BY
GS-15	2	2
GS-14	6	6
All Other GS	128	134
Wage Board	11	5
Total Permanent	147	147

RANGE ENGINEERING DIVISION

	70 CY	71 BY
GS-16	1	1
GS-15	4	4
GS-14	14	14
All Other GS	86	86
Total Permanent	105	105

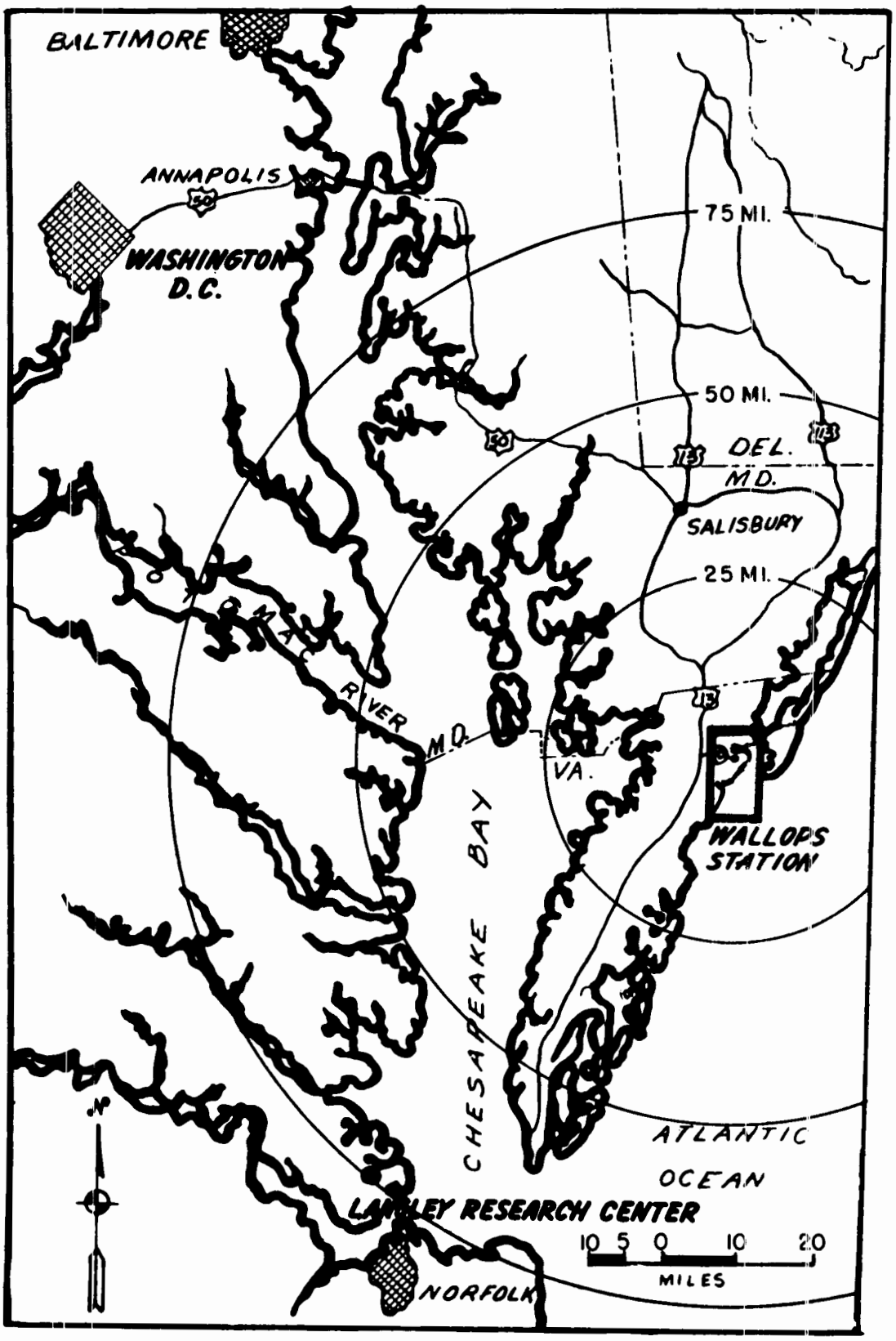
ADMINISTRATIVE MANAGEMENT DIVISION

	70 CY	71 BY
GS-15	1	1
GS-14	1	1
All Other GS	92	92
Wage Board	1	1
Total Permanent	95	95

TECHNICAL SERVICES DIVISION

	70 CY	71 BY
GS-15	1	1
GS-14	0	0
All Other GS	66	70
Wage Board	68	64
Total Permanent	135	135

WALLOPS STATION LOCATION



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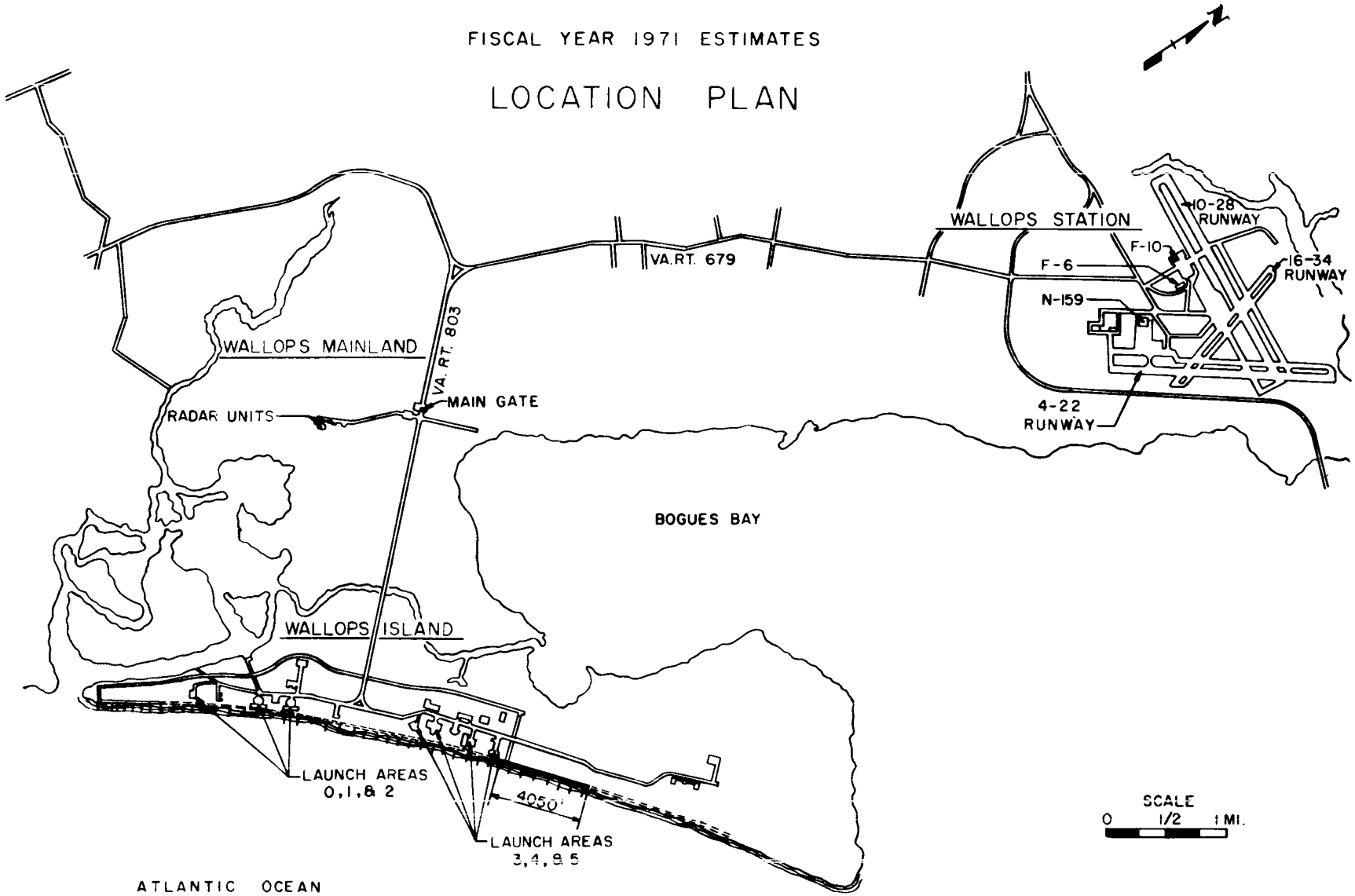
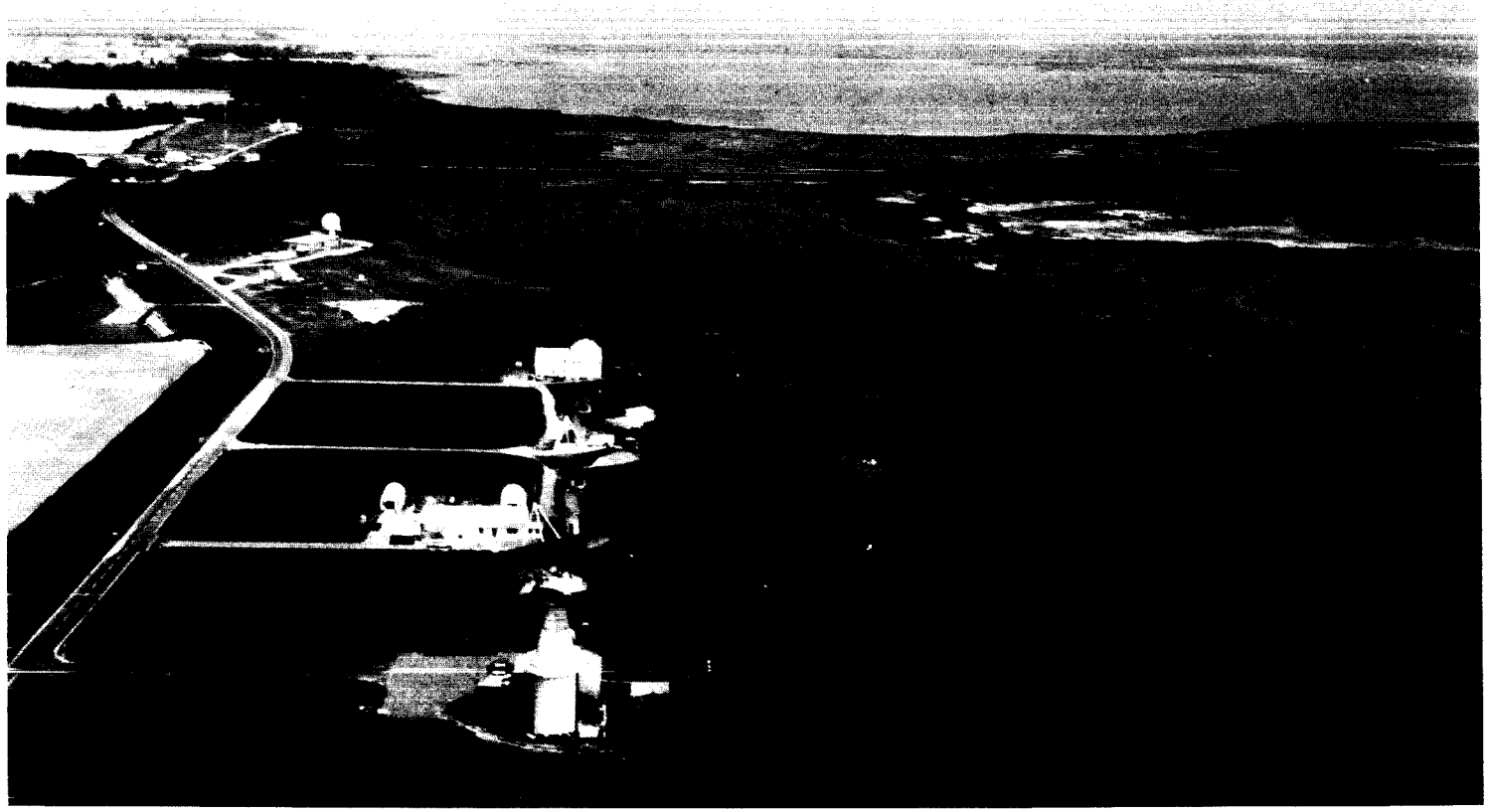
WALLOPS STATION

FISCAL YEAR 1971 ESTIMATES

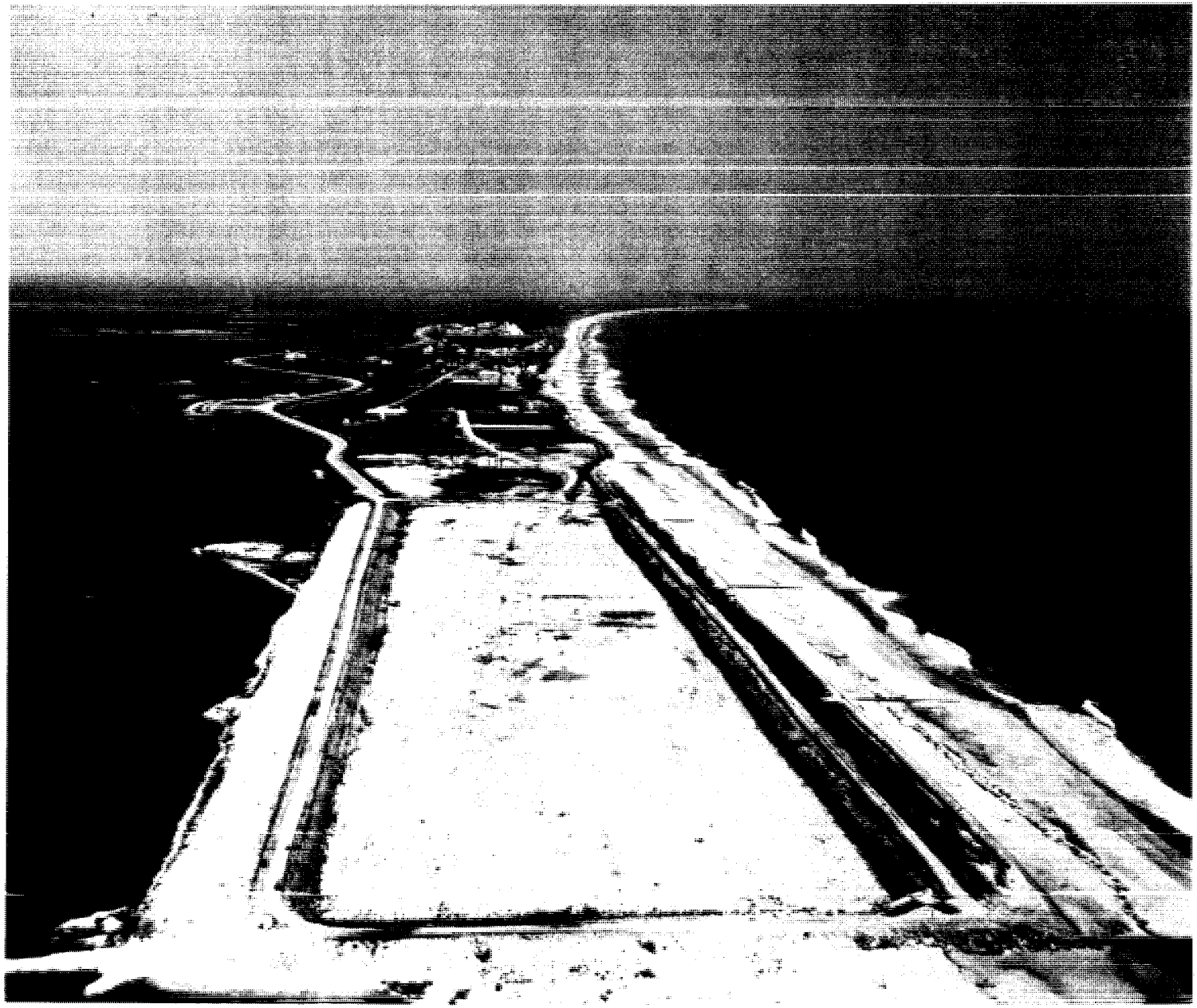
LOCATION PLAN



WALLOPS STATION



Tracking Radar Facilities on Wallops Mainland



South Wallops Island Looking North

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

AMES RESEARCH CENTER

MISSION:

The programs at the Ames Research Center are directed at research and development in the fields of aeronautics and spacecraft technology as well as application to national needs of the new science and technology growing out of the aerospace program. In carrying out this mission, the Center works closely with the aerospace and educational communities in an effort to take full advantage of the nation's manpower capabilities. More specifically, the Ames Research Center has, in addition to the traditional research mission in the physical sciences, a major research responsibility in the life and space sciences, flight project management responsibility, and the operational responsibility for the NASA Convair 990 aircraft to conduct airborne scientific experiments.

This installation has flight project management responsibility for the Pioneer project. Pioneer provides scientific observations of phenomena in interplanetary space from an unmanned spacecraft.

Research in the physical sciences includes studies in atmosphere entry and environmental physics, guidance and control systems, and aeronautics. The work in entry and environmental physics includes basic studies of the physics of high-temperature gases, the stability, control, and performance of a wide range of spacecraft configurations, and of materials and structures for spacecraft. In the area of gas physics, particular emphasis is placed on problems associated with flight into earth and other planetary atmospheres. Through this effort, significant contributions have been made to the design of the Mercury, Gemini, and Apollo spacecraft, the design of Mars and Venus entry vehicles, and the design of ballistic missiles.

The work in guidance and control systems is broad in nature and is applicable to manned and unmanned spacecraft, as well as aircraft. Current emphasis in guidance systems is directed mainly at current and follow-on manned missions. This includes an intensive theoretical and experimental effort in the areas of midcourse navigation and terminal guidance with a small effort directed at studies involving lunar approach, lunar landing, and rendezvous. The research and technology in control systems is directed at examining various techniques applicable to unmanned satellites and probes and techniques applicable to vertical and short take-off (V/STOL) aircraft, the supersonic transport, and manned spacecraft.

The research program in aeronautics is directed at fundamental studies in aerodynamics, propulsion and operating problems associated with supersonic aircraft with particular emphasis on the supersonic transport, a wide variety of V/STOL vehicles, and hypersonic research aircraft. This includes studies of piloting problems with numerous fixed-base, moving-base, and flight simulators.

Research in the space sciences includes studies in the field of solar physics, planetary environments, and geophysics. This includes ground based and sounding rocket experiments as well as experiments requiring specialized instruments aboard satellites and space probes. The work covers studies pertaining to magnetic fields and plasmas in space, studies to determine the composition and structure of planets and of planetary and stellar atmospheres, and studies of cratering mechanics in natural materials to aid in understanding the structure of lunar surfaces.

Research in the life sciences is conducted in three major areas: (1) basic research in the physiological and behavioral sciences concerned with obtaining a basic understanding of the effects of terrestrial and extraterrestrial environments and of space flight stresses upon living organisms, including man; (2) studies in exobiology oriented towards the prediction, detection, and study of extraterrestrial fossils, chemicals, and life forms including an active participation in defining the science package for Viking; and (3) research in long-term advanced life support systems and in the human factors aspects of the relationships between man and the machines which transport and support him during lunar and planetary exploration.

DESCRIPTION:

The Ames Research Center was established in 1940, and is located at the southern end of San Francisco Bay on land contiguous to the U. S. Naval Air Station, Moffett Field, California. Its physical plant comprises many specialized facilities for aerospace research in the traditional physical sciences as well as the space sciences and life sciences, all of which are included in the mission of the Center. These include conventional wind tunnels, entry-heating simulators, and free-flight ballistic test facilities capable of conducting tests at speeds up to and above earth escape speed as well as laboratories equipped to study solar and geophysical phenomena, life synthesis, life detection, and life environmental factors. The Ames Research Center occupies about 365 acres of land. Certain other facilities, such as the utilities and airfield runways, are used jointly by NASA and the Department of the Navy. The capital investment at the Ames Research Center, including fixed assets in progress, and contractor held facilities at various locations as of June 30, 1969, was $237,827,000.

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

Functions	1969	1970	1971
Personnel	$28,477,000	$31,059,000	$32,385,000
Travel	694,000	736,000	921,000
Automatic data processing	324,000	115,000	115,000
Facilities services	3,659,000	3,696,000	4,073,000
Technical services	41,000	9,000	9,000
Administrative support	837,000	744,000	745,000
Total, fund requirements	$34,032,000	$36,359,000	$38,248,000

PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	14	7	7
Space Science and Applications			
Physics and astronomy	58	57	57
Lunar and planetary exploration	118	118	118
Bioscience	144	144	144
Space applications	5	5	5
Advanced Research and Technology			
Basic research	326	325	325
Space vehicle systems	197	197	197
Electronics systems	161	160	160
Human factor systems	149	149	149
Space power and electric propulsion systems	23	23	23
Aeronautical vehicles	382	398	398
Technology Utilization	4	4	4
Subtotal, direct positions	1,581	1,587	1,587

	1969	1970	1971
2. **Indirect Positions:**			
Director and staff.....	37	37	37
Administrative support.....	246	218	218
Research and development support.....	128	130	130
Subtotal, indirect positions.....	411	385	385
Total, permanent positions.....	1,992	1,972	1,972

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART
AMES RESEARCH CENTER

STAFFING SUMMARY

	70	71
Excepted	22	22
GS-16	26	26
GS-15	137	140
GS-14	210	219
All Other GS	1092	1080
Wage Board	485	485
Total Permanent	1972	1972

DIRECTOR

	70	71
Excepted	2	2
GS-16	1	1
GS-15	3	3
GS-14	-	-
All Other GS	7	7
Wage Board	-	-
Total Permanent	13	13

OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY
(NASA HEADQUARTERS)

TECHNOLOGY UTILIZATION OFFICE

	70	71
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	1	1
All Other GS	2	2
Wage Board	-	-
Total Permanent	4	4

PROGRAMS & RESOURCES OFFICE

	70	71
Excepted	-	-
GS-16	1	1
GS-15	2	2
GS-14	3	3
All Other GS	5	5
Wage Board	-	-
Total Permanent	11	11

PUBLIC AFFAIRS OFFICE

	70	71
Excepted	-	-
GS-16	-	-
GS-15	-	-
GS-14	1	1
All Other GS	4	4
Wage Board	-	-
Total Permanent	5	5

MEDICAL OFFICE

	70	71
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	-	-
All Other GS	-	-
Wage Board	-	-
Total Permanent	1	1

LEGAL OFFICE

	70	71
Excepted	-	-
GS-16	-	-
GS-15	2	2
GS-14	2	2
All Other GS	2	2
Wage Board	-	-
Total Permanent	6	6

DIRECTOR AERONAUTICS & FLIGHT MECHANICS

	70	71
Excepted	1	1
GS-16	-	-
GS-15	2	2
GS-14	1	1
All Other GS	4	4
Wage Board	-	-
Total Permanent	8	8

DIRECTOR ASTRONAUTICS

	70	71
Excepted	1	1
GS-16	-	-
GS-15	11	11
GS-14	-	-
All Other GS	1	1
Wage Board	-	-
Total Permanent	3	3

DIRECTOR LIFE SCIENCES

	70	71
Excepted	2	2
GS-16	-	-
GS-15	-	-
GS-14	-	-
All Other GS	3	3
Wage Board	-	-
Total Permanent	5	5

DIRECTOR DEVELOPMENT

	70	71
Excepted	1	1
GS-16	-	-
GS-15	1	1
GS-14	-	-
All Other GS	1	1
Wage Board	-	-
Total Permanent	3	3

DIRECTOR ADMINISTRATION

	70	71
Excepted	1	1
GS-16	-	-
GS-15	-	-
GS-14	2	2
All Other GS	1	1
Wage Board	-	-
Total Permanent	4	4

DIRECTOR RESEARCH SUPPORT

	70	71
Excepted	1	1
GS-16	-	-
GS-15	1	1
GS-14	-	-
All Other GS	1	1
Wage Board	-	-
Total Permanent	3	3

MISSION ANALYSIS DIVISION

	70	71
Excepted	3	3
GS-16	1	1
GS-15	7	7
GS-14	12	12
All Other GS	25	25
Wage Board	-	-
Total Permanent	48	48

AERONAUTICS DIVISION

	70	71
Excepted	-	-
GS-16	2	2
GS-15	7	7
GS-14	15	17
All Other GS	101	99
Wage Board	22	22
Total Permanent	147	147

THERMO- & GAS-DYNAMICS DIVISION

	70	71
Excepted	2	2
GS-16	2	2
GS-15	20	20
GS-14	22	22
All Other GS	102	99
Wage Board	10	10
Total Permanent	158	158

EXOBIOLOGY DIVISION

	70	71
Excepted	-	-
GS-16	1	1
GS-15	2	3
GS-14	4	5
All Other GS	35	33
Wage Board	-	-
Total Permanent	42	42

SYSTEMS ENGINEERING DIVISION

	70	71
Excepted	-	-
GS-16	1	1
GS-15	8	8
GS-14	12	12
All Other GS	11	11
Wage Board	-	-
Total Permanent	32	32

SERVICES & SUPPLY DIVISION

	70	71
Excepted	-	-
GS-16	-	-
GS-15	-	-
GS-14	1	1
All Other GS	45	45
Wage Board	19	19
Total Permanent	65	65

RESEARCH FACILITIES & EQUIPMENT DIVISION

	70	71
Excepted	-	-
GS-16	1	1
GS-15	5	5
GS-14	10	10
All Other GS	99	99
Wage Board	94	94
Total Permanent	209	209

FULL-SCALE & SYSTEMS RESEARCH DIVISION

	70	71
Excepted	-	-
GS-16	5	5
GS-15	16	16
GS-14	20	21
All Other GS	70	69
Wage Board	6	6
Total Permanent	117	117

VEHICLE ENVIRONMENT DIVISION

	70	71
Excepted	1	1
GS-16	4	4
GS-15	13	14
GS-14	15	18
All Other GS	103	99
Wage Board	14	14
Total Permanent	150	150

ENVIRONMENTAL BIOLOGY DIVISION

	70	71
Excepted	2	2
GS-16	1	1
GS-15	6	6
GS-14	7	7
All Other GS	34	34
Wage Board	6	6
Total Permanent	56	56

PROJECT PIONEER

	70	71
Excepted	1	1
GS-16	-	-
GS-15	6	6
GS-14	13	13
All Other GS	30	30
Wage Board	-	-
Total Permanent	50	50

FISCAL DIVISION

	70	71
Excepted	-	-
GS-16	-	-
GS-15	-	-
GS-14	1	1
All Other GS	51	51
Wage Board	-	-
Total Permanent	52	52

TECHNICAL SERVICES DIVISION

	70	71
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	1	1
All Other GS	20	20
Wage Board	185	185
Total Permanent	207	207

INSTRUMENTATION DIVISION

	70	71
Excepted	-	-
GS-16	-	-
GS-15	6	6
GS-14	9	9
All Other GS	109	109
Wage Board	51	51
Total Permanent	176	176

SPACE SCIENCES DIVISION

	70	71
Excepted	1	1
GS-16	2	2
GS-15	15	15
GS-14	14	14
All Other GS	34	34
Wage Board	-	-
Total Permanent	66	66

BIOTECHNOLOGY DIVISION

	70	71
Excepted	-	-
GS-16	1	1
GS-15	4	4
GS-14	15	15
All Other GS	36	36
Wage Board	-	-
Total Permanent	56	56

PROJECT BIOSATELLITE

	70	71
Excepted	-	-
GS-16	1	1
GS-15	1	1
GS-14	13	13
All Other GS	27	27
Wage Board	2	2
Total Permanent	45	45

PERSONNEL DIVISION

	70	71
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	2	2
All Other GS	44	44
Wage Board	-	-
Total Permanent	47	47

COMPUTATION DIVISION

	70	71
Excepted	-	-
GS-16	1	1
GS-15	1	1
GS-14	5	5
All Other GS	41	41
Wage Board	-	-
Total Permanent	49	49

SIMULATION SCIENCES DIVISION

	70	71
Excepted	-	-
GS-16	1	1
GS-15	3	3
GS-14	7	7
All Other GS	19	19
Wage Board	3	3
Total Permanent	33	33

PROCUREMENT DIVISION

	70	71
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	1	1
All Other GS	56	56
Wage Board	-	-
Total Permanent	58	58

TECHNICAL INFORMATION DIVISION

	70	71
Excepted	-	-
GS-16	-	-
GS-15	-	-
GS-14	1	1
All Other GS	32	32
Wage Board	10	10
Total Permanent	43	43

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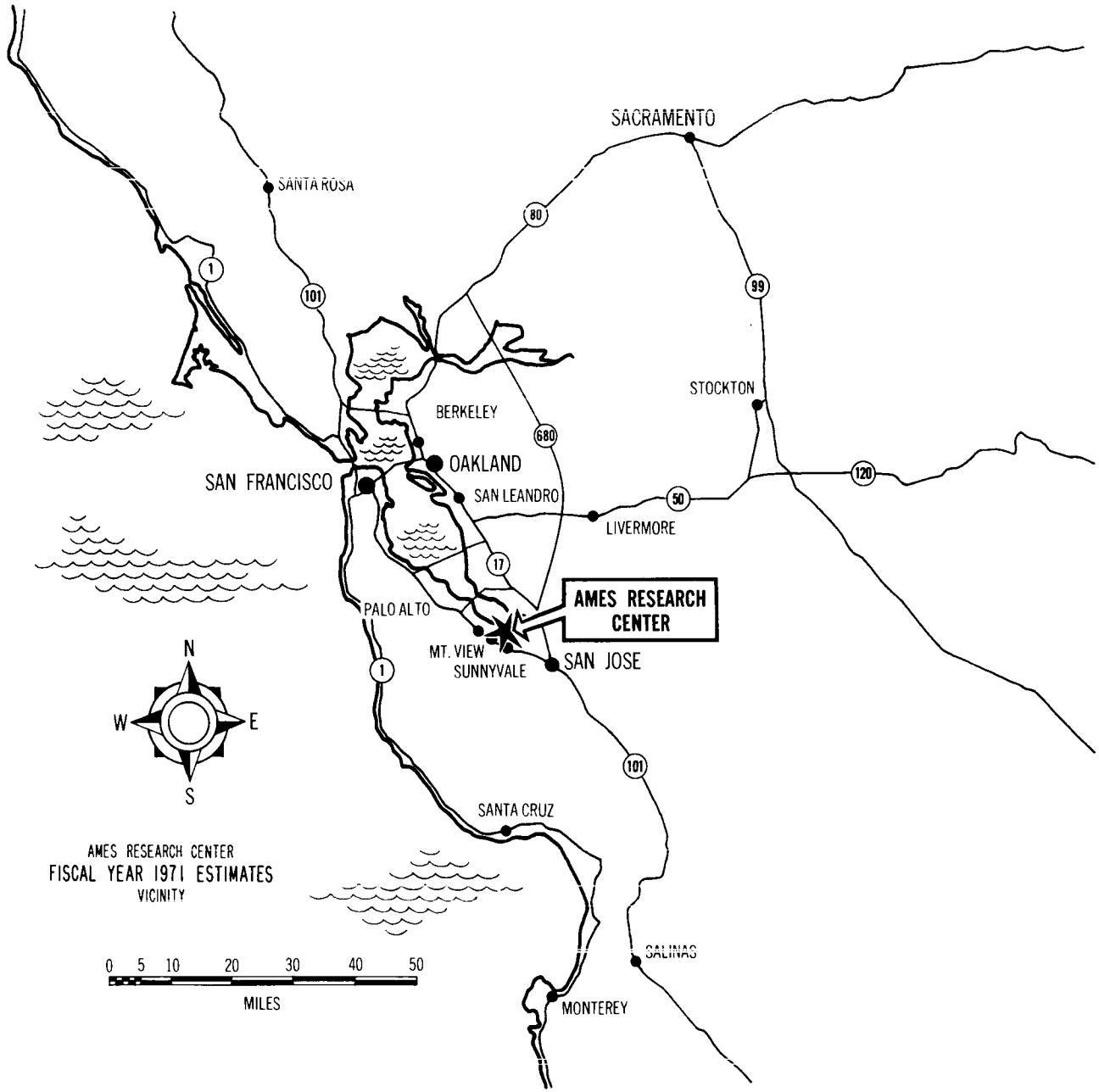

AMES RESEARCH CENTER
FISCAL YEAR 1971 ESTIMATES
VICINITY

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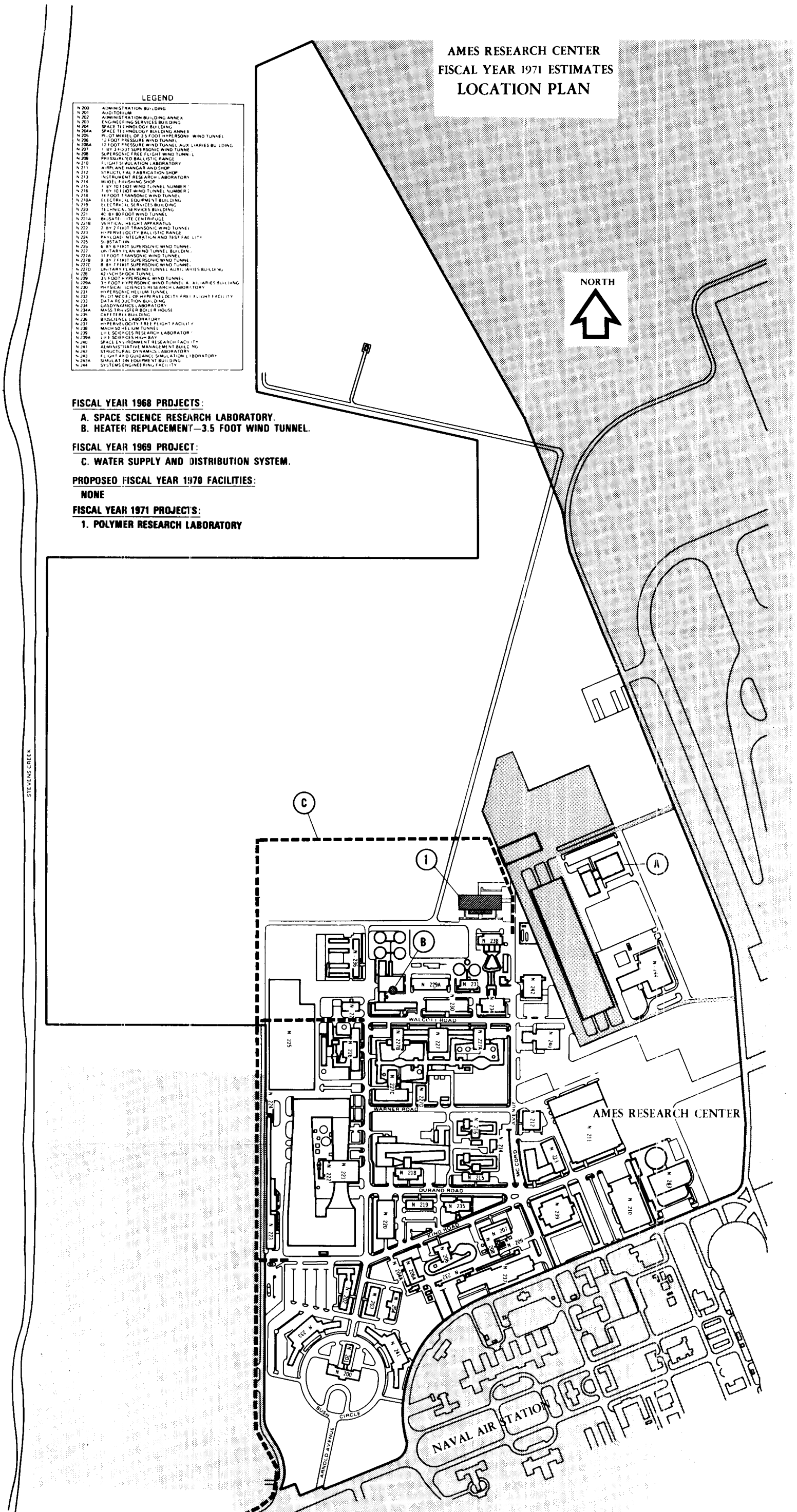
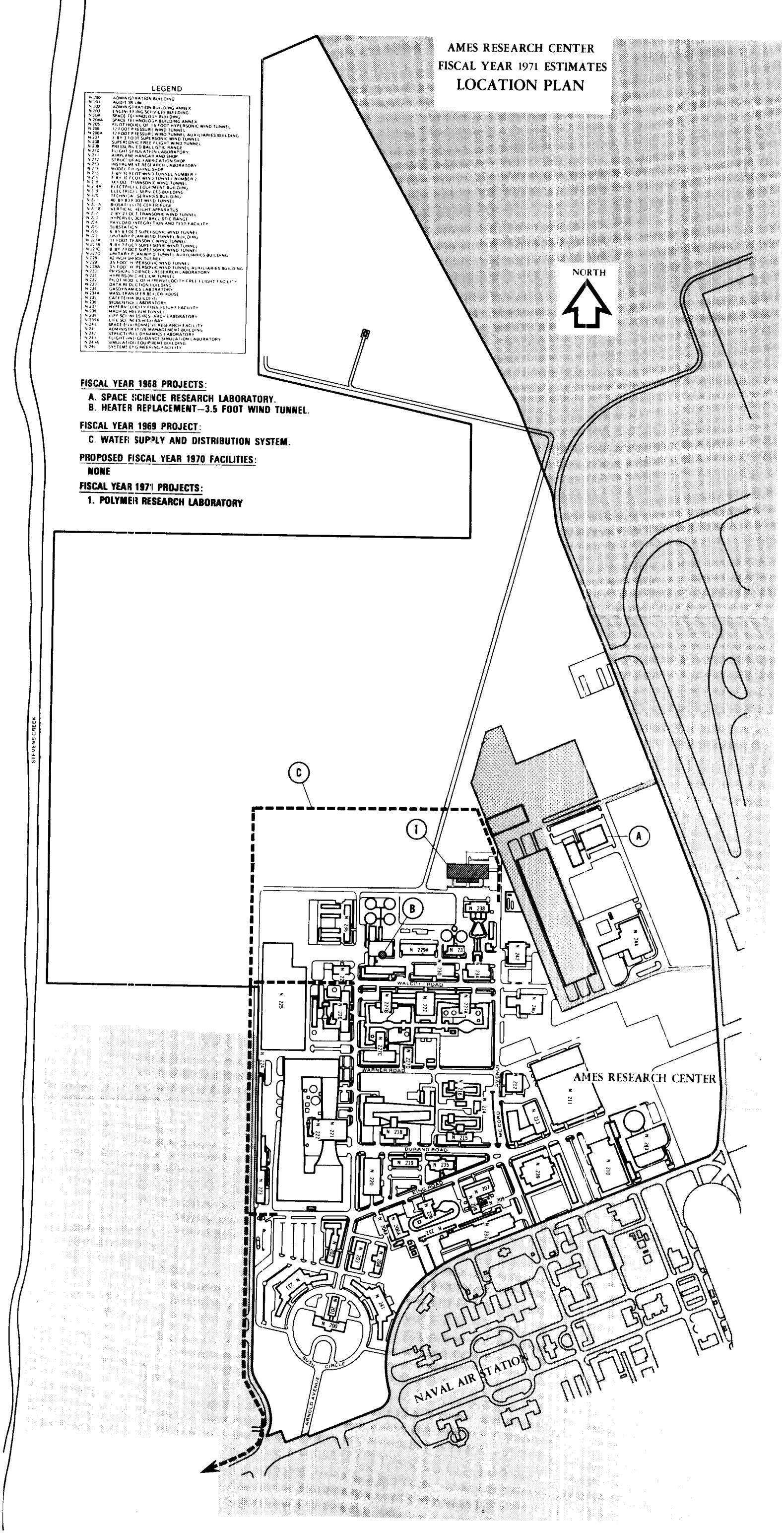


AMES RESEARCH CENTER
FISCAL YEAR 1971 ESTIMATES
LOCATION PLAN



LEGEND

N-100	ADMINISTRATION BUILDING
N-101	AUDITORIUM
N-102	ADMINISTRATION BUILDING ANNEX
N-103	ENGINEERING SERVICES BUILDING
N-104	SPACE TECHNOLOGY BUILDING
N-104A	SPACE TECHNOLOGY BUILDING ANNEX
N-205	PILOT MODEL OF 15 FOOT HYPERSONIC WIND TUNNEL
N-206	12 FOOT PRESSURE WIND TUNNEL
N-206A	12 FOOT PRESSURE WIND TUNNEL AUXILIARIES BUILDING
N-207	1 BY 3 FOOT SUPERSONIC WIND TUNNEL
N-208	SUPERSONIC FREE FLIGHT WIND TUNNEL
N-209	PRESSURIZED BALLISTIC RANGE
N-210	FLIGHT SIMULATION LABORATORY
N-211	AIRPLANE HANGAR AND SHOP
N-212	STRUCTURAL FABRICATION SHOP
N-213	INSTRUMENT RESEARCH LABORATORY
N-214	MODEL FINISHING SHOP
N-215	7 BY 10 FOOT WIND TUNNEL NUMBER 1
N-216	7 BY 10 FOOT WIND TUNNEL NUMBER 2
N-218	14 FOOT TRANSONIC WIND TUNNEL
N-218A	ELECTRICAL EQUIPMENT BUILDING
N-219	ELECTRICAL SERVICES BUILDING
N-220	TECHNICAL SERVICES BUILDING
N-221	40 BY 80 FOOT WIND TUNNEL
N-221A	BIOSATELLITE CENTRIFUGE
N-221B	VERTICAL HEIGHT APPARATUS
N-222	2 BY 2 FOOT TRANSONIC WIND TUNNEL
N-223	HYPERVELOCITY BALLISTIC RANGE
N-224	PAYLOAD INTEGRATION AND TEST FACILITY
N-225	SUBSTATION
N-226	6 BY 6 FOOT SUPERSONIC WIND TUNNEL
N-227	UNITARY PLAN WIND TUNNEL BUILDING
N-227A	11 FOOT TRANSONIC WIND TUNNEL
N-227B	9 BY 7 FOOT SUPERSONIC WIND TUNNEL
N-227C	8 BY 7 FOOT SUPERSONIC WIND TUNNEL
N-227D	UNITARY PLAN WIND TUNNEL AUXILIARIES BUILDING
N-228	42 INCH SHOCK TUNNEL
N-229	3.5 FOOT HYPERSONIC WIND TUNNEL
N-229A	3.5 FOOT HYPERSONIC WIND TUNNEL AUXILIARIES BUILDING
N-232	PHYSICAL SCIENCES RESEARCH LABORATORY
N-233	HYPERSONIC HELIUM TUNNEL
N-237	PILOT MODEL OF HYPERVELOCITY FREE FLIGHT FACILITY
N-233	DATA REDUCTION BUILDING
N-234	GASDYNAMICS LABORATORY
N-234A	MASS TRANSFER BOILER HOUSE
N-235	CAFETERIA BUILDING
N-236	BIOSCIENCE LABORATORY
N-237	HYPERVELOCITY FREE FLIGHT FACILITY
N-238	MACH SC HELIUM TUNNEL
N-239	LIFE SCIENCES RESEARCH LABORATORY
N-239A	LIFE SCIENCES HIGH BAY
N-240	SPACE ENVIRONMENT RESEARCH FACILITY
N-241	ADMINISTRATIVE MANAGEMENT BUILDING
N-242	STRUCTURAL DYNAMICS LABORATORY
N-243	FLIGHT AND GUIDANCE SIMULATION LABORATORY
N-243A	SIMULATION EQUIPMENT BUILDING
N-244	SYSTEMS ENGINEERING FACILITY

FISCAL YEAR 1968 PROJECTS:

A. SPACE SCIENCE RESEARCH LABORATORY.
B. HEATER REPLACEMENT—3.5 FOOT WIND TUNNEL.

FISCAL YEAR 1969 PROJECT:

C. WATER SUPPLY AND DISTRIBUTION SYSTEM.

PROPOSED FISCAL YEAR 1970 FACILITIES:

NONE

FISCAL YEAR 1971 PROJECTS:

1. POLYMER RESEARCH LABORATORY

AMES RESEARCH
CENTER

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

ELECTRONICS RESEARCH CENTER

MISSION:

The Electronics Research Center was established in September 1964 to provide the knowledge and advanced technology needed to improve performance and reliability of space and aeronautical electronic systems and components.

The decision to suspend operations at the Electronics Research Center was made during the space agency's fiscal year 1971 budget process and in planning the future course of the nation's space program over the next decade. This action is part of a larger picture which includes our current requirements, the new directions for the Seventies, and budget constraints within which we must work.

It is anticipated that personnel and other costs of approximately $4.5 million will be necessary in FY 1971 to complete the closing of the Center.

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

Functions	1969	1970	1971
Personnel.....	$11,979,000	$13,847,000	$3,670,000
Travel.....	321,000	351,000	200,000
Automatic data processing.....	1,206,000	590,000	---
Facilities services.....	1,822,000	2,317,000	100,000
Technical services.....	866,000	981,000	---
Administrative support.....	1,043,000	1,397,000	500,000
Total, fund requirements.....	$17,237,000	$19,483,000	$4,470,000

PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	1	1	---
Space Science and Applications			
Physics and astronomy	6	5	---
Lunar and planetary exploration	1	1	---
Space applications	24	18	---
Launch vehicle procurement	27	19	---
Advanced Research and Technology			
Basic research	105	78	---
Space vehicle systems	5	4	---
Electronics systems	303	227	---
Human factor systems	27	18	---
Space power and electric propulsion systems	26	19	---
Aeronautical vehicles	---	10	---
Subtotal, positions by program	525	400	---
2. Indirect Positions:			
Director and staff	26	21	---
Administrative support	179	120	---
Research and development support	72	59	---
Subtotal, indirect positions	277	200	---
Total, permanent positions	802	600	---

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

FLIGHT RESEARCH CENTER

MISSION:

The Flight Research Center, established in 1947, conducts aeronautical and space related research and technology, using a variety of aerospace vehicles. The work includes effort on problems of take-off, landing, low-speed flight, supersonic and hypersonic flight, and re-entry to verify predicted characteristics and to identify unexpected problems in actual flight.

The current and projected programs at this Center include: aeronautical projects concerning general aviation and subsonic and supersonic transport research; space vehicle systems projects in which the flight behavior of advanced re-entry vehicles including M2-F2, HL-10, and X-24A heavyweight lifting bodies are studied; and electronic systems projects such as display, guidance, and control in advanced flight missions and improvements on systems and sensors used in biomedical monitoring, tracking, and data acquisition.

Most important of the facilities and special equipment for conducting programs at the Flight Research Center are the aircraft. They range from general aviation aircraft for handling qualities investigations to supersonic aircraft, such as the YF-12A, used for various research investigations having application to both civil and military aviation. Special purpose vehicles such as lifting bodies, variable stability aircraft, or airborne simulators, are contractor procured or developed in-house. Specialized laboratory facilities are available to complement the flight activities with proper preliminary research and testing. Simulation equipment is used to guide and assist in the performance of productive flight activities. A two-station radar for tracking and data acquisition is operated to support the flight activity.

DESCRIPTION:

The Flight Research Center, Edwards, California, is 65 air miles northeast of Los Angeles. The Center is located at the north end of Edwards Air Force Base on 218 acres of land used under a permit from the Department of the Air Force. Utilities are provided by the Air Force on a reimbursable basis. The Center is adjacent to Rogers Dry Lake, a 55-square-mile area with a complex of runways varying in length from 5 to 11 miles.

The physical plant consists of an office-laboratory building with adjoining shops, a flight maintenance hangar and a calibration hangar, and a high temperature loads calibrations facility. Auxiliary buildings include warehouses, an auxiliary power systems building, communications building, and

an aircraft maintenance dock. The main station of the two station radar range operated by the Center is located on the third floor of the office-laboratory building. The total capital investment of the Flight Research Center, including fixed assets in progress, and contractor held facilities at various locations as of June 30, 1969, was $47,132,000.

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

Functions	1969	1970	1971
Personnel.....	$7,522,000	$ 8,221,000	$ 8,503,000
Travel.....	200,000	219,000	234,000
Automatic data processing.....	58,000	9,000	9,000
Facilities services.....	1,257,000	1,072,000	1,118,000
Technical services.....	47,000	73,000	77,000
Administrative support.....	613,000	537,000	608,000
Total, fund requirements....	$9,697,000	$10,131,000	$10,549,000

PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Advanced Research and Technology			
Space vehicle systems.....	97	90	90
Electronics systems.....	37	30	30
Human factor systems.....	4	4	4
Aeronautical vehicles.....	277	282	282
Tracking and Data Acquisition...	32	32	32
Technology Utilization.....	1	1	1
Subtotal, positions by program	448	439	439

	1969	1970	1971
2. **Indirect Positions:**			
Director and staff.....	12	12	12
Administrative support.....	79	84	84
Subtotal, indirect positions..	91	96	96
Total, permanent positions.....	539	535	535

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ORGANIZATION AND STAFFING CHART

FLIGHT RESEARCH CENTER

STAFFING SUMMARY	CY	BY
Excepted	6	6
GS-16	6	6
GS-15	17	19
GS-14	39	42
All Other GS	289	284
Wage Board	178	178
Total Permanent	535	535

OFFICE OF THE DIRECTOR	CY	BY
Excepted	2	2
GS-16	1	1
GS-15	3	4
GS-14	1	-
All Other GS	5	5
Wage Board	18	18
Total Permanent	30	30

RESEARCH DIVISION	CY	BY
Excepted	1	1
GS-16	4	4
GS-15	6	6
GS-14	18	20
All Other GS	76	74
Wage Board	7	7
Total Permanent	112	112

OPERATIONS DIVISION	CY	BY
Excepted	2	2
GS-16	-	-
GS-15	4	5
GS-14	5	7
All Other GS	21	18
Wage Board	113	113
Total Permanent	145	145

DATA SYSTEMS DIVISION	CY	BY
Excepted	-	-
GS-16	1	1
GS-15	1	1
GS-14	10	10
All Other GS	107	107
Wage Board	35	35
Total Permanent	154	154

BIOMEDICAL OFFICE	CY	BY
Excepted	1	1
GS-16	-	-
GS-15	-	-
GS-14	1	1
All Other GS	6	6
Wage Board	-	-
Total Permanent	8	8

ADMINISTRATIVE DIVISION	CY	BY
Excepted	-	-
GS-16	-	-
GS-15	3	3
GS-14	4	4
All Other GS	74	74
Wage Board	5	5
Total Permanent	86	86

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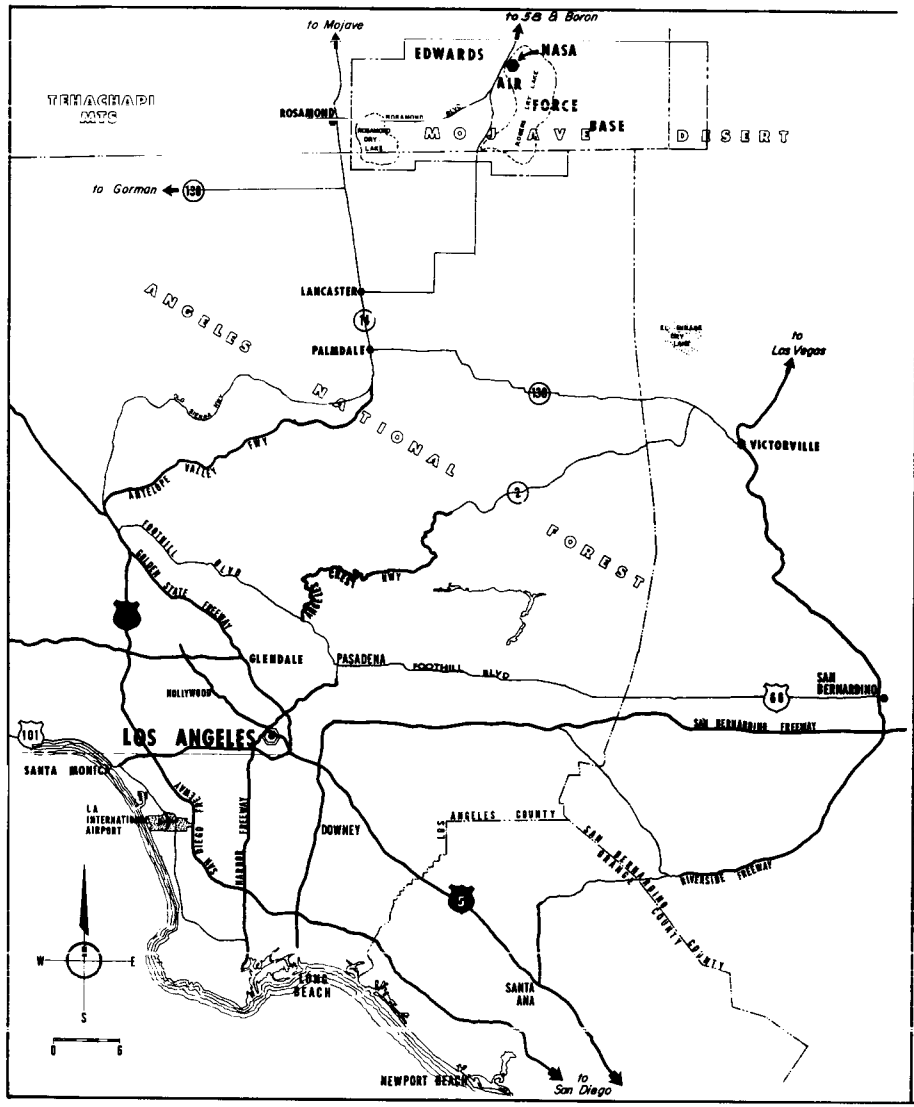
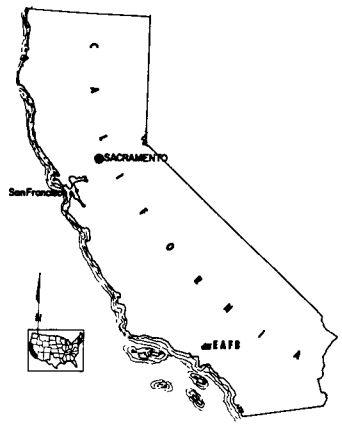
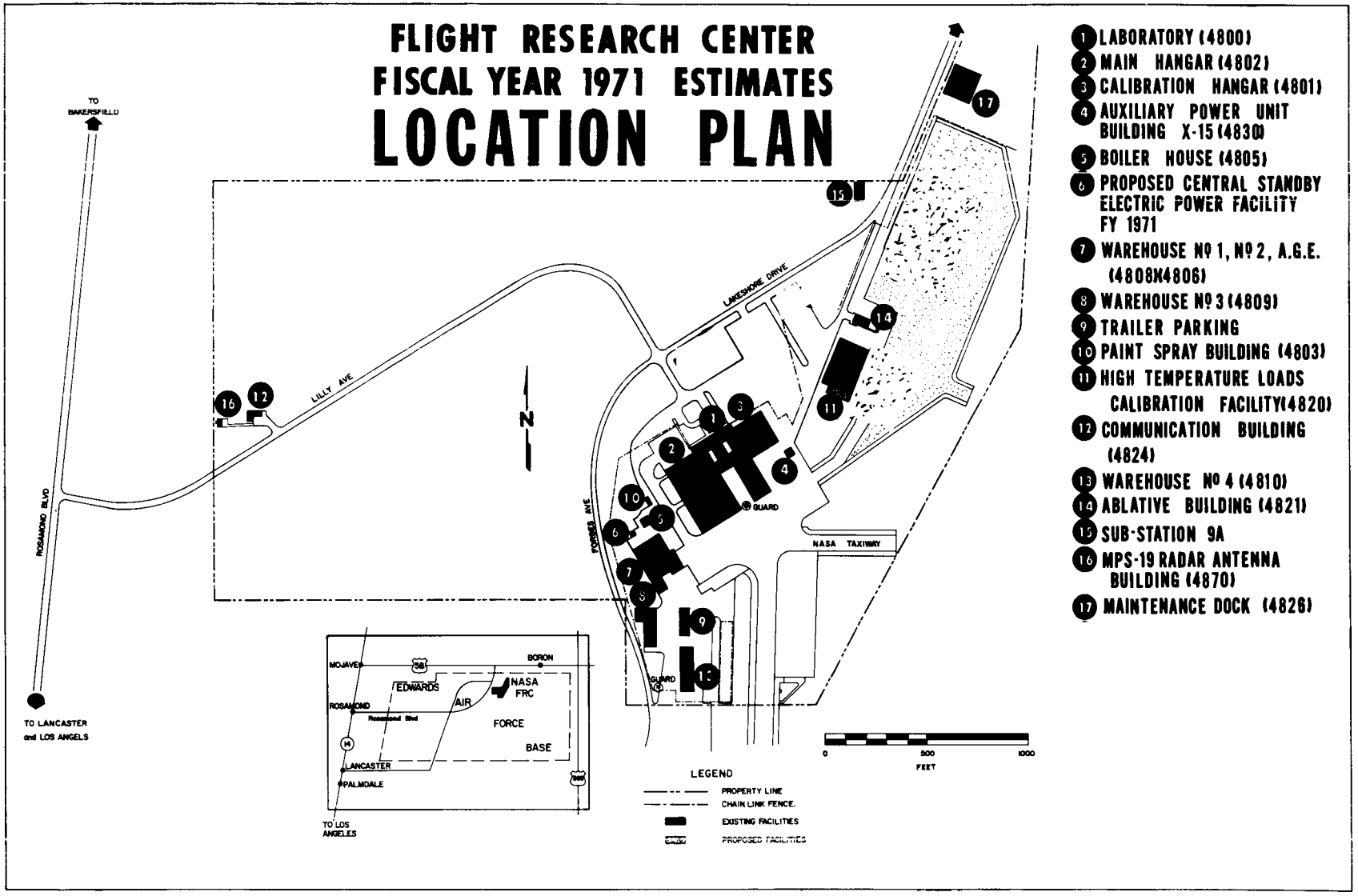
FLIGHT RESEARCH CENTER
FISCAL YEAR 1971 ESTIMATES
VICINITY MAP





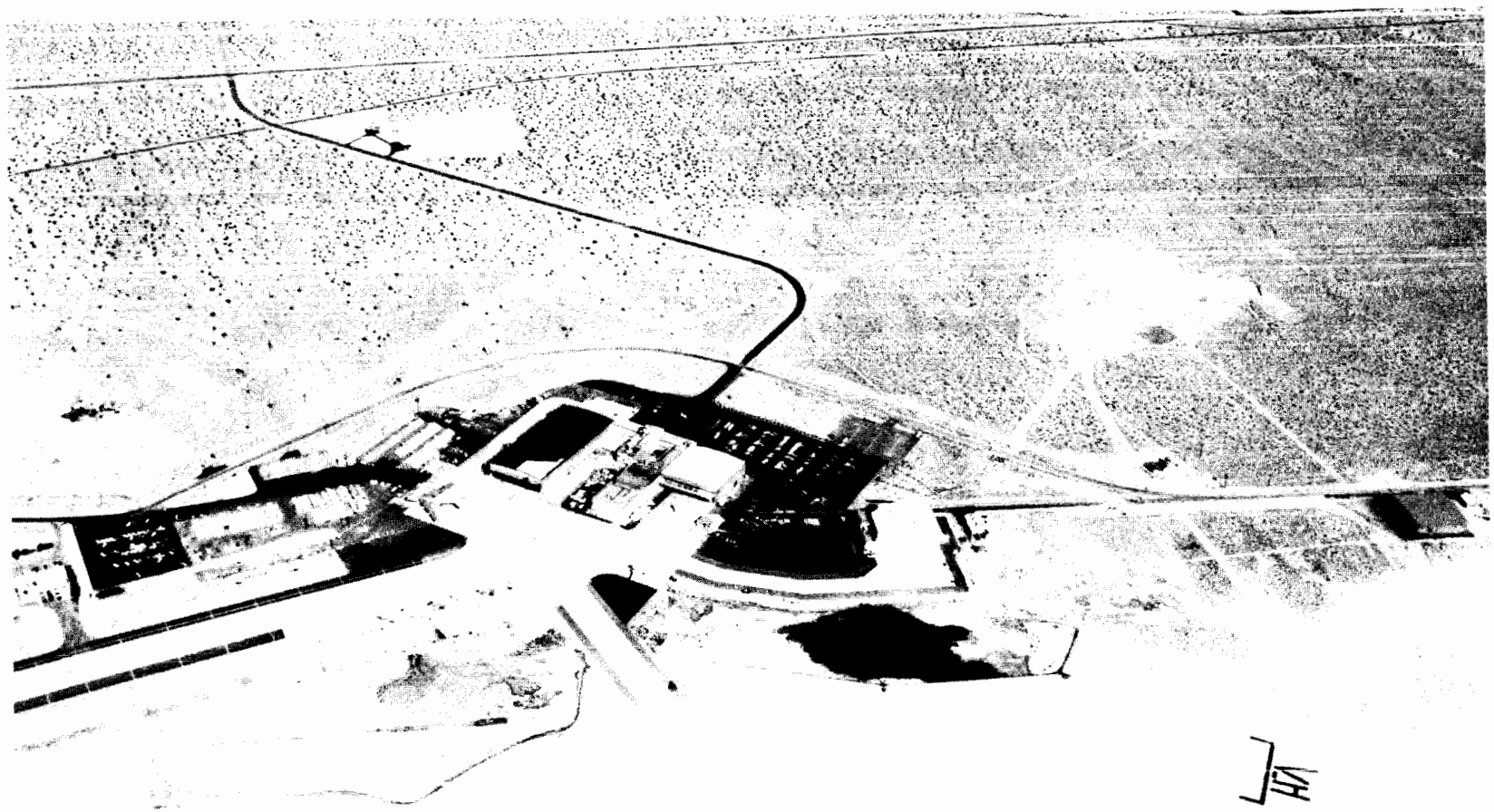
KEY PLAN

FLIGHT RESEARCH CENTER
FISCAL YEAR 1971 ESTIMATES
LOCATION PLAN



FLIGHT RESEARCH CENTER

FISCAL YEAR 1971 ESTIMATES



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RPM 2-70

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

LANGLEY RESEARCH CENTER

MISSION:

The Langley Research Center conducts a comprehensive range of research and technology programs to identify and evaluate new opportunities for advanced aeronautical and space flight activities; to expose and solve the basic technical problems confronting flight progress; to evolve, improve, and validate the technological basis for the design, construction, and operation of advanced aircraft and space vehicles; to support the conduct of nationally important flight projects; and to promote the broad diffusion and application of aerospace research knowledge.

A significant portion of this research and technology program is directed to developing, evaluating, and refining specific aircraft designs; and to exploring and understanding improved concepts and technology on which future aircraft with more advanced performance, increased operational capabilities, and enhanced safety and economy may be based. In this effort, special emphasis is placed on the evolution of aircraft configurations which maximize flight efficiency, as in the supercritical wing development for high-subsonic-speed transports, variable-sweep-wing and optimized-integrated-design approaches for supersonic military and civil aircraft, and the study of improved concepts for ramjet-propelled hypersonic vehicles and V/STOL aircraft designs. Associated research is aimed at the prediction of critical operating loads and aeroelastic characteristics of advanced designs, and the evolution of new materials and structural concepts with improved efficiency under critical environments. Related programs are providing insight into the stability and control problems of new generations of vehicles, and particularly those associated with all-weather and terminal-area operations, cooperative or competitive maneuvering, and other complex flight tasks. Studies are also underway on the technology for detecting clear-air turbulence and aircraft trailing vortices; on simplified lower-cost approaches to collision-hazard-warning systems, and on integrated and automated controls for light aircraft. Considerable work is underway investigating the basic causes of aircraft propulsion noise and sonic boom, the characterization of their annoyance effects, and the study of practicable methods for noise reduction. Advances are being accomplished in the study of tire, braking system, and runway surface design requirements for improved aircraft traction and control on water and slush covered runways, are finding important applications in the automotive safety field. The technical support of the Departments of the Air Force, Navy, and Army, the Federal Aviation Administration, and the aerospace industry is a continuing portion of the Langley program.

Another significant portion of Langley's skills and resources is devoted to advancing the Nation's space flight capabilities, and to the management and support of important space flight projects. Especially noteworthy are research efforts relative to: atmosphere-entry aerothermodynamics and heat shielding for return from earth-orbital, lunar, and planetary missions; the structural-dynamic characteristics of large launch vehicles and complex modular spacecraft; advanced configurations for lifting-entry and controlled-landing spacecraft, refurbishable space vehicles, long-duration orbital and planetary systems, and expandable space structures; the effects of heat, vacuum, loads, noise, micrometeoroids, and radiation on the performance of vehicle systems and materials; the technology of improved electronic, propulsion, information, structures, and life support systems; and man's functional capabilities and systems accommodations for performance of complex manned space missions involving space assembly and maintenance, rendezvous and docking, extravehicular operations, and extraterrestrial landings.

Responsibility has been assigned to Langley for the Viking project which plans to orbit and soft land unmanned instrumented vehicles on Mars in 1975 for study of Martian geophysics, atmospheric characteristics, local surface properties, and life-form indicators. Langley is also prominently engaged in the definition and provision of advanced technology required for the selection and development of manned systems and operations for future national space shuttle, space station, space base, and planetary mission projects. This includes investigations of mission flight mechanics and operations; configuration performance and aerothermal characteristics; structural efficiency, aeroelasticity, dynamics, and thermal protection; the technology of practicable navigation, guidance, control, power, propulsion, information, tracking, communications, and long-duration life-support systems; criteria for human factors and crew activities; and the definition, development, and integration of worthy mission experiments. Langley is also responsible for the development and operation of the Scout launch vehicle in its various national and international satellite and entry-vehicle applications; for the provision of ranges of technology and experiments for the continuing phases of the Apollo lunar and applications programs; and for broad technological support of a number of other space flight projects.

DESCRIPTION:

The Langley Research Center, Hampton, Virginia, is located approximately 100 air miles south of Washington, D.C. The Center occupies 773 acres of Government-owned land, divided into two areas by the runway facilities of Langley Air Force Base. The West Area consists of 750 acres, 430 owned by NASA and 320 under permit from the Air Force. The East Area comprises 23 acres under Air Force permit. Runways, some utilities, and certain other facilities are used jointly by NASA and the Air Force. In addition,

there are 110 acres of NASA-owned land located in the city of Newport News, Virginia, 3,277 acres under permit from the Air Force, and 9 acres under lease. The total acreage presently owned, under permit or leased, is 4,169. The total capital investment at the Langley Research Center, including fixed assets in progress, and contractor held facilities at various locations as of June 30, 1969, was $389,907,000.

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

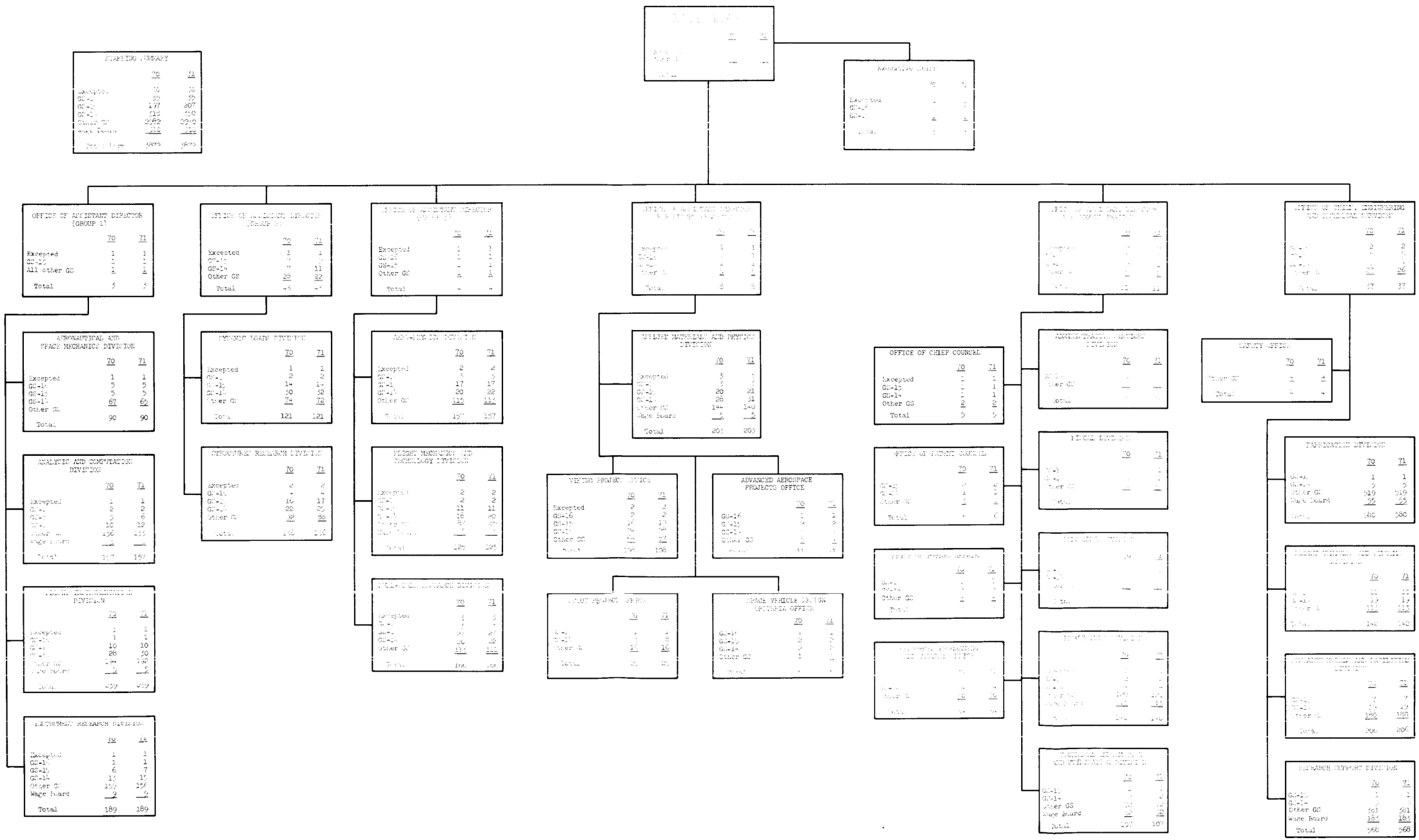
Functions	1969	1970	1971
Personnel	$51,899,000	$57,744,000	$59,269,000
Travel	1,134,000	1,237,000	1,669,000
Automatic data processing	933,000	240,000	256,000
Facilities services	6,394,000	6,116,000	6,749,000
Technical services	73,000	73,000	73,000
Administrative support	2,512,000	2,563,000	2,718,000
Total, fund requirements	$62,945,000	$67,973,000	$70,734,000

PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	56	46	33
Advanced missions	13	13	19
Space Science and Applications			
Physics and astronomy	16	17	17
Lunar and planetary exploration	171	199	184
Bioscience	4	6	6
Space applications	25	19	19
Launch vehicle procurement	36	36	36

	1969	1970	1971
Advanced Research and Technology			
Basic research.....	232	215	215
Space vehicle systems.....	718	657	666
Electronics systems.....	352	324	329
Human factor systems.....	112	101	102
Space power and electric propulsion systems.....	28	28	28
Chemical propulsion.....	42	29	29
Aeronautical vehicles.....	855	965	972
Tracking and Data Acquisition.....	31	27	27
Technology Utilization.....	5	5	5
Subtotal, positions by program..	2,696	2,687	2,687
2. Indirect Positions:			
Director and staff.....	9	9	9
Administrative support.....	477	476	476
Research and development support	730	700	700
Subtotal, indirect positions..	1,216	1,185	1,185
Total, permanent positions.....	3,912	3,872	3,872

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Organization and staffing chart
LANGLEY RESEARCH CENTER



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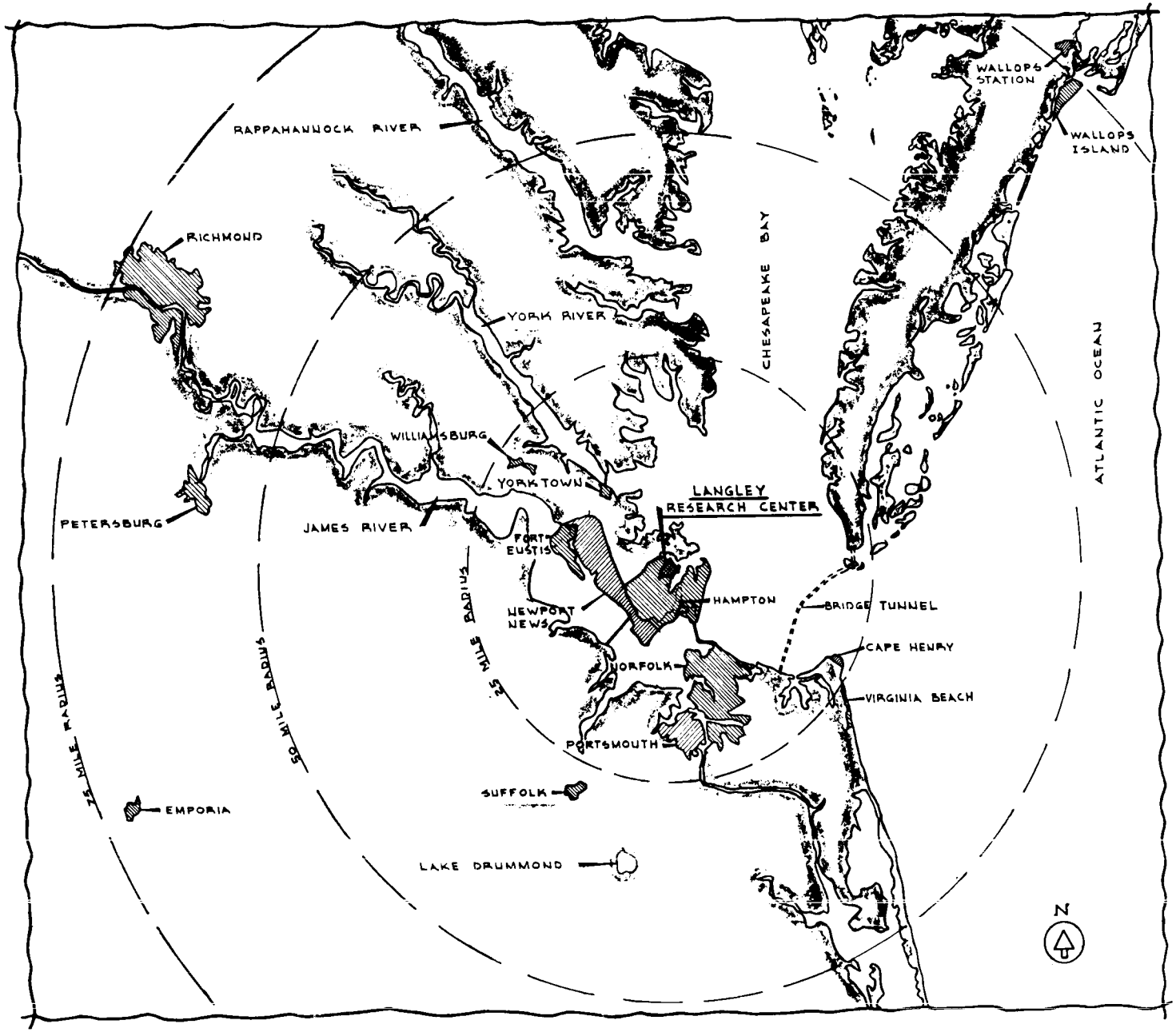

LANGLEY RESEARCH CENTER AND VICINITY

1" = 8 MILES

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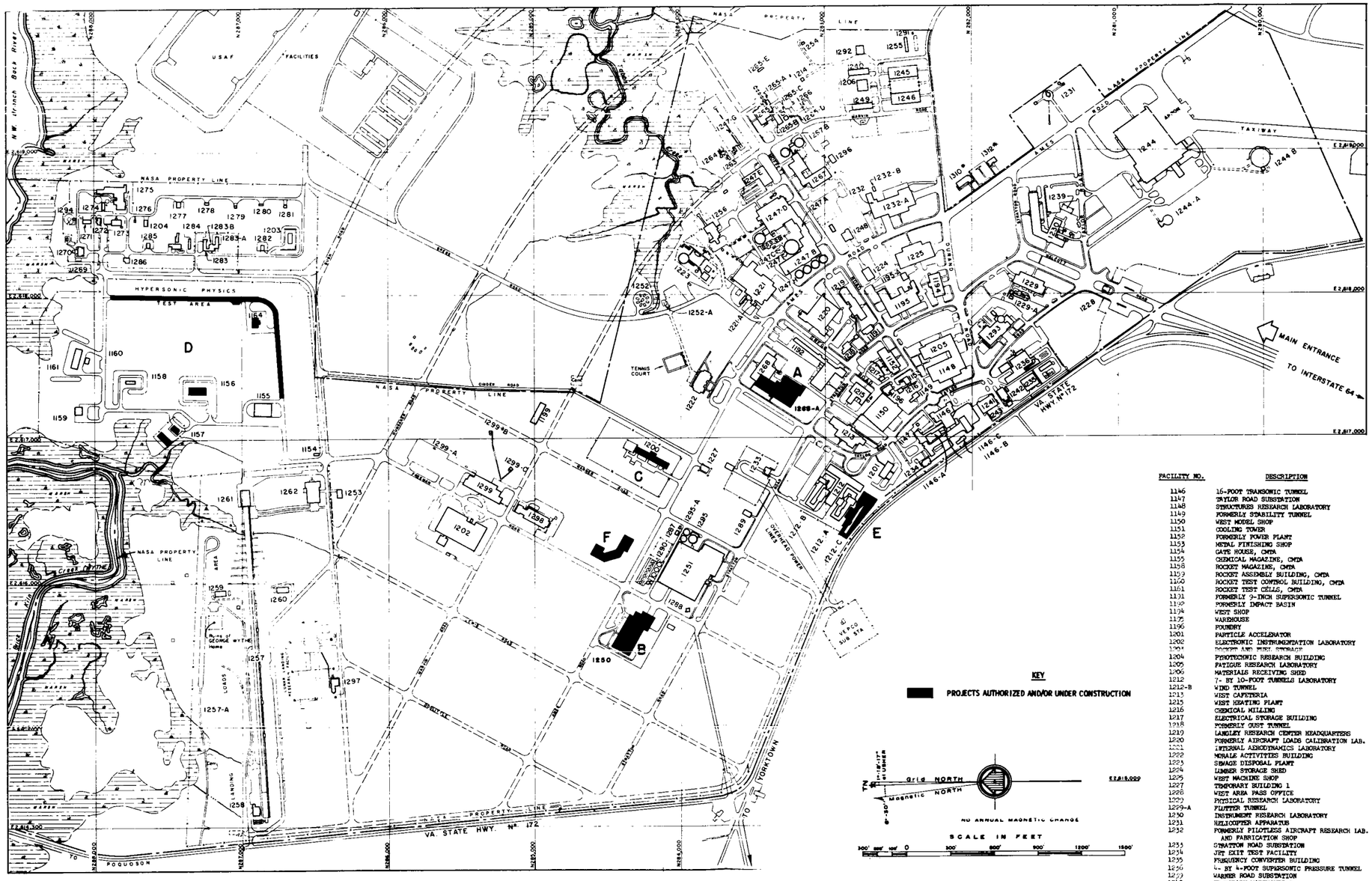
LANGLEY RESEARCH CENTER
FISCAL YEAR 1971 ESTIMATES

LOCATION PLAN



FACILITIES AUTHORIZED AND/OR UNDER CONSTRUCTION

- A FLIGHT CONTROL RESEARCH FACILITY
- B LIFE SUPPORT TECHNOLOGY LABORATORY
- C HOT-GAS RADIATION RESEARCH FACILITY
- D REACTIVE CHEMICAL DISTRIBUTION AREA
- E V/STOL TRANSITION RESEARCH WIND TUNNEL
- F AIRCRAFT NOISE REDUCTION LABORATORY (F.Y. 1970)

FACILITY NO.	DESCRIPTION
1146	16-FOOT TRANSONIC TUNNEL
1147	TAYLOR ROAD SUBSTATION
1148	STRUCTURES RESEARCH LABORATORY
1149	FORMERLY STABILITY TUNNEL
1150	WEST MODEL SHOP
1151	COOLING TOWER
1152	FORMERLY POWER PLANT
1153	METAL FINISHING SHOP
1154	GATE HOUSE, CMDA
1155	CHEMICAL MAGAZINE, CMDA
1158	ROCKET MAGAZINE, CMDA
1159	ROCKET ASSEMBLY BUILDING, CMDA
1160	ROCKET TEST CONTROL BUILDING, CMDA
1161	ROCKET TEST CELLS, CMDA
1191	FORMERLY 9-INCH SUPERSONIC TUNNEL
1192	FORMERLY IMPACT BASIN
1194	WEST SHOP
1195	WAREHOUSE
1196	FOUNDRY
1201	PARTICLE ACCELERATOR
1202	ELECTRONIC INSTRUMENTATION LABORATORY
1203	DOCKER AND DUST CHAMBER
1204	PYROTECHNIC RESEARCH BUILDING
1205	FATIGUE RESEARCH LABORATORY
1206	MATERIALS RECEIVING SHED
1212	7- BY 10-FOOT TUNNELS LABORATORY
1212-B	WIND TUNNEL
1213	WEST CAFETERIA
1215	WEST HEATING PLANT
1216	CHEMICAL MILLING
1217	ELECTRICAL STORAGE BUILDING
1218	FORMERLY DUST TUNNEL
1219	LANGLEY RESEARCH CENTER HEADQUARTERS
1220	FORMERLY AIRCRAFT LOADS CALIBRATION LAB.
1221	INTERNAL AERODYNAMICS LABORATORY
1222	MORALE ACTIVITIES BUILDING
1223	SEWAGE DISPOSAL PLANT
1224	LUMBER STORAGE SHED
1225	WEST MACHINE SHOP
1227	TEMPORARY BUILDING 1
1228	WEST AREA PASS OFFICE
1229	PHYSICAL RESEARCH LABORATORY
1229-A	FLUTTER TUNNEL
1230	INSTRUMENT RESEARCH LABORATORY
1231	HELICOPTER APPARATUS
1232	FORMERLY PILOTLESS AIRCRAFT RESEARCH LAB. AND FABRICATION SHOP
1233	STRATTON ROAD SUBSTATION
1234	JET EXIT TEST FACILITY
1235	FREQUENCY CONVERTER BUILDING
1236	4- BY 4-FOOT SUPERSONIC PRESSURE TUNNEL
1239	WARNER ROAD SUBSTATION
1240	TEMPORARY WAREHOUSE 3
1241	DRIVE CONTROL BUILDING
1242	PROPELLER STATIC TEST STAND
1243	YORKTOWN ROAD SUBSTATION
1244	FORMERLY FLIGHT RESEARCH LABORATORY
1244-A	WATER TANK NO. 2
1244-B	CONTROL LINE FACILITY
1245	TEMPORARY WAREHOUSE 1

FACILITY NO.	DESCRIPTION
1246	TEMPORARY WAREHOUSE 2
1247-A	FORMERLY GAS DYNAMICS LABORATORY CENTER
1247-B	WEST WING
1247-C	COOLING TOWER
1247-D	EAST WING
1247-E	COMPRESSOR BUILDING
1247-F	AMES ROAD SUBSTATION
1247-G	HIGH-PRESSURE SHOCK TUBE
1248	PLANT SAFETY BUILDING
1249	TEMPORARY WAREHOUSE 4
1251	UNITARY PLAN WIND TUNNEL
1252	WATER TANK NO. 1
1254	AMMUNITION STORAGE 1
1255	TEMPORARY WAREHOUSE 6
1256	9- BY 6-FOOT THERMAL STRUCTURES TUNNEL
1257	LANDING LOADS TRACK
1258	LANDING LOADS TRACK COMPRESSOR BUILDING
1259	NORTH ARRESTING GEAR HOUSING
1260	SOUTH ARRESTING GEAR HOUSING
1261	LANDING LOADS TRACK SHOP
1262	HIGH-SPEED HYDRODYNAMICS OFFICE AND SHOP
1263	HIGH-TEMPERATURE JET (PILOT MODEL)
1264	HIGH-TEMPERATURE MACH 7 JET (PILOT MODEL)
1265	8-FOOT HIGH-TEMPERATURE STRUCTURES TUNNEL
1266	MOFFETT ROAD SUBSTATION
1267	HIGH-TEMPERATURE MATERIALS LABORATORY
1268	DATA REDUCTION BUILDING
1269	GATE HOUSE (HYPERSONIC PHYSICS TEST AREA)
1270	ROCKET PROPELLANT TEST UNIT, HPTA
1271	OPEN SHED, HPTA
1272	HEATING PLANT, HPTA
1273	OPERATIONS CENTER, HPTA
1274	CERAMIC-HEATED MACH 15 JET, HPTA
1275	IMPACT AND PROJECTILE TEST UNIT, HPTA
1276	IGNITER ASSEMBLY BUILDING, HPTA
1277	STORAGE A
1278	STORAGE B
1279	STORAGE C
1280	STORAGE D
1281	STORAGE E
1282	STORAGE F
1283	STORAGE G
1284	ROCKET PROPELLANT PROCESSING BUILDING, HPTA
1285	STORAGE H
1286	ROCKET ASSEMBLY AND PROPELLANT ALTERATION BUILDING
1287	TEMPORARY SHED
1288	SOLAR ENERGY COLLECTOR
1289	TEMPORARY STORAGE
1290	SUBSTATION
1291	PUMP STATION
1292	FACILITIES MAINTENANCE BUILDING
1293	DYNAMICS RESEARCH LABORATORY
1294	ROCKET MOTOR TEST APPARATUS
1295	SHOP AND INSTRUMENTATION FOR 60-FOOT SPHERE
1296	SHOP BUILDING
1297	LUNAR LANDING RESEARCH FACILITY
1298	STABILIZATION AND CONTROL EQUIPMENT LABORATORY
1299	VEHICLE ANTENNA TEST FACILITY AND ADDITION

WEST AREA

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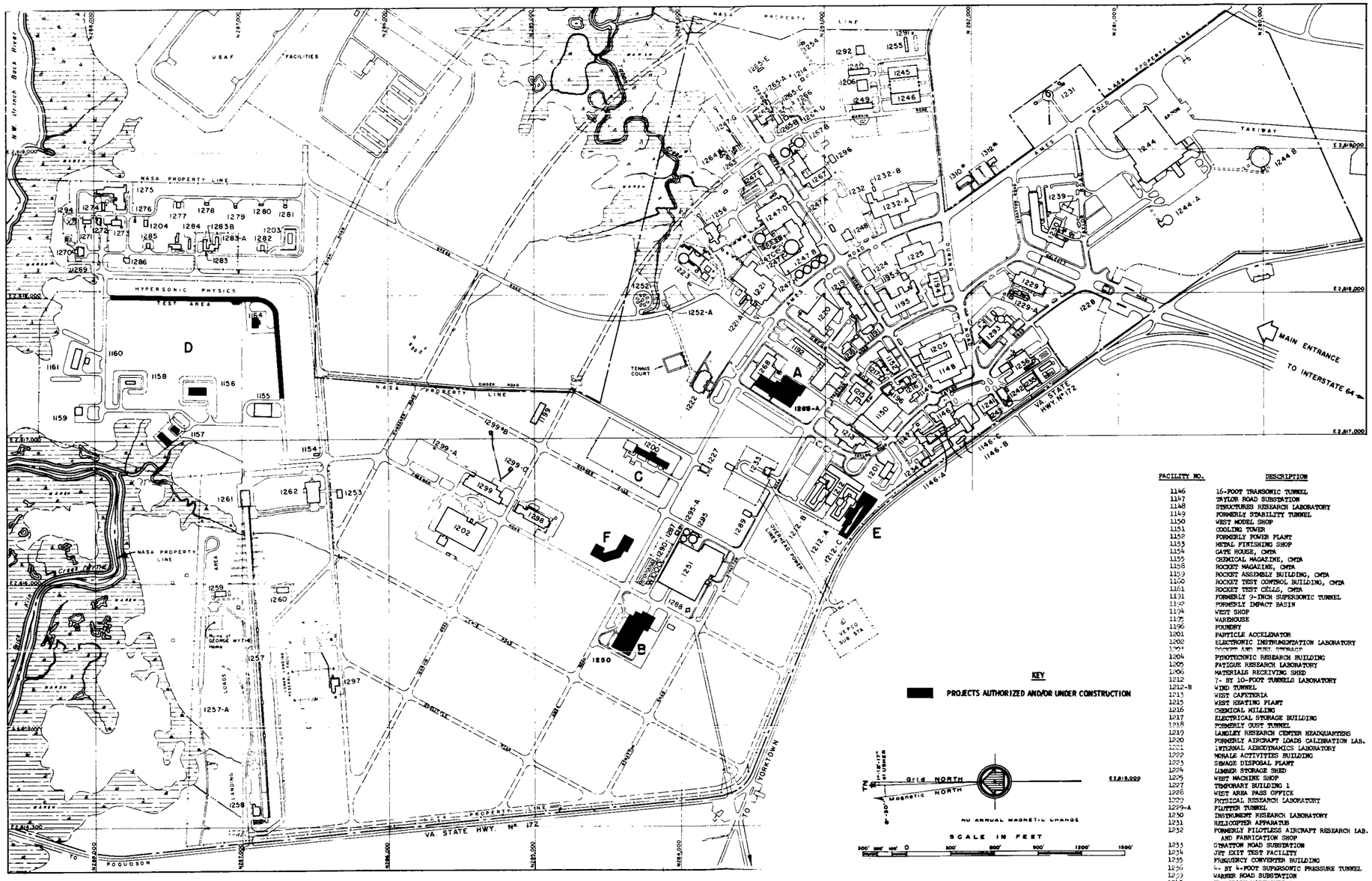
LANGLEY RESEARCH CENTER
FISCAL YEAR 1971 ESTIMATES

LOCATION PLAN



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1223	SEWAGE DISPOSAL PLANT
1224	LUMBER STORAGE SHED
1225	WEST MACHINE SHOP
1227	TEMPORARY BUILDING 1
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1239	WARNER ROAD SUBSTATION
1240	TEMPORARY WAREHOUSE 3
1241	DRIVE CONTROL BUILDING
1242	PROPELLER STATIC TEST STAND
1243	YORKTOWN ROAD SUBSTATION
1244	FORMERLY FLIGHT RESEARCH LABORATORY
1244-A	WATER TANK NO. 2
1244-B	CONTROL LINE FACILITY
1245	TEMPORARY WAREHOUSE 1

FACILITY NO.	DESCRIPTION
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1247-A	FORMERLY GAS DYNAMICS LABORATORY CENTER
1247-B	WEST WING
1247-C	COOLING TOWER
1247-D	EAST WING
1247-E	COMPRESSOR BUILDING
1247-F	AMES ROAD SUBSTATION
1247-G	HIGH-PRESSURE SHOCK TUBE
1248	PLANT SAFETY BUILDING
1249	TEMPORARY WAREHOUSE 4
1251	UNITARY PLAN WIND TUNNEL
1252	WATER TANK NO. 1
1254	AMMUNITION STORAGE 1
1255	TEMPORARY WAREHOUSE 6
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1296	SHOP BUILDING
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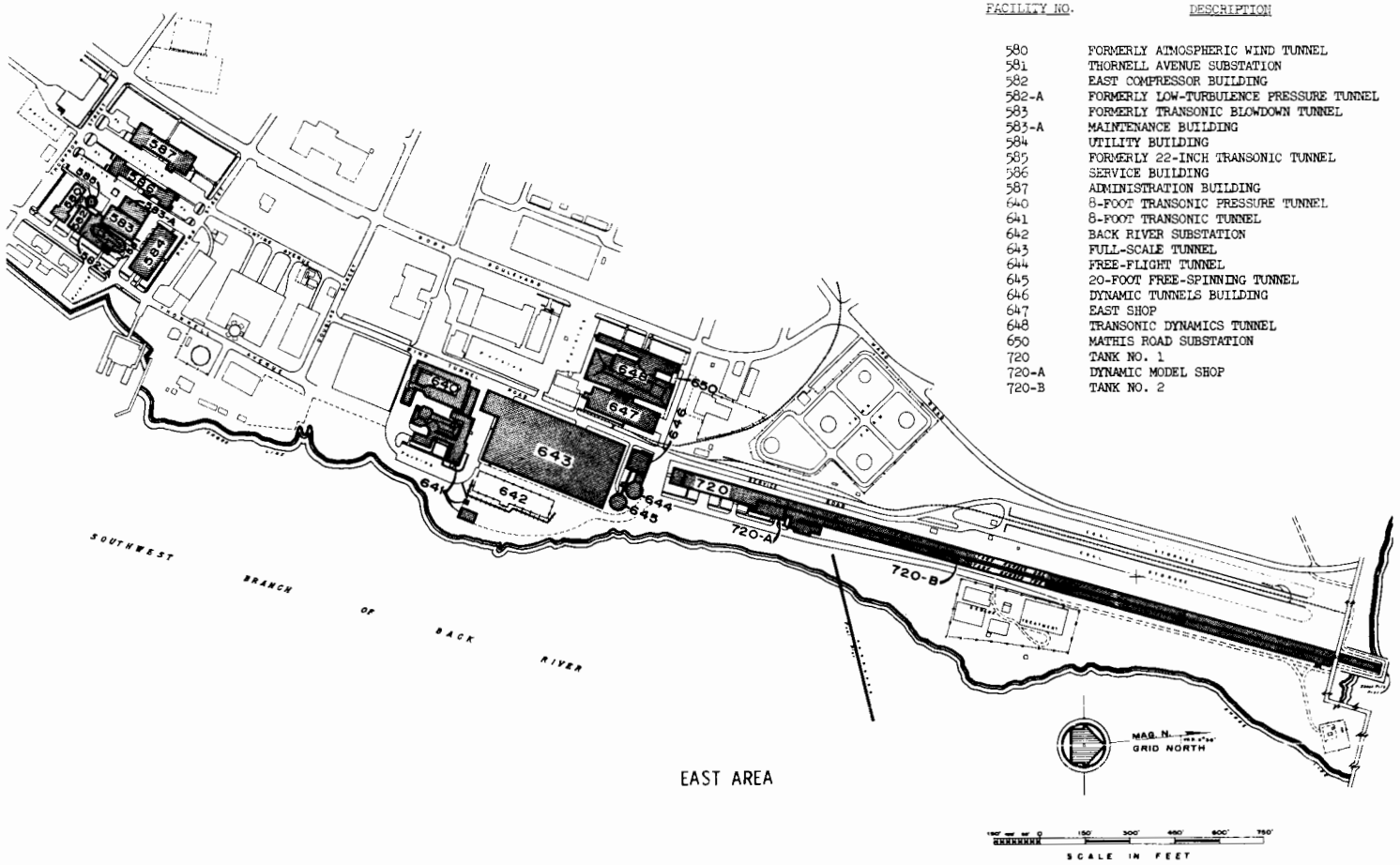
1298	STABILIZATION AND CONTROL EQUIPMENT LABORATORY
1299	VEHICLE ANTENNA TEST FACILITY AND ADDITION

WEST AREA

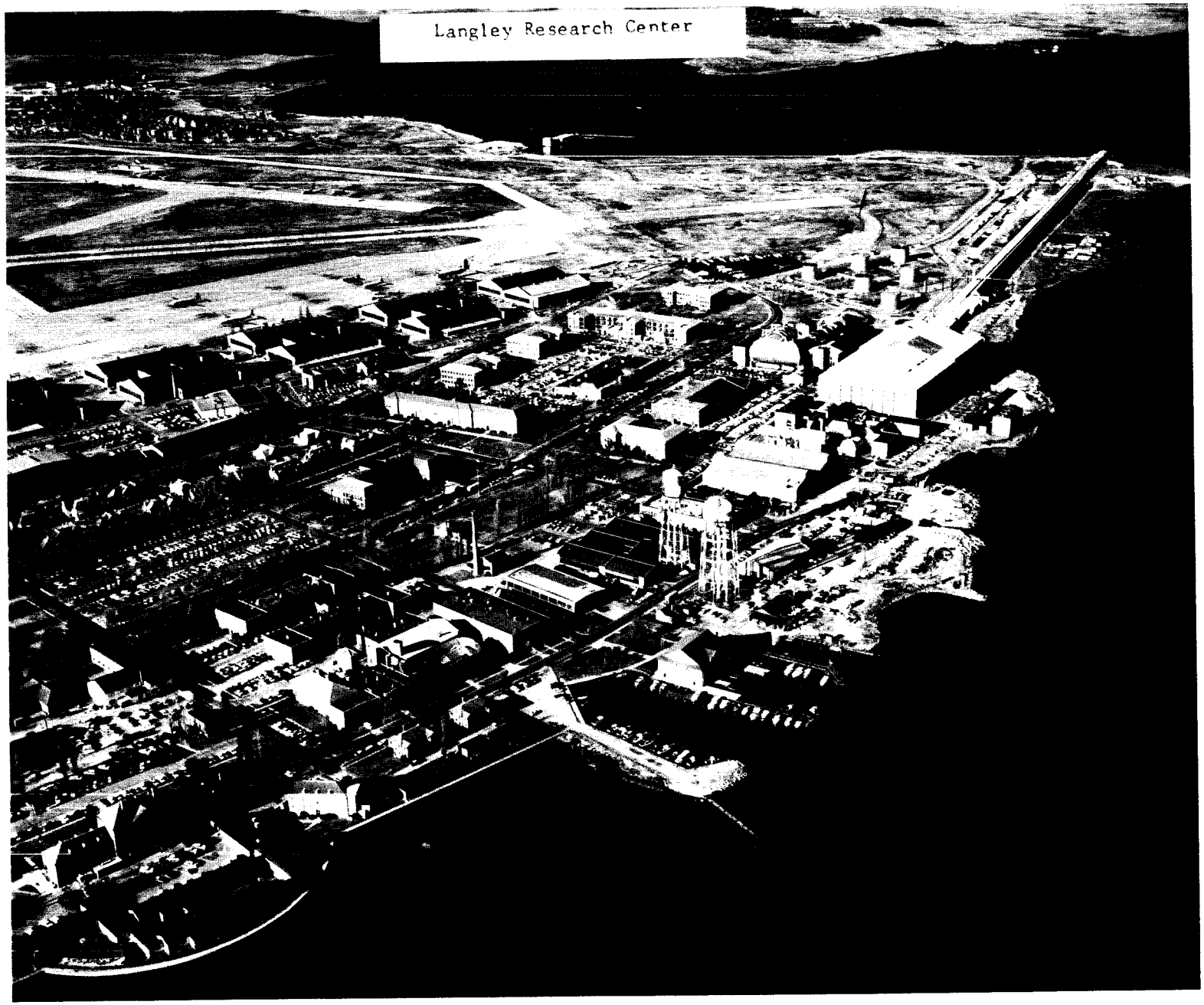
375-945 O - 70 (Face blank back of RPM 2-76) Master 9

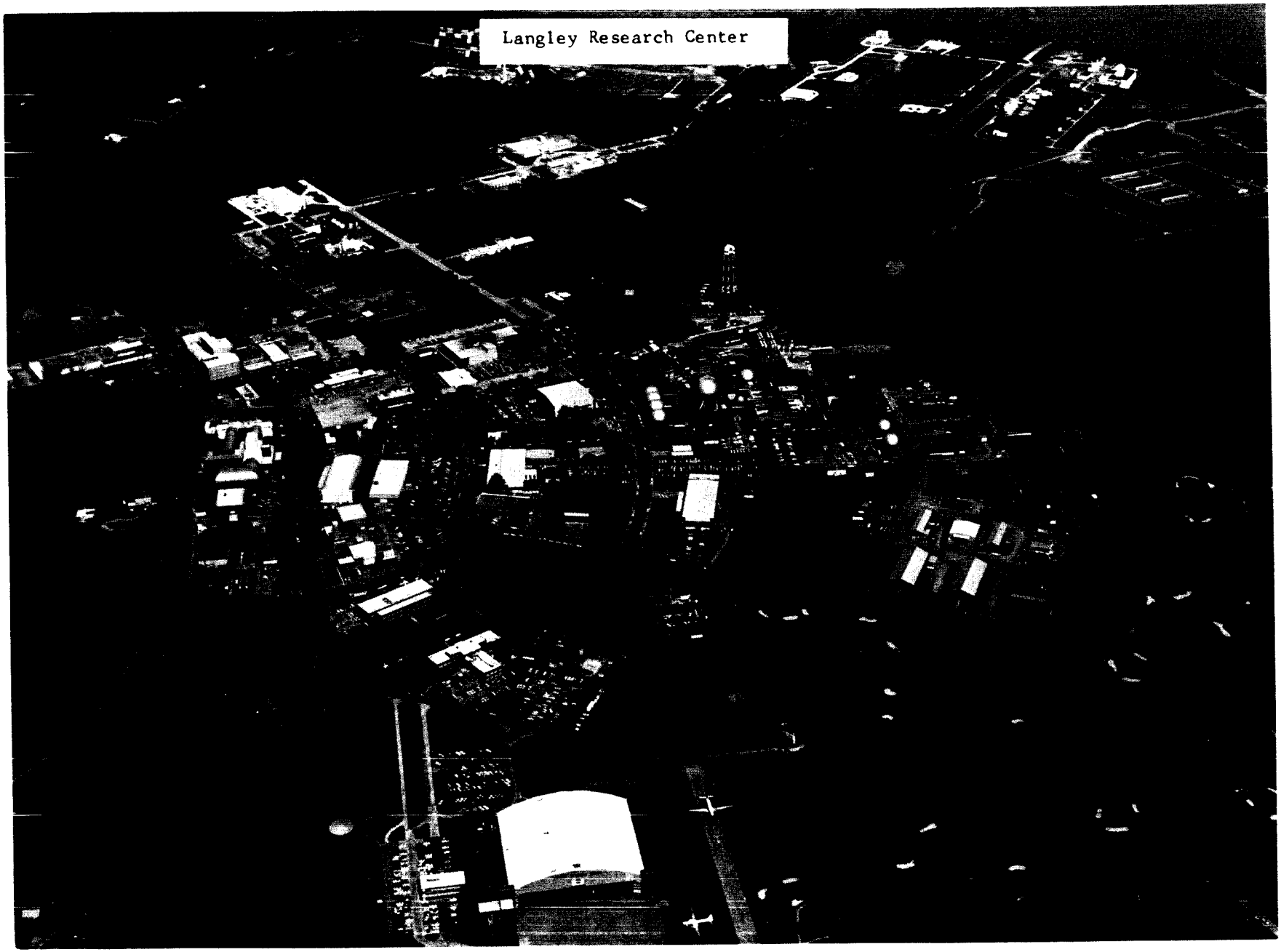
LANGLEY RESEARCH CENTER
FISCAL YEAR 1970 ESTIMATES

LOCATION PLAN



FACILITY NO.	DESCRIPTION
580	FORMERLY ATMOSPHERIC WIND TUNNEL
581	THORNELL AVENUE SUBSTATION
582	EAST COMPRESSOR BUILDING
582-A	FORMERLY LOW-TURBULENCE PRESSURE TUNNEL
583	FORMERLY TRANSONIC BLOWDOWN TUNNEL
583-A	MAINTENANCE BUILDING
584	UTILITY BUILDING
585	FORMERLY 22-INCH TRANSONIC TUNNEL
586	SERVICE BUILDING
587	ADMINISTRATION BUILDING
640	8-FOOT TRANSONIC PRESSURE TUNNEL
641	8-FOOT TRANSONIC TUNNEL
642	BACK RIVER SUBSTATION
643	FULL-SCALE TUNNEL
644	FREE-FLIGHT TUNNEL
645	20-FOOT FREE-SPINNING TUNNEL
646	DYNAMIC TUNNELS BUILDING
647	EAST SHOP
648	TRANSONIC DYNAMICS TUNNEL
650	MATHIS ROAD SUBSTATION
720	TANK NO. 1
720-A	DYNAMIC MODEL SHOP
720-B	TANK NO. 2


Langley Research Center


Langley Research Center

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

LEWIS RESEARCH CENTER

MISSION:

The Lewis Research Center's principal mission is research and technology in the areas of aircraft and spacecraft propulsion, and power generation systems for spacecraft.

The emphasis is predominantly on research and technology; however, the entire spectrum of activities is undertaken from basic research to development. The scope of technology ranges from work on individual components through complete systems.

Most of the critical areas which limit the performance of engines and power systems are the subjects of in-house effort at this Center. Research by commercial and university laboratories is also conducted under contracts directed by Lewis Research Center personnel.

Several large development programs are assigned to this Center. The Atlas and Centaur programs are supervised, as well as part of the Titan program. The SNAP-8 nuclear powered electric generating system, SERT (Space Electric Rocket Test) and Quiet Engine contracts are directed and there is also considerable supporting in-house research effort on these projects.

The research and technology activities cover many technical fields. Some examples of major activity are discussed in the following paragraphs.

It is expected that engines for future supersonic planes will be of a turbofan design incorporating high by-pass ratios, high compressor pressure ratios and high turbine inlet temperatures. A large part of the research effort at Lewis is aimed directly at solving the problems that limit the development of engines for supersonic flight. Among these research efforts are: slotted compressor blades to increase pressure ratio per stage, cooled turbine blades, high-speed bearings, air inlets, exhaust nozzles, combustor configurations, higher energy fuels, and fuel tank fire hazard evaluations. A large addition to the Propulsion Systems Laboratory is being built to test full-scale engines for supersonic airplanes. A flight test program is being conducted with an F-106 airplane to determine the interaction of engine inlets and exhaust nozzles with wings and fuselage at transonic speeds, because such data obtained from transonic wind tunnels of current size is unreliable.

The problems of the Supersonic Combustion Ramjet engine for hypersonic flight speeds up to Mach 7 are being studied in existing facilities, and construction of a new facility is nearing completion at Plum Brook to extend the effort to engines of practical size.

At the lower end of the speed scale, the effects of cross flow on high-pressure ratio lift fans for V/STOL aircraft are being investigated in the return passage of the 8-by-6-Foot Supersonic Wind Tunnel.

Contributions to rocket technology continue to flow from Lewis. Relatively small scale chemical rockets are used to study the problems of combustion instability, fuel-oxidant mixing, regenerative cooling of nozzles, ablative nozzles, and nozzle insulating coatings.

Propellant management systems for Centaur, Saturn S-IV and the Apollo Service Module vehicles were studied and their designs were based on data obtained in the Lewis Zero Gravity facilities. Current research includes studies of in-orbit propellant transfer, propellant re-orientation and slosh dynamics.

A full-scale Centaur vehicle has been installed and operated in the Spacecraft Propulsion Research Facility. This vehicle will be equipped with a prototype tank pressurizing system replacing the current pump system for feeding the propellants to the engine during the coming year.

Electric rockets for deep space propulsion have benefited greatly from the work in the Electric Propulsion Research Building and the newer Electric Propulsion Laboratory. These buildings contain many large vacuum tanks where the space environment essential to electric propulsion research are approximated.

Many devices for power generation in space are being studied. The solar cell converts sunlight directly into electricity. Batteries and fuel cells convert stored chemicals into electricity. For a large and sustained power supply, however, an adaptation of the familiar turbine driven generator seems most practical. To achieve the tremendous weight reduction necessary means many years of intensive research and technology. Instead of steam, the turbines will be driven by liquid metal vapor (Rankine cycle) or by heated gas (Brayton cycle). The only way to reject the waste heat is by direct radiation to space, so very large radiators will be required. High rotative speeds will reduce weight, but call for new designs of compressors, turbines, bearings and electric generators. The heat source may be either a nuclear reactor, or the sun's rays concentrated by a large concave mirror. A 20-foot flight-weight mirror has been assembled at the Lewis Research Center.

Various problems in connection with the development of nuclear power systems and nuclear rockets are conducted at Plum Brook. A 60-megawatt thermal reactor facility is used to determine the effects of radiation on materials, on various electronic, hydraulic, and mechanical control systems, and on items of equipment.

A 28-million dollar Space Power Facility has been placed in operation at Plum Brook where nuclear powered electric generating systems can be operated under simulated space environment conditions for long periods of time. The first system to be installed was a compressor-turbine unit for a Brayton cycle electric power generating system.

Another type of electric generator and another source of energy are more distant prospects. A stream of ionized plasma flowing through a coil will generate electricity in that coil (magnetohydrodynamics). The success of this effort and of related activities depends largely on the development of superconducting electric magnets. The Lewis Research Center has been a leader in this field and has constructed a magnet with a field of 150,000 gauss over a twelve-inch bore.

The performance of propulsion and power generation systems, launch vehicles, spacecraft, and practically all hardware is paced by physical limitations of available materials. We have maintained a substantial materials research effort aimed at raising these limitations and improving component and system performance. Our activity covers the entire temperature range of materials usage going from the cryogenic temperature of liquified gases to the high temperatures encountered in the rocket nozzles of aircraft engine combustors and turbine wheels.

The material research includes both fundamental studies of what makes materials strong or weak and the development of new materials. "Super" alloys, corrosion resistant coatings, ultra pure tungsten, and composites made of metal whiskers, fibers, or sintered granules are among the many products investigated.

The NASA Aerospace Safety Institute is located at the Center. Its staff of specialists survey the research needs and direct research efforts in this field. A data bank of research information is being compiled and cataloged for ready access.

DESCRIPTION:

The Lewis Research Center occupies two sites in north central Ohio. The older one was established in 1941 on 200 acres adjacent to the Cleveland Municipal Airport. The original area has been expanded to 364 acres. Here there are over 90 buildings, including two large supersonic wind tunnels, two Zero Gravity research facilities (free drop shafts, one of which is an underground evacuated shaft 477 feet deep in which Zero Gravity durations of about 10 seconds are obtained), a large Propulsion Systems Laboratory in which full-scale engines are operated under simulated high altitude conditions, three rocket laboratories, five materials research buildings, eighteen major space simulation facilities ranging from four to thirty feet in diameter, a 50-foot diameter Space Power Chamber 120 feet long in which altitudes up to 100,000 feet are simulated, an Energy Conversion Laboratory, an Instrument Research Laboratory, a High Energy Fuels Laboratory, a Chemistry Laboratory, an Engine Research Building containing 64 test cells and covering nearly four acres, four office buildings, machine shops and other service buildings.

A newer site, established in 1956, is located south of Sandusky, Ohio, about 50 miles west of Cleveland on land occupied by the Plum Brook Ordnance Works. Known as the Plum Brook Station, it occupies 6,031 acres of which 5,981 are owned by the Government and 50 are in easements. Funds for the

purchase of additional land to serve as a buffer zone around the present site have been appropriated. Purchase negotiations are near completion for approximately 2,000 acres of this buffer zone. Negotiations for an additional 110 acres are underway.

There are over 200 buildings on the Plum Brook site, 55 built by the NASA and the rest by the former tenants. The major facilities include a Reactor Facility, an Altitude Rocket Test Facility, a Cryogenic Propellant Research Facility, Heat Transfer Facility, a Spacecraft Dynamics Research Facility, a Rocket Pump Laboratory, a Rocket Turbine Laboratory, a Rocket Turbo-pump Laboratory, a Rocket Systems Hydraulic Laboratory, a Fluorine Pump Laboratory, and a temporary site for testing rockets at sea level conditions. The latest major research facilities to be completed are the Spacecraft Propulsion Research Facility and the Space Power Facility. The former is used to test the ignition and operation of full-scale rocket engines after a prolonged shut-down period in a space environment. The latter is for testing full-scale nuclear powered electric generating systems. Nearing completion is a Hypersonic Tunnel Facility in which burning ramjet engines can be operated at speeds up to Mach 7. The research programs at Plum Brook are under the technical direction of personnel located at Cleveland. They are conducted at the larger site because of the need for large separation distances to minimize hazards.

The total capital investment of the Lewis Research Center, including fixed assets in progress, and contractor held facilities at various locations as of June 30, 1969, was $379,435,000, of which $111,082,000 represents facilities located at the Plum Brook Station.

SUMMARY OF RESOURCES REQUIREMENTS:

	FUNDS		
Functions	1969	1970	1971
Personnel.....	$57,987,000	$64,351,000	$67,111,000
Travel.....	898,000	1,013,000	1,088,000
Automatic data processing.....	432,000	47,000	53,000
Facilities services.....	6,881,000	6,110,000	5,995,000
Technical services.....	737,000	36,000	90,000
Administrative support.....	909,000	841,000	881,000
Total, fund requirements.....	$67,844,000	$72,398,000	$75,218,000

PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Space Science and Applications			
Space applications.....	15	13	13
Launch vehicle procurement.....	311	311	311
Advanced Research and Technology			
Basic research.....	445	438	438
Space vehicle systems.....	161	153	153
Space power and electric propulsion systems.....	849	853	853
Nuclear rockets.....	53	29	25
Chemical propulsion.....	200	190	190
Aeronautical vehicles.....	863	886	890
Technology Utilization.....	7	7	7
Subtotal, positions by program....	2,904	2,880	2,880
2. Indirect Positions:			
Director and staff.....	18	18	18
Administrative support.....	507	505	505
Research and development support.....	839	812	812
Subtotal, indirect positions.....	1,364	1,335	1,335
Total, permanent positions.....	4,268	4,215	4,215

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National Aeronautics and Space Administration
Organization and Staffing Chart

LEWIS RESEARCH CENTER
Cleveland, Ohio

STAFFING SUMMARY

	70	71
Excepted	26	26
GS-16	25	25
GS-15	195	215
GS-14	380	390
Other GS	2077	2001
WB	1512	1558
Total Permanent	4215	4215

DIRECTOR'S OFFICE

	70	71
Excepted	2	2
GS-15	3	3
Other GS	3	3
Total	8	8

PLANS AND PROGRAMS OFFICES

	70	71
GS-15	2	2
GS-14	4	4
Other GS	6	6
Total	12	12

BUDGET OFFICE

	70	71
Excepted	1	1
GS-14	2	3
Other GS	7	6
Total	10	10

OFFICE OF DEVELOPMENT EVALUATION AND MANAGEMENT REVIEW

	70	71
Excepted	1	1
GS-16	1	1
GS-15	1	2
GS-14	10	10
Other GS	15	14
Total	28	28

PUBLIC AFFAIRS OFFICES

	70	71
Excepted	1	1
GS-15	1	1
GS-14	1	1
Other GS	17	17
Total	20	20

ADVANCED RESEARCH INSTITUTE

	70	71
Excepted	1	1
GS-15	2	2
Other GS	2	2
Total	5	5

AEROSPACE SAFETY RESEARCH AND DATA INSTITUTE

	70	71
Excepted	1	1
GS-15	3	3
GS-14	4	4
Other GS	15	17
Total	23	25

RESEARCH INSTALLATIONS BRANCH

	70	71
GS-15	2	3
GS-14	5	5
Other GS	21	20
Total	28	28

ELECTROMAGNETIC PROPULSION DIVISION

	70	71
Excepted	1	1
GS-16	1	1
GS-15	8	9
GS-14	14	15
Other GS	45	43
Total	69	69

PHYSICS AND CHEMISTRY DIVISION

	70	71
GS-16	2	2
GS-15	17	16
GS-14	26	27
Other GS	55	55
Total	100	100

AERONAUTICS DIVISION

	70	71
Excepted	1	1
Other GS	1	1
Total	2	2

AIRBREATHING ENGINES DIVISION

	70	71
Excepted	1	1
GS-16	1	1
GS-15	12	14
GS-14	24	25
Other GS	66	63
Total	104	104

WIND TUNNEL AND FLIGHT DIVISION

	70	71
GS-15	5	5
GS-14	8	8
Other GS	45	45
Total	58	58

MATERIALS AND STRUCTURES DIVISION

	70	71
Excepted	2	2
GS-16	2	2
GS-15	12	13
GS-14	19	20
Other GS	102	100
Total	137	137

INSTRUMENT AND COMPUTING DIVISION

	70	71
Excepted	1	1
GS-16	1	1
GS-15	8	9
GS-14	18	18
Other GS	165	169
WB	44	39
Total	237	237

SPECIAL PROJECTS DIVISION

	70	71
Excepted	1	1
GS-16	1	1
GS-15	11	12
GS-14	12	12
Other GS	37	36
Total	62	62

POWER DIVISIONS

	70	71
Excepted	1	1
GS-15	1	1
Other GS	1	1
Total	3	3

DIRECT ENERGY CONVERSION DIVISION

	70	71
GS-16	1	1
GS-15	6	9
GS-14	17	17
Other GS	59	58
Total	85	85

SPACE POWER SYSTEMS DIVISION

	70	71
GS-16	1	1
GS-15	7	8
GS-14	24	24
Other GS	66	64
Total	98	98

NUCLEAR SYSTEMS DIVISION

	70	71
Excepted	1	1
GS-16	3	3
GS-15	10	11
GS-14	25	26
Other GS	64	62
Total	103	103

FLUID SYSTEM COMPONENTS DIVISION

	70	71
Excepted	1	1
GS-16	3	3
GS-15	14	15
GS-14	21	21
Other GS	59	58
Total	98	98

ROCKETS AND VEHICLES DIVISION

	70	71
Excepted	1	1
Other GS	1	1
Total	2	2

LAUNCH VEHICLES DIVISION

	70	71
Excepted	1	1
GS-16	2	2
GS-15	11	12
GS-14	35	37
Other GS	100	95
Total	149	147

CHEMICAL ROCKET DIVISION

	70	71
Excepted	1	1
GS-16	1	1
GS-15	7	8
GS-14	20	20
Other GS	64	63
Total	93	93

ADVANCED SYSTEMS DIVISION

	70	71
Excepted	2	2
GS-16	1	1
GS-15	10	11
GS-14	7	7
Other GS	58	57
Total	78	78

SPACECRAFT TECHNOLOGY DIVISION

	70	71
GS-16	1	1
GS-15	10	11
GS-14	8	8
Other GS	64	63
Total	83	83

TECHNICAL SERVICES

	70	71
Excepted	1	1
Other GS	1	1
Total	2	2

TECHNICAL SERVICES COORDINATION OFFICE

	70	71
Other GS	14	14
Total	14	14

PLANT SERVICES DIVISION

	70	71
GS-14	1	1
Other GS	43	43
WB	83	83
Total	127	127

TEST INSTALLATIONS DIVISION

	70	71
GS-14	1	1
Other GS	14	44
WB	498	468
Total	513	513

FACILITIES OPERATIONS DIVISION

	70	71
GS-15	2	2
Other GS	50	50
WB	284	284
Total	336	336

FABRICATION DIVISION

	70	71
GS-14	2	2
Other GS	29	29
WB	207	207
Total	238	236

EQUIPMENT AND SUPPLY DIVISION

	70	71
GS-14	1	1
Other GS	49	49
WB	80	80
Total	130	130

ENGINEERING SERVICES

	70	71
GS-16	1	1
Other GS	1	1
Total	2	2

ENGINEERING DESIGN DIVISION

	70	71
GS-15	5	6
GS-14	15	15
Other GS	122	121
WB	4	4
Total	146	146

FACILITIES ENGINEERING DIVISION

	70	71
GS-15	8	9
GS-14	12	12
Other GS	61	61
Total	81	81

CONSTRUCTION DIVISION

	70	71
GS-15	1	1
GS-14	1	1
Other GS	14	14
Total	16	16

ADMINISTRATION

	70	71
Excepted	1	1
Other GS	3	3
Total	4	4

CHIEF COUNSEL

	70	71
GS-15	1	1
GS-14	1	1
Other GS	4	4
Total	6	6

SECURITY OFFICE

	70	71
GS-14	1	1
Other GS	6	6
Total	7	7

SAFETY OFFICE

	70	71
Other GS	6	6
Total	6	6

PATENT COUNSEL

	70	71
GS-15	1	1
GS-14	1	1
Other GS	3	3
Total	5	5

PERSONNEL DIVISION

	70	71
GS-15	1	1
GS-14	5	5
Other GS	37	37
Total	43	43

FINANCE DIVISION

	70	71
GS-14	1	1
Other GS	60	60
Total	61	61

PROCUREMENT DIVISION

	70	71
Excepted	1	1
GS-14	5	5
Other GS	97	97
Total	103	103

MANAGEMENT SERVICES DIVISION

	70	71
GS-14	2	2
Other GS	121	123
WB	12	10
Total	135	135

PLUM BROOK STATION

	70	71
Excepted	1	1
GS-15	1	1
Other GS	5	5
Total	7	7

ROCKET SYSTEMS DIVISION

	70	71
GS-15	1	1
GS-14	8	8
Other GS	35	35
Total	44	44

REACTOR DIVISION

	70	71
GS-16	1	1
GS-15	5	6
GS-14	9	10
Other GS	74	72
Total	89	89

SPACE POWER FACILITY DIVISION

	70	71
GS-16	1	1
GS-15	3	4
GS-14	6	6
Other GS	25	22
Total	35	35

ENGINEERING DIVISION

	70	71
GS-15	1	1
GS-14	3	3
Other GS	30	30
Total	34	34

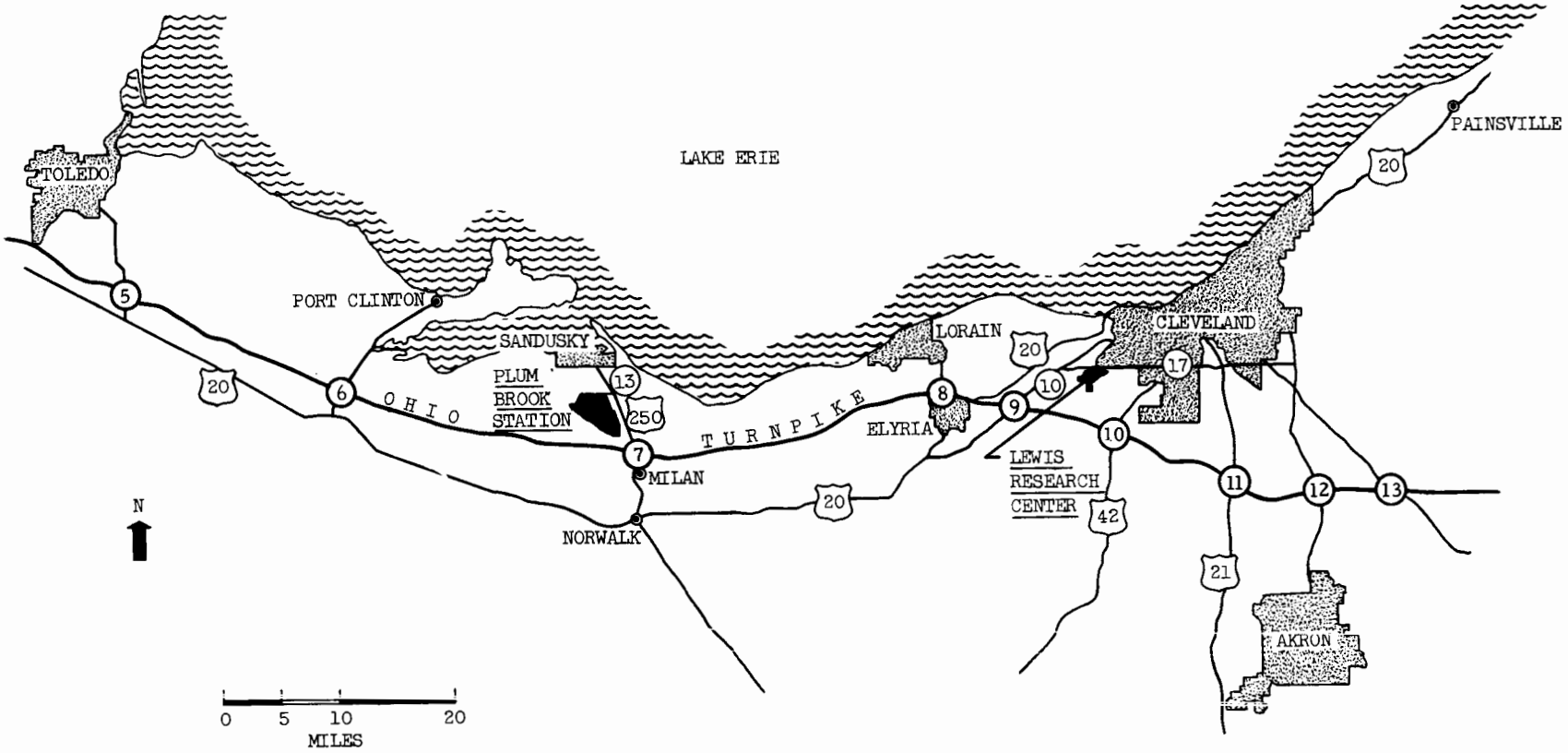
ADMINISTRATION DIVISION

	70	71
Other GS	22	22
WB	6	6
Total	28	28

FACILITIES SERVICE DIVISION

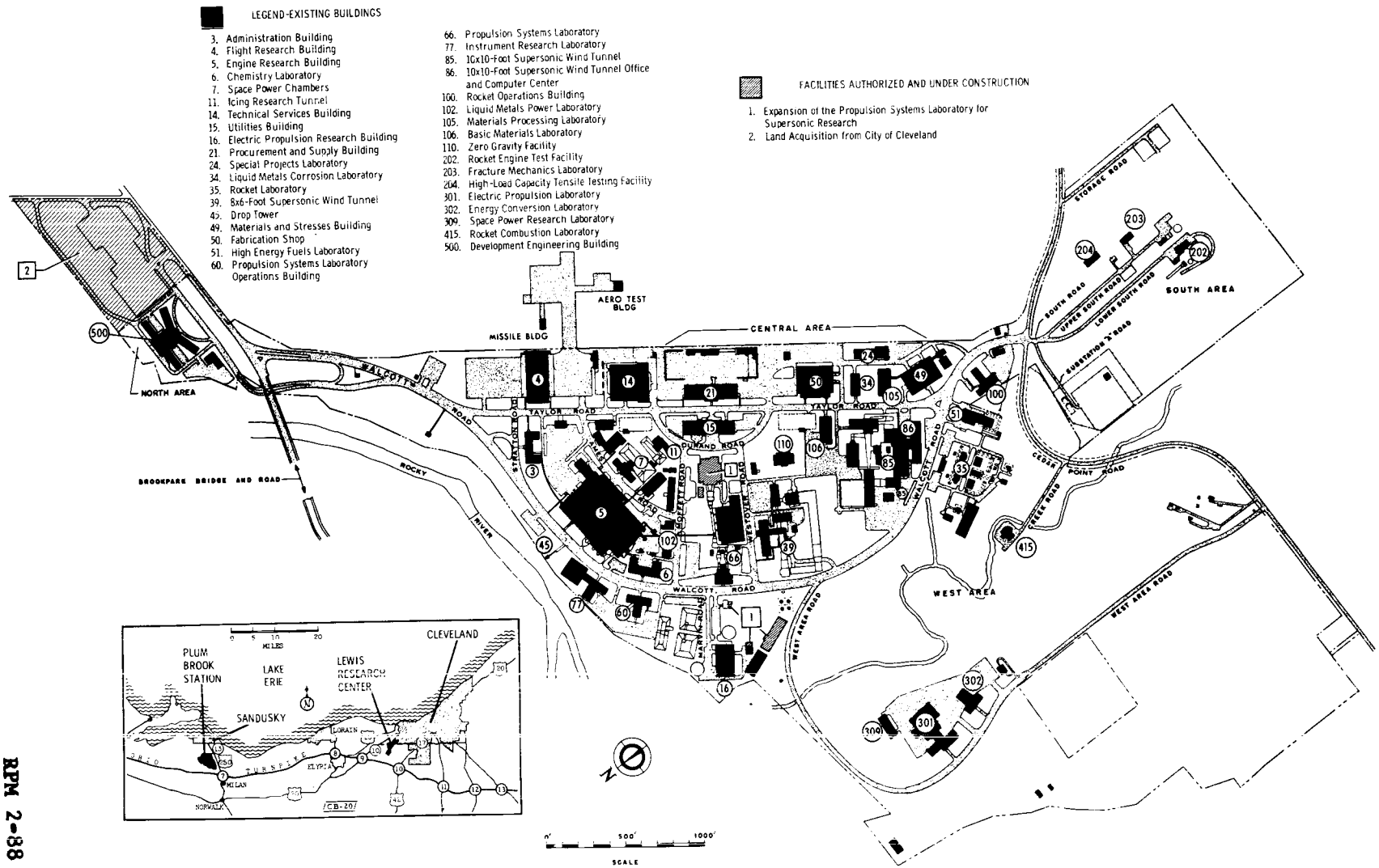
	70	71
GS-14	1	1
Other GS	15	23
WB	294	286
Total	310	310

LOCATION OF LEWIS RESEARCH CENTER INCLUDING PLUM BROOK STATION



LEWIS RESEARCH CENTER
FISCAL YEAR 1971 ESTIMATES

LOCATION PLAN



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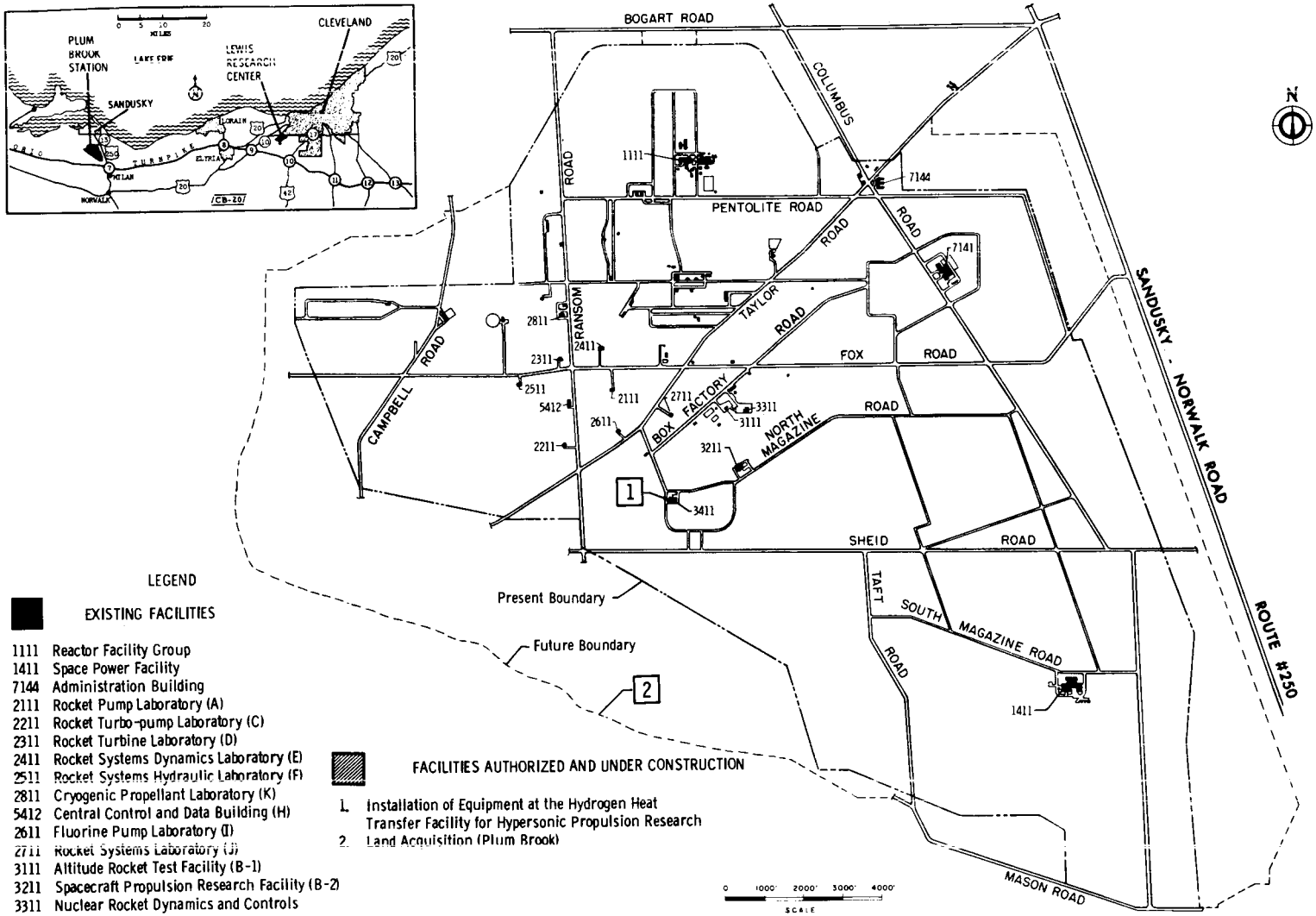
LEWIS RESEARCH CENTER
PLUM BROOK STATION
FISCAL YEAR 1971 ESTIMATES

LOCATION PLAN



LEGEND

EXISTING FACILITIES

1111 Reactor Facility Group
1411 Space Power Facility
7144 Administration Building
2111 Rocket Pump Laboratory (A)
2211 Rocket Turbo-pump Laboratory (C)
2311 Rocket Turbine Laboratory (D)
2411 Rocket Systems Dynamics Laboratory (E)
2511 Rocket Systems Hydraulic Laboratory (F)
2811 Cryogenic Propellant Laboratory (K)
5412 Central Control and Data Building (H)
2611 Fluorine Pump Laboratory (I)
2711 Rocket Systems Laboratory (J)
3111 Altitude Rocket Test Facility (B-1)
3211 Spacecraft Propulsion Research Facility (B-2)
3311 Nuclear Rocket Dynamics and Controls Facility (B-3)
3411 Heat Transfer Facility
7141 Engineering Building

FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

1. Installation of Equipment at the Hydrogen Heat Transfer Facility for Hypersonic Propulsion Research
2. Land Acquisition (Plum Brook)

LEWIS RESEARCH CENTER
FISCAL YEAR 1971 ESTIMATES

CLEVELAND FACILITIES

LEWIS RESEARCH CENTER
FISCAL YEAR 1971 ESTIMATES

PLUM BROOK FACILITIES

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1971 ESTIMATES

SPACE NUCLEAR PROPULSION OFFICE

MISSION:

The joint AEC-NASA Space Nuclear Propulsion Office is responsible for the formulation and execution of a research and development program for nuclear rockets. The general objective of the Nuclear Rocket Program is to provide a significant increase in propulsion capability for future space activities. A principal specific objective is to develop a 75,000 pound thrust engine, NERVA, for incorporation in a reusable nuclear stage.

In addition to NERVA development, effort is directed to the advancement of the technology of nuclear rocketry with emphasis being placed on the areas of: (1) continued improvement to nuclear rocket performance, (2) to provide the base of information for the development of a nuclear stage, and (3) to investigate the feasibility of advanced propulsion concepts.

DESCRIPTION:

The Nuclear Rocket Program is a joint AEC-NASA undertaking. To ensure an integrated program, the Space Nuclear Propulsion Office, established by an interagency agreement between NASA and the Atomic Energy Commission, manages all aspects of the program.

The Space Nuclear Propulsion Office consists of a Headquarters Office located at Germantown, Maryland, and three field extensions located in Ohio, New Mexico, and Nevada. At the Nevada location, the Nuclear Rocket Development Station (NRDS) was established to provide a site for ground static testing of the reactors, engines, and eventually, vehicles associated with nuclear rocket development.

The Nuclear Rocket Development Station consists of an approximately 78,000-acre site owned by the Atomic Energy Commission, approximately 90 miles northwest of Las Vegas, Nevada. The total capital investment of NASA-funded facilities, including fixed assets in progress and contractor-held facilities at various locations, as of June 30, 1969, was $50,256,000.

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

Functions	1969	1970	1971
Personnel	$1,880,000	$2,030,000	$2,089,000
Travel	188,000	204,000	213,000
Automatic data processing	---	---	---
Facilities services	---	---	---
Technical services	67,000	---	---
Administrative support	---	---	---
Total, fund requirements	$2,135,000	$2,234,000	$2,302,000

PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Advanced Research and Technology			
Nuclear rockets	100	96	96
Subtotal, positions by program	100	96	96
2. Indirect Positions:			
Director and staff	3	3	3
Administrative support	1	1	1
Subtotal, indirect positions	4	4	4
Total, permanent positions	104	100	100

National Aeronautics and Space Administration
Organization and Staffing Chart
Space Nuclear Propulsion Office

Staffing Summary

	70	71
Excepted	3	3
GS-16	6	6
GS-15	23	23
GS-14	25	25
All Other GS	43	43
Total Permanent	100	100

Office of the Manager

	70	71
Excepted	2	2
GS-16	-	-
GS-15	1	1
GS-14	2	2
All Other GS	1	1
Total Permanent	6	6

Albuquerque Extension

	70	71
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	-	-
All Other GS	-	-
Total Permanent	1	1

Office of NERVA Development

	70	71
Excepted	-	-
GS-16	1	1
GS-15	3	3
GS-14	-	-
All Other GS	-	-
Total Permanent	4	4

Cleveland Extension

	70	71
Excepted	1	1
GS-16	2	2
GS-15	13	13
GS-14	16	16
All Other GS	27	27
Total Permanent	59	59

Office of Vehicle & Technology

	70	71
Excepted	-	-
GS-16	1	1
GS-15	2	2
GS-14	-	-
All Other GS	1	1
Total Permanent	4	4

Nevada Extension

	70	71
Excepted	-	-
GS-16	1	1
GS-15	3	3
GS-14	7	7
All Other GS	14	14
Total Permanent	25	25

Facilities & Equip. Branch

	70	71
Excepted	-	-
GS-16	1	1
GS-15	-	-
GS-14	-	-
All Other GS	-	-
Total Permanent	1	1

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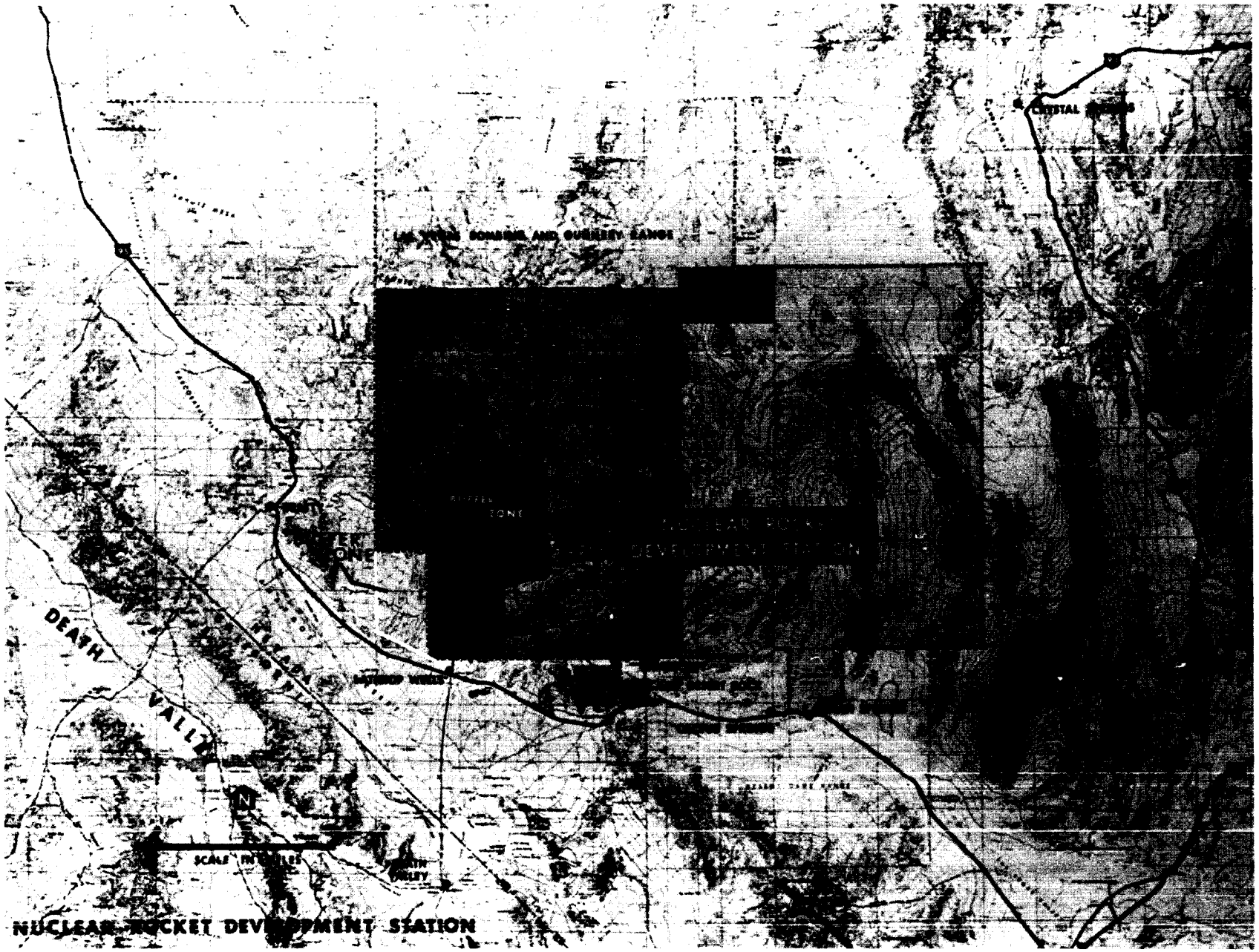
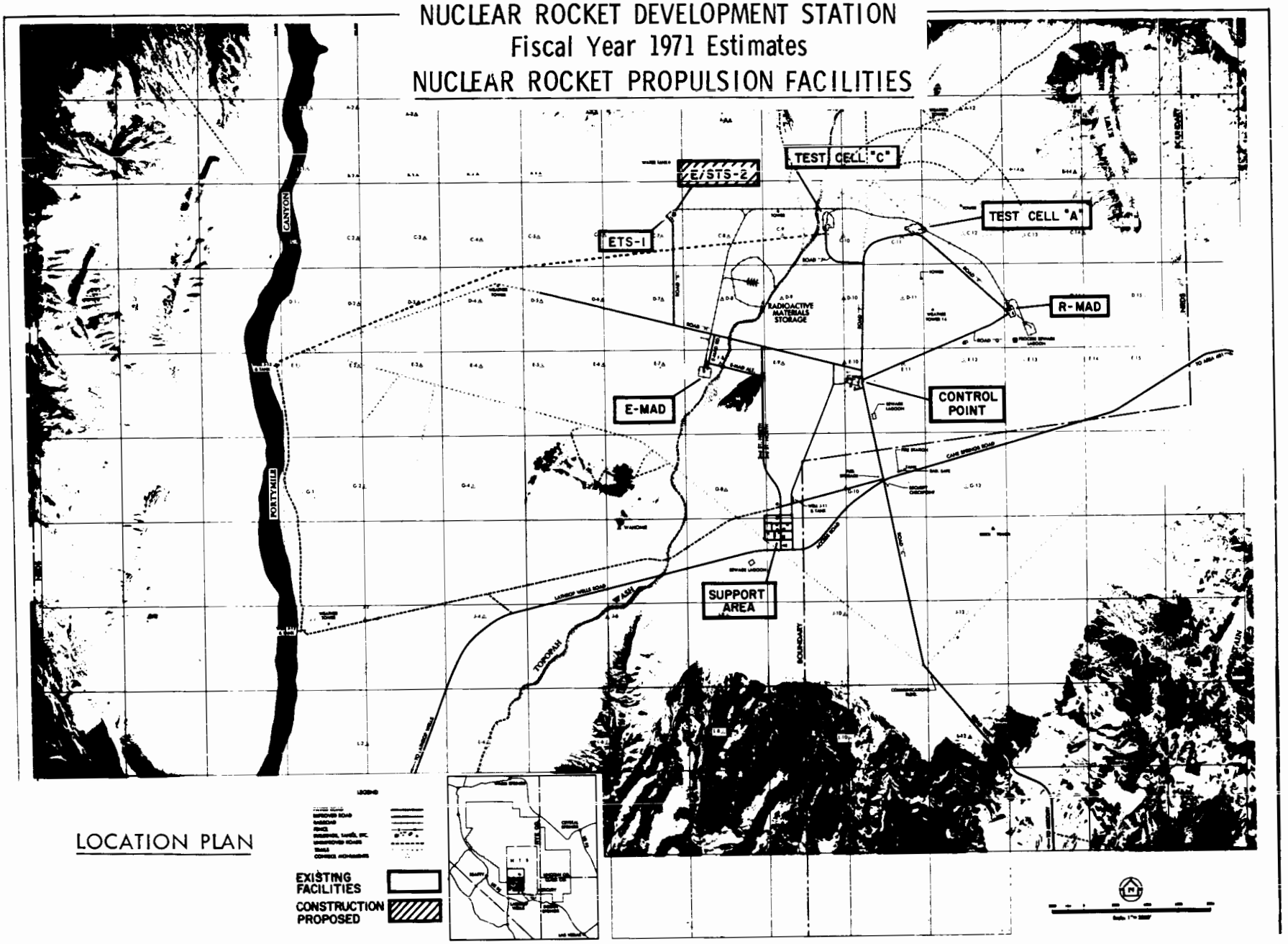
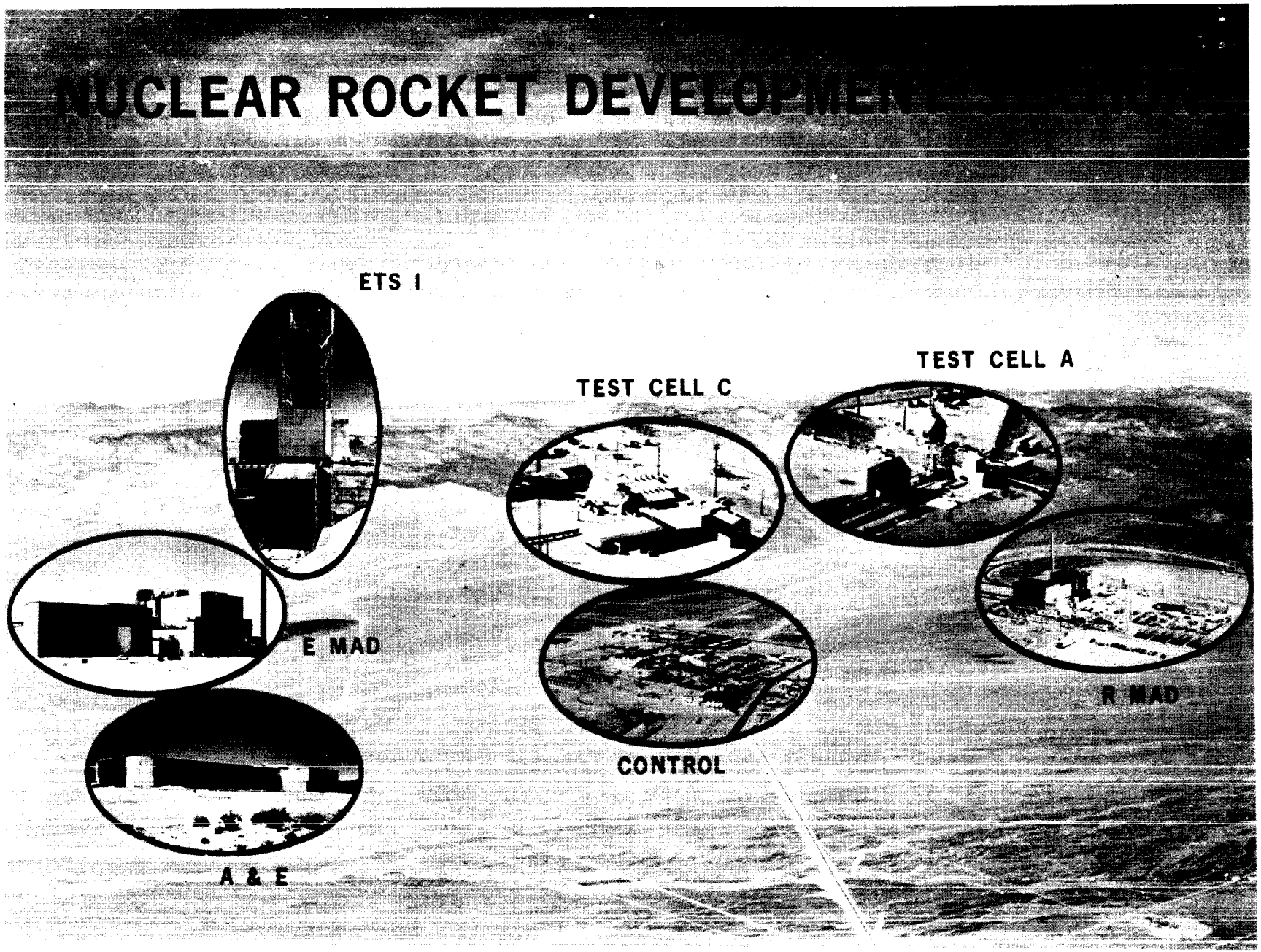

DEATH
VALLEY
N
SCALE IN MILES
NUCLEAR ROCKET DEVELOPMENT STATION

NUCLEAR ROCKET DEVELOPMENT STATION
Fiscal Year 1971 Estimates
NUCLEAR ROCKET PROPULSION FACILITIES



LOCATION PLAN


NUCLEAR ROCKET DEVELOPMEN
ETS I
TEST CELL C
TEST CELL A
E MAD
R MAD
CONTROL
A & E

Advanced Missions - To plan a broad program of explorations which will achieve and maintain a position of space leadership for the United States.

The Office of Manned Space Flight has launch responsibility for major manned and unmanned missions. The three installations primarily concerned with the manned space flight programs are: the George C. Marshall Space Flight Center, including Mississippi Test Facility, Michoud Assembly Facility, and Slidell where a computer facility is located; the Manned Spacecraft Center, including NASA activities at the White Sands Test Facility; and the John F. Kennedy Space Center, NASA, including NASA activities at the Eastern and Western Test Ranges.

Office of Space Science and Applications - Responsible for the NASA automated space flight program directed toward scientific investigations of the solar system utilizing ground based, airborne, and space techniques including sounding rockets, earth satellites, and deep space probes; for scientific experiments to be conducted by man in space and for assisting in the training of astronaut-scientists; for the research and development of space flight applications in such areas as meteorology, communications, navigation, geodesy, and earth resources surveys, and for the support of operational systems using these developments; and for the development, procurement and use of light and medium class launch vehicles.

The Office of Space Science and Applications has overall institutional responsibility for NASA installations primarily involved in space science and applications programs. These are the Goddard Space Flight Center, Wallops Station, the Jet Propulsion Laboratory (a Government-owned facility operated for NASA by the California Institute of Technology), and the NASA Pasadena Office, a component field activity of Headquarters.

Office of Advanced Research and Technology - Responsible for the planning, direction, execution, evaluation, documentation, and dissemination of the results of all NASA research and technology programs that are conducted primarily to demonstrate the feasibility of a concept, structure, component, or system and which may have general application to the nation's aeronautical and space objectives. This office is also responsible for coordinating NASA's total program of supporting research and technology related to carrying out specific flight missions in order to avoid unnecessary duplication and to insure an integrated and balanced agency research program.

In addition, this office has over-all institutional responsibility for the research centers primarily involved in carrying out NASA's advanced research programs. These installations are: the Ames Research Center, the Flight Research Center, the Langley Research Center, the Lewis Research Center, and the Space Nuclear Propulsion Office.

The NASA Pasadena Office - Pasadena, California, is a component field activity of the NASA Headquarters Office of Space Science and Applications. Its responsibilities are to negotiate and administer NASA contracts with the

California Institute of Technology for the operation of the Jet Propulsion Laboratory; provide patent and technology utilization services as they relate to prime and subcontracts at the Jet Propulsion Laboratory; and perform such additional procurement, contract administration, public affairs, communications, financial management, and other functions as may be assigned by the Associate Administrator for Space Science and Applications.

DESCRIPTION:

The NASA Headquarters is located at 400 Maryland Avenue, S.W., Washington, D.C., and also occupies other buildings in the District of Columbia and nearby Virginia. Except for some office space leased in the District of Columbia and a storage area in Virginia, personnel occupy Government-owned buildings. The NASA Pasadena Office is physically located at the Jet Propulsion Laboratory in Pasadena, California.

SUMMARY OF RESOURCES REQUIREMENTS:

	FUNDS		
Functions	1969	1970	1971
Personnel.....	$38,002,000	$41,929,000	$42,653,000
Travel.....	2,539,000	3,135,000	3,262,000
Automatic data processing.....	2,336,000	1,559,000	1,574,000
Facilities services.....	427,000	326,000	326,000
Technical services.....	11,594,000	9,546,000	9,490,000
Administrative support.....	5,879,000	5,323,000	5,430,000
Total, fund requirements.....	$60,777,000	$61,818,000	$62,735,000

PERSONNEL

	1969	1970	1971
1. **Permanent Positions by Program:**			
Manned Space Flight			
Apollo	196	153	143
Space flight operations	127	188	188
Advanced missions	52	40	40
Space Science and Applications			
Physics and astronomy	60	60	59
Lunar and planetary exploration	53	56	55
Bioscience	33	33	29
Space applications	52	55	56
Launch vehicle procurement	26	26	25
Advanced Research and Technology			
Basic research	29	30	29
Space vehicle systems	41	41	41
Electronics systems	31	31	30
Human factor systems	22	23	22
Space power and electric propulsion systems	28	28	28
Chemical propulsion	22	22	21
Aeronautical vehicles	29	30	29
University Affairs			
Sustaining university program	12	12	9
Tracking and Data Acquisition	54	55	54
Technology Utilization	18	18	18
Subtotal, positions by program	885	901	876
2. **Indirect Positions:**			
Director and staff	433	445	435
Administrative support	272	262	252
Research and development support	503	515	510
Subtotal, indirect positions	1,208	1,222	1,197
Total, permanent positions	2,093	2,123	2,073

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
ORGANIZATION AND STAFFING CHART

NASA HEADQUARTERS

STAFFING SUMMARY

	FY-70	FY-71
Excepted	196	196
GS-16	83	83
GS-15	432	435
GS-14	357	359
All Other GS	1,035	980
Wage Board	20	20
Total Perm.	2,123	2,073

ADMINISTRATOR

	FY-70	FY-71
Excepted	7	7
GS-16	-	-
GS-15		
GS-14	-	-
All Other GS	9	9
Wage Board	-	-
Total Perm.	16	16

GENERAL COUNSEL

	FY-69	FY-70
Excepted	6	6
GS-16	-	-
GS-15	11	11
GS-14	8	8
All Other GS	25	24
Wage Board	-	-
Total Perm.	50	49

POLICY

	FY-70	FY-71
Excepted	6	6
GS-16	-	-
GS-15	2	2
GS-14	2	2
All Other GS	10	10
Wage Board	-	-
Total Perm.	20	20

PROGRAMS PLANS & ANALYSIS

	FY-70	FY-71
Excepted	6	6
GS-16	-	-
GS-15	4	4
GS-14	1	1
All Other GS	3	3
Wage Board	-	-
Total Perm.	14	14

EXECUTIVE SECRETARY

	FY-70	FY-71
Excepted	2	2
GS-16		
GS-15	5	5
GS-14	6	6
All Other GS	38	37
Wage Board	5	5
Total Perm.	56	55

MANAGEMENT DEVELOPMENT

	FY-70	FY-71
Excepted	4	4
GS-16	-	-
GS-15	3	3
GS-14	1	1
All Other GS	7	7
Wage Board	-	-
Total Perm.	14	14

(AD HOC) AEROSPACE SAFETY ADVISORY PANEL

	FY-70	FY-71
Excepted	-	-
GS-16	-	-
GS-15	-	-
GS-14	-	-
All Other GS	-	-
Wage Board	-	-
Total Perm.		-

(AD HOC) PERSONNEL MANAGEMENT REVIEW COMMITTEE

	FY-70	FY-71
Excepted	-	-
GS-16	-	-
GS-15	-	-
GS-14	-	-
All Other GS	-	-
Wage Board	-	-
Total Perm.	-	-

ORGANIZATION & MANAGEMENT

	FY-70	FY-71
Excepted	14	14
GS-16	-	-
GS-15	22	25
GS-14	35	37
All Other GS	237	224
Wage Board	14	14
Total Perm.	322	314

ADMINISTRATION

	FY-70	FY-71
Excepted	12	12
GS-16	-	-
GS-15	37	37
GS-14	53	53
All Other GS	132	127
Wage Board	-	-
Total Perm.	236	230

INDUSTRY AFFAIRS

	FY-70	FY-71
Excepted	10	10
GS-16	1	1
GS-15	31	31
GS-14	56	56
All Other GS	60	56
Wage Board	-	-
Total Perm.	158	154

SPECIAL CONTRACTS NEGOTIATION & REVIEW

	FY-70	FY-71
Excepted	-	-
GS-16	-	-
GS-15	1	1
GS-14	-	-
All Other GS	3	3
Wage Board	-	-
Total Perm.	7	7

TECHNOLOGY UTILIZATION

	FY-70	FY-71
Excepted	6	6
GS-16	-	-
GS-15	18	18
GS-14	19	19
All Other GS	57	55
Wage Board	-	-
Total Perm.	99	97

UNIVERSITY AFFAIRS

	FY-70	FY-71
Excepted	-	-
GS-16	2	2
GS-15	4	4
GS-14	5	5
All Other GS	16	15
Wage Board	-	-
Total Perm.	29	28

DOD & INTERAGENCY AFFAIRS

	FY-70	FY-71
Excepted	5	5
GS-16	-	-
GS-15	4	4
GS-14	1	1
All Other GS	3	3
Wage Board	-	-
Total Perm.	13	13

INTERNATIONAL AFFAIRS

	FY-70	FY-71
Excepted	3	3
GS-16	1	1
GS-15	3	3
GS-14	3	3
All Other GS	18	17
Wage Board	-	-
Total Perm.	30	29

LEGISLATIVE AFFAIRS

	FY-70	FY-71
Excepted	3	3
GS-16	-	-
GS-15	6	6
GS-14	2	2
All Other GS	16	15
Wage Board	1	1
Total Perm.	28	27

PUBLIC AFFAIRS

	FY-70	FY-71
Excepted	5	5
GS-16	-	-
GS-15	21	21
GS-14	20	20
All Other GS	59	56
Wage Board	-	-
Total Perm.	105	102

MANNED SPACE FLIGHT

	FY-70	FY-71
Excepted	40	40
GS-16	21	21
GS-15	110	110
GS-14	77	77
All Other GS	129	120
Wage Board	-	-
Total Perm.	377	368

SPACE SCIENCE & APPLICATIONS

	FY-70	FY-71
Excepted	29	29
GS-16	24	24
GS-15	59	59
GS-14	39	39
All Other GS	139	132
Wage Board	-	-
Total Perm.	290	283

TRACKING & DATA ACQUISITION

	FY-70	FY-71
Excepted	6	6
GS-16	6	6
GS-15	22	22
GS-14	9	9
All Other GS	12	11
Wage Board	-	-
Total Perm.	55	54

ADVANCED RESEARCH & TECHNOLOGY

	FY-70	FY-71
Excepted	27	27
GS-16	28	28
GS-15	70	70
GS-14	20	20
All Other GS	59	54
Wage Board	-	-
Total Perm.	204	199

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RESEARCH AND PROGRAM MANAGEMENT TYPE COSTS

FISCAL YEAR 1971 ESTIMATES

JET PROPULSION LABORATORY

The Jet Propulsion Laboratory (JPL) is a Government-owned facility managed and operated by the California Institute of Technology under a contract with NASA. The cost of operating the Laboratory is funded from the Research and Development appropriation, except for the lease of administrative aircraft and the purchase of passenger motor vehicles which are funded from the Research and Program Management appropriation and are included in the NASA Headquarters budget presentation. The Research and Program Management type costs are presented for information only and are not a part of the NASA Research and Program Management budget.

MISSION:

The Jet Propulsion Laboratory performs a variety of engineering, scientific, and management missions including:

1. Project management of complete automated spacecraft systems for planetary exploration.

2. Operation of the Deep Space Network including tracking and data acquisition activities required by planetary flights, as well as backup to the Manned Space Flight Network.

3. A continuing program of supporting research and technology.

Specific examples of the Jet Propulsion Laboratory's activity in these areas are:

Planetary Exploration - The Mariner series of automated spacecraft was designed at the Jet Propulsion Laboratory. The Laboratory has been responsible for the project management of all Mariner missions including the integration, assembly, and testing of the spacecraft. Mariner II accomplished the first successful flyby of Venus in 1962, and in 1965, Mariner IV photographed the surface of Mars as it passed within 6,200 miles of the planet's surface. Mariner V was launched in June 1967 and four months later passed within 2,131 miles of Venus providing information on the atmospheric composition of the planet and other scientific data. Mariners VI and VII have just completed a successful dual mission to Mars in 1969. Mariner VI made its pass within 2,100 miles of Mars and photographed the planet's equatorial region, while Mariner VII photographed the southern hemisphere including the polar cap of Mars from 2,100 miles. Both spacecraft returned high quality pictures of the planet's surface. Photographs and science data provided by Mariners VI and VII have significantly increased man's knowledge of the Red Planet. Additional Mariner missions to the planets are planned for 1971 and 1973.

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Supporting Research and Technology - The Jet Propulsion Laboratory maintains a strong program of supporting research and technology, and advanced development. Much of the knowledge gained from active research in such areas as fluid physics, electrophysics, materials, applied mathematics, and guidance and control will continue to be applied to problems in space exploration.

Another activity of considerable importance is the development and fabrication of scientific experiments to be flown on vehicles other than Jet Propulsion Laboratory spacecraft. These include high-altitude balloons, Aerobee rockets, NASA aircraft, and Earth orbiters. The scientific teams involved in these experiments frequently include faculty members of various universities and staff members from NASA field installations.

Tracking and Data Acquisition - The Jet Propulsion Laboratory is responsible for the design and operation of the worldwide Deep Space Network. The Deep Space Network is comprised of the Space Flight Operations Facility in Pasadena as well as tracking and data acquisition stations located in California, Spain, South Africa and Australia. The Space Flight Operations Facility is the central communications and control facility for the conduct of flight missions. The Deep Space Network provides support not only to Jet Propulsion Laboratory managed flight missions, but also for all manned Lunar Missions, and for projects such as Pioneer and Helios which are managed by other NASA field installations.

DESCRIPTION:

The Jet Propulsion Laboratory is located in Pasadena, California, approximately 20 miles north of downtown Los Angeles. Subsidiary facilities are located at Goldstone, California (tracking and data acquisition), Edwards Air Force Base, Muroc, California (solid propellant formulation and testing), and Table Mountain, California (open air testing and astronomy).

At Pasadena, the Laboratory occupies 175.9 acres of land of which 145.9 acres are owned by NASA and 30 acres are leased. At Goldstone, facilities are located on land occupied under permit from the Army. At Edwards Air Force Base, facilities are located on land occupied under permit from the Air Force. Facilities at Table Mountain are located on land occupied under permit from the Forest Service of the Department of Agriculture. The capital investment of the Jet Propulsion Laboratory, including the Deep Space Network and contractor-held facilities, as of June 30, 1969, was $193,425,000.

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

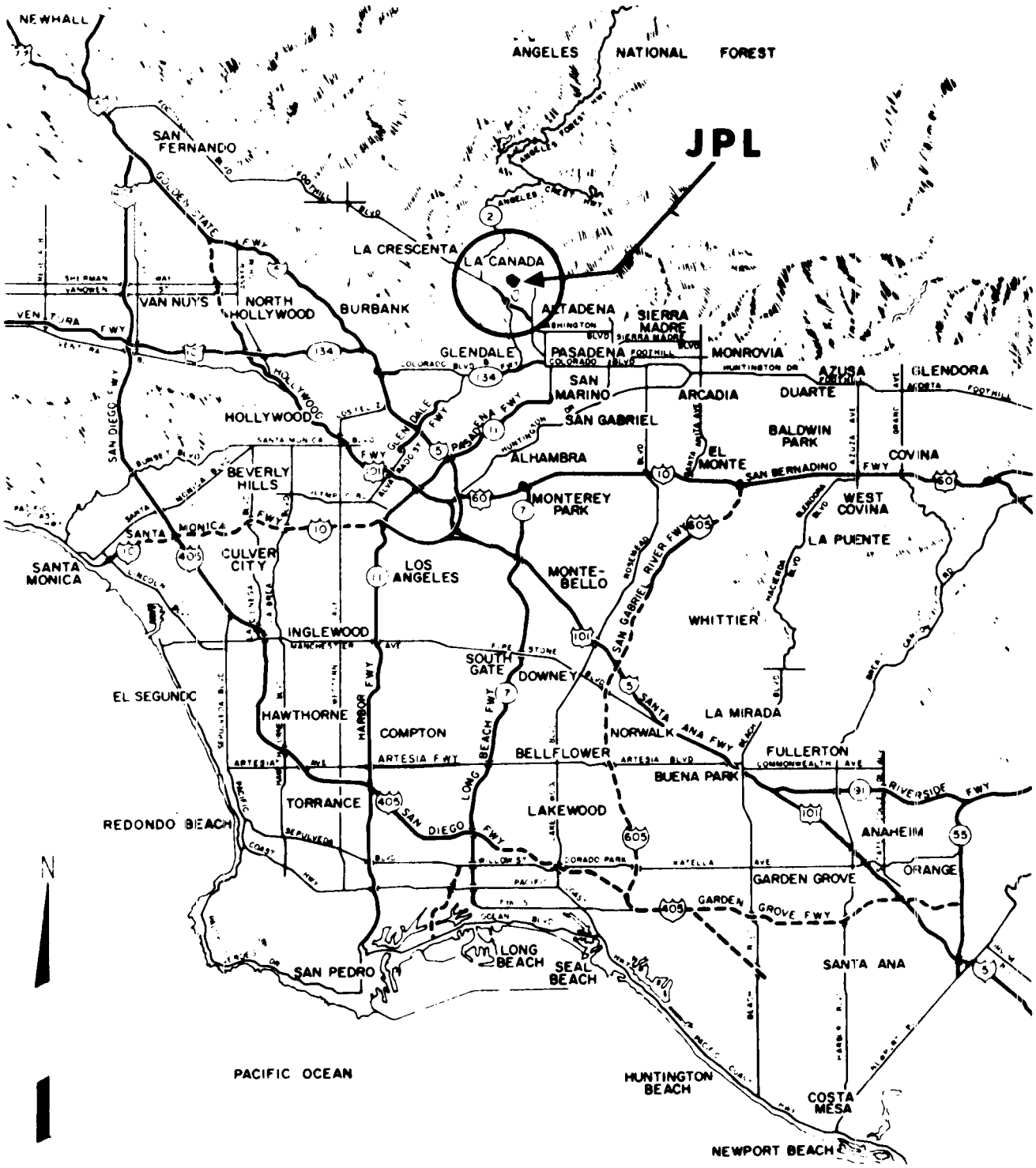
Functions	1969	1970	1971
Personnel	$59,380,000	$67,160,000	$71,211,000
Travel	2,468,000	2,259,000	2,472,000
Automatic data processing	3,531,000	5,379,000	5,375,000
Facilities services	5,995,000	6,572,000	6,556,000
Technical services	674,000	784,000	779,000
Administrative support	2,420,000	2,495,000	2,462,000
Total, fund requirements	$74,468,000	$84,649,000	$88,855,000

PERSONNEL

	1969	1970	1971
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	29	43	36
Advanced missions	17	17	17
Space Science and Applications			
Physics and astronomy	12	11	8
Lunar and planetary exploration	949	903	859
Bioscience	30	30	30
Space applications	30	67	71
Launch vehicle procurement	2	7	7
Advanced Research and Technology			
Basic research	117	109	109
Space vehicle systems	39	39	39
Electronics systems	71	88	88
Human factor systems	2	-	-
Space power and electric propulsion systems	77	94	94
Chemical propulsion	48	58	58
Aeronautical vehicles	-	2	2

	1969	1970	1971
Tracking and Data Acquisition..	454	494	494
Subtotal, positions by program	1,877	1,962	1,912
Direct Support.....	515	545	533
2. Indirect Positions.....	1,598	1,693	1,655
Total, permanent positions.....	3,990	4,200	4,100

VICINITY MAP



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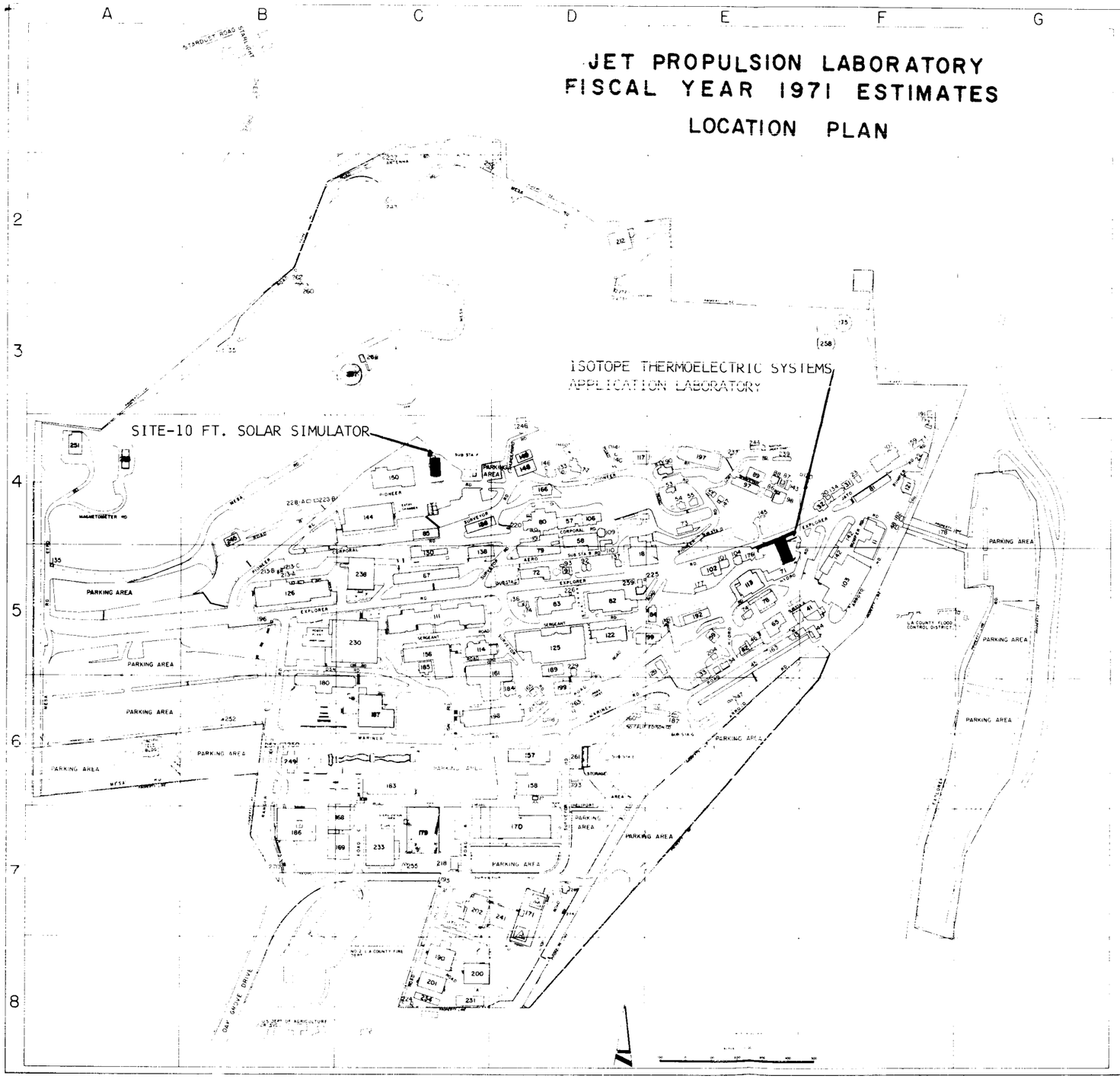
JET PROPULSION LABORATORY
FISCAL YEAR 1971 ESTIMATES
LOCATION PLAN



BUILDING LEGEND

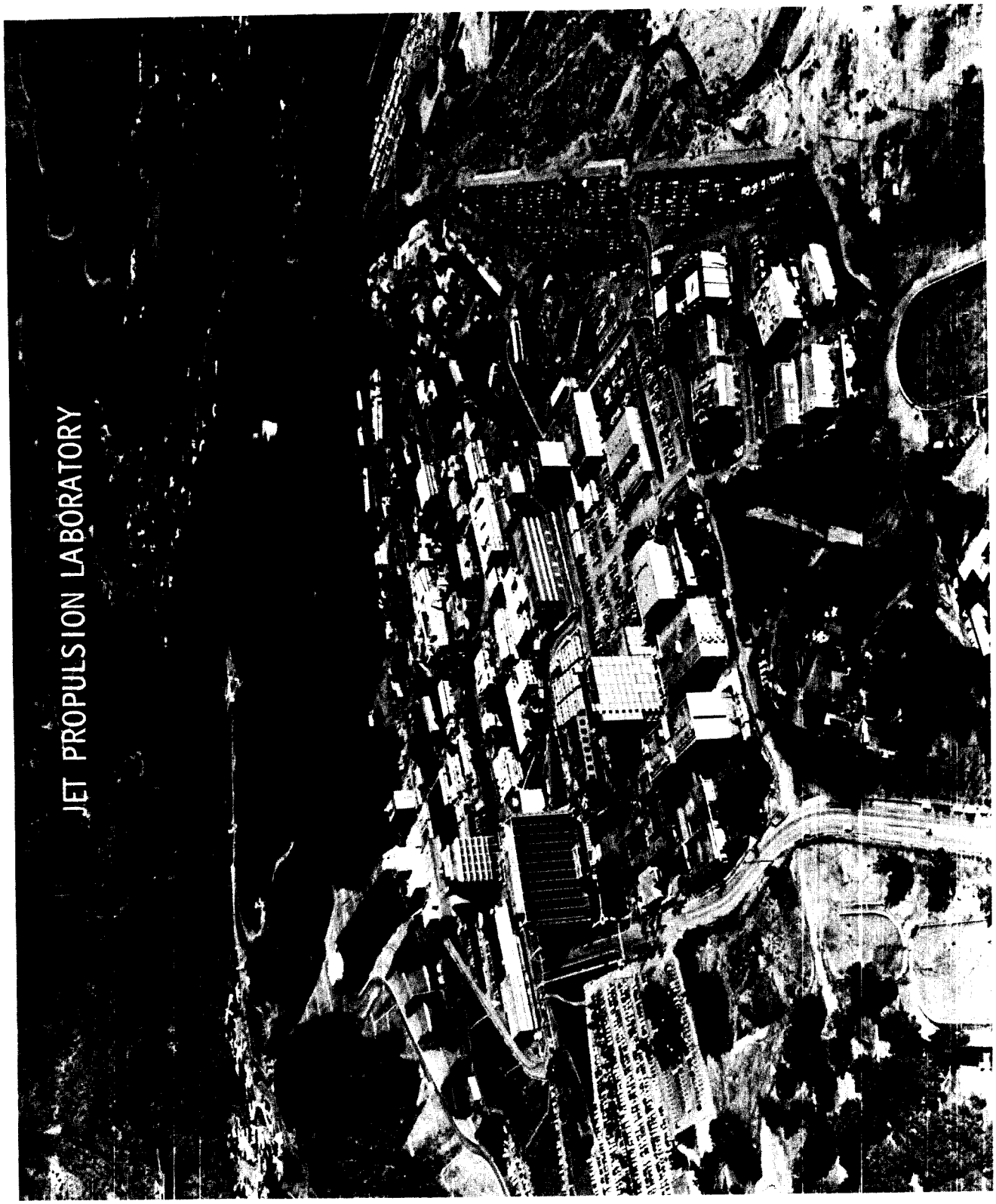
Bldg Nº	Title	Location
11	SPACE SCIENCES LABORATORY	4-F
13	OFFICES, LAB & SHOP	5-E
18	STRUCTURAL TEST LAB	5-D
20	SHOP TEST CELL Nº 2 (LIQUID)	4-F
22	SPACE SCIENCES LAB	4-F
23	SHOP TEST CELL Nº12 (LIQUID)	4-F
31	TEST CELL (LIQUID)	4-F
32	TEST CELL (LIQUID)	4-F
33	TEST CELL (LIQUID)	5-E
34	SHOP TEST CELL Nº 33 (LIQUID)	5-E
35	MAGNETIC FLUX TANK SHELTER	5-B
41	HI TEMP LAB	5-F
42	TEST CELL (LIQUID)	5-E
44	CREDIT UNION	5-F
45	IMPACT LABORATORY	5-E
46	SHOP TEST CELL Nº 42 (LIQUID)	5-E
47	PLANT PROTECTION	4-E
48	GUARD SHELTER	4-F
53	CONDITIONING LAB (SOLID)	4-E
54	BLENDING LAB (SOLID)	4-E
55	MIXING LAB (SOLID)	5-E
57	TEST CELL (AIR FUEL)	4-D
58	COMPRESSOR BUILDING	4-D
59	CHEM LAB	5-E
65	MATERIALS LAB	5-E
67	MICROBIOLOGY FACILITY	5-C
71	MATERIAL SERVICES STORAGE ANNEX	5-E
72	ENGINEERING OFFICES	5-D
73	UTILITIES AREA STORAGE	4-E
74	TEST CELL (CHEMISTRY)	5-F
77	SOIL SCIENCE LAB	4-D
78	HYDRAULICS LAB	5-E
79	WIND TUNNEL (20 INCH)	4-D
80	WIND TUNNEL (21 INCH)	4-D
81	SPACE SCIENCES LAB	4-F
82	ENVIRONMENTAL TEST LAB	5-D
83	ELECTRONIC PARTS & ENGINEERING	5-D
84	TEST CELL & SOLID CHEMISTRY	5-E
85	BUSINESS SYSTEMS OFFICE	4-C
86	OXIDIZER GRINDING (SOLID)	4-E
87	OVENS (SOLID)	4-E
88	MIXING LAB (SOLID)	4-E
89	PROCESSING LAB (SOLID)	4-E
90	SHOP TEST CELL Nº 51	4-E
91	AIR DRYER (WIND TUNNEL)	5-D
92	COOLING TOWER (WIND TUNNEL)	5-D
93	VAPORIZER (WIND TUNNEL)	5-D
97	DEVELOPMENT LAB & OFFICES	4-E
98	PREPARATION SHOP (SOLID)	4-E
99	CHEMISTRY LAB (SOLID)	5-E
101	TRANSPORTATION OFFICES	5-E
102	TRANSPORTATION SHOP	5-E
103	FABRICATION SHOP	5-F
104	FIRST AID	5-E
106	TEST CELL (AIR FUEL)	4-D
107	TEST CELL	4-F
109	COOLING TOWER (WIND TUNNEL)	4-D
110	FUEL STORAGE DOCK	4-D
111	GENERAL OFFICES BLDG	5-C
113	PROPULSION LABORATORY	5-E
114	CAFETERIA & OFFICES	5-C
115	HEATING PLANT (SOLID)	4-E
116	PROPELLANT STORAGE DOCK	6-E
117	TEST CELL (SOLID)	4-D
118	COOLING TOWER	6-D
120	COOLING TOWER	4-F
121	EMPLOYEE DEVELOPMENT CENTER	4-F
122	ENGINEERING OFFICES	5-D
125	COMBINED ELECTRONICS	5-D
126	VOYAGER PROJECT OFFICE	5-B
129	TEST CELL (CHEMISTRY)	5-E
130	ENGINEERING OFFICES	5-C
133	SERVICE DOCK	4-D
134	SHOP TEST CELL	4-F
135	GUARD SHELTER	5-A
136	COOLING TOWER	5-D
137	COOLING TOWER	5-D
138	ENGINEERING OFFICES	5-C
140	MAGAZINE X TEMP	4-D
141	MAGAZINE X TEMP	4-D
142	UTILITIES DOCK	4-F
143	SOLID ROCKET DOCK	4-E
144	ENVIRONMENTAL LAB	4-C
145	MAGAZINE-PROPELLANT	4-E
146	MAGAZINE-TEMP	4-D
147	COOLING TOWER	4-E
148	ENERGY CONVERSION LABORATORY	4-D
150	25 FOOT SPACE SIMULATOR	4-C
152	HAZARDOUS CHEMICAL STORAGE	5-E
156	COMPUTER PROGRAM OFFICE	5-C
157	ENGINEERING & MECHANICS BLDG	6-D
158	MATL RESEARCH PROCESS-LAB	6-D
159	PUMP HOUSE (WATER)	4-F
160	SEWAGE LIFT STATION	6-D
161	TELECOMMUNICATIONS LAB	5-C
163	COOLING TOWER	5-E
165	COOLING TOWER	6-D
166	COOLING TOWER	4-D
167	CAFETERIA	6-C
168	SPACE SCIENCES INSTRMT SYSTEM LAB	7-C
169	SURVEYOR PROJECT OFFICE	7-C
170	FABRICATION SHOP	7-D
171	MATERIALS SERVICE BLDG	7-D
173	TEST SHELTER	4-F
174	COOLING TOWER	5-D
175	WATER RESERVOIR	5-F
176	FIRE HOUSE	5-E
177	HEAVY EQUIP SERVICING SHED	5-E
178	BAILEY BRIDGE	4-F
179	SPACECRAFT ASSY FACILITY	7-C
180	CENTRAL ENGR BLDG	6-B
182	BUS STOP SHELTER	4-F
183	PHYSICAL SCIENCE LAB	6-C
184	ELECTRONIC STORES	5-D
185	PROGRAMMING OFFICE	5-C
186	SPACE SCIENCES DIVISION BLDG	7-B
187	CHEMICAL STORAGE	6-F
188	ENGINEERING FACILITIES BLDG	4-C
189	ELECTRONICS LAB ANNEX	5-D
190	PROCUREMENT OFFICES	4-C
191	HAZARDOUS TEST BAY	5-F
192	PROPULSION ENGINEERING	5-E
193	HELIPORT DISPATCHERS OFFICE	6-D
195	GUARD SHELTER	7-C
196	GUARD SHELTER	5-B
197	SOLID PROPELLANT PROCESS LAB	4-E
198	GUIDANCE LAB	6-D
199	CELESTIAL SIMULATOR BLDG	6-D
200	PLANT ENGINEERING SERVICES	8-C
201	CARPENTER SHOP	8-C
202	PROCUREMENT OFFICES	7-C
204	TEST CELL "X" EQUIP BLDG	5-E
212	ANTENNA (DEMONSTRATION)	2-D
213	COOLING TOWERS A, B & C	5-B
215	COOLING TOWER	6-D
219	SECRETARIAL CENTER	7-C
220	CARS TERMINAL BUILDING	4-D
224	SEWER LIFT STATION	8-F
225	GUARD SHELTER	5-D
226	SOLVENT STORAGE BLDG	5-D
227	GUARD SHELTER	2-C
228	COOLING TOWERS (A & B)	4-B
229	SHIELDED ROOM BLDG	5-D
230	SPACE FLIGHT OPERATIONS FACILITY	5-C
231	PAINT SHOP	8-E
233	SPACECRAFT DEVELOPMENT BLDG	7-C
234	LUMBER STORAGE BLDG	8-E
237	COOLING TOWER	4-E
238	TELECOMMUNICATIONS LAB	5-C
239	LOW TEMP SOLID PROPELLANT MAG	1-E
241	SHIPPING & RECEIVING	7-D
243	REMOTE ANTENNA RANGE CONTR BLDG	2-C
244	HI TEMP STORAGE MAGAZINE	4-A
245	SPECTROSCOPY LAB	4-B
246	SOILS TEST LAB	4-D
247	DYNAMITRON (TEMPORARY)	4-C
248	TEN FT SPACE SIMULATOR	4-C
249	VISITORS RECEPTION BLDG	7-C
250	GUARD SHELTER	6-B
251	GYRO LAB	4-A
252	GUARD SHELTER	6-B
253	LOW MAG INTERFERENCE LAB	4-A
255	SEWAGE LIFT STATION	7-C
256	MODEL RANGE CONTROL BLDG	2-C
257	GUARD ISLAND	6-B
258	WATER RESERVOIR	3-F
259	LIQUID NITROGEN BOTTLING STORAGE	5-D
260	ILLUMINATOR EQUIPMENT BLDG	3-B
261	CONSTRUCTION MATERIALS STORAGE	6-D
262	RADIOMETER BLDG	2-B
263	PROTECTIVE SERVICES BLDG	6-D
267	WATER RESERVOIR	3-C
268	PUMP HOUSE	3-C
269	GROUNDS MAINTENANCE BLDG	7-D
270	SEWAGE METERING STATION	7-B
271	OIL BARREL STORAGE BLDG	6-D
272	EAST ILLUMINATOR BLDG	3-D
273	EAST ILLUMINATOR TOWER	3-D
274	COOLING TOWER	7-D

CALIFORNIA INSTITUTE OF TECHNOLOGY
JET PROPULSION LABORATORY
PLANT ENGINEERING

SITE PLAN
BUILDING LOCATIONS

SP 01

RPM 2-108



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U. S. GOVERNMENT PRINTING OFFICE : 1970 O - 375-945