National Aeronautics and Space Administration

BUDGET ESTIMATES

FISCAL YEAR 1972

Volume IV

RESEARCH AND PROGRAM MANAGEMENT

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1972 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, it is intended 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 logistics support, (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 1970	Fiscal Year 1971	Fiscal Year 1972
MANNED SPACE FLIGHT.....	$329,836,000	$348,807,000	$332,005,000
John F. Kennedy Space Center, NASA.....	97,582,000	97,246,000	95,559,000
Manned Spacecraft Center.....	106,561,000	109,113,000	106,255,000
Marshall Space Flight Center..	125,693,000	142,448,000	130,191,000
SPACE SCIENCE AND APPLICATIONS.	$96,140,000	$101,268,000	$100,326,000
Goddard Space Flight Center..	86,452,000	91,194,000	90,299,000
Wallops Station.....	9,688,000	10,074,000	10,027,000

	Fiscal Year 1970	Fiscal Year 1971	Fiscal Year 1972
ADVANCED RESEARCH AND TECHNOLOGY	$213,044,000	$203,795,000	$205,338,000
Ames Research Center.....	37,602,000	39,899,000	39,719,000
Electronics Research Center...	19,106,000	---	---
Flight Research Center.....	10,308,000	10,895,000	10,974,000
Langley Research Center.....	69,851,000	73,388,000	74,191,000
Lewis Research Center.....	73,895,000	77,094,000	77,866,000
Space Nuclear Systems Office..	2,282,000	2,519,000	2,588,000
SUPPORTING OPERATIONS			
NASA Headquarters.....	$63,158,000	$64,563,000	$59,681,000
TOTAL.....	$702,178,000	$718,433,000	$697,350,000

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 Systems Office. The Associate Administrator for Organization and Management acts as the institutional director for NASA Headquarters.

The Research and Program Management appropriation request may be categorized into five functional areas, as follows:

1. Personnel and 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 costs of moving expenses (as provided by law), recruiting and personnel investigation services provided by the Civil Service Commission, and personnel training. This functional category accounts for 76% of the Research and Program Management appropriation.

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; for overseas travel to launch and tracking sites; and for travel to meetings and technical seminars.

3. Facilities Services includes the cost of maintenance and related services, custodial services, minor construction, facility operations, and for range operations at the John F. Kennedy Space Center, NASA.

4. Technical Services includes the cost of automatic data processing, institutional engineering services, the dissemination of scientific and technical information derived from the various R&D programs, and educational informational program activities.

5. Administrative Support includes the cost of communications; administrative printing; administrative supplies, general purpose materials and equipment; transportation support; and other support activities.

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

Function	Fiscal Year 1970	Fiscal Year 1971	Fiscal Year 1972
Personnel and related costs.	$529,448,000	$535,962,000	$530,916,000
Travel.....	15,195,000	17,946,000	17,061,000
Facilities services.....	82,980,000	90,176,000	78,527,000
Technical services.....	35,983,000	33,654,000	31,265,000
Administrative support.....	38,572,000	40,695,000	39,581,000
Total.....	$702,178,000	$718,433,000	$697,350,000

1971 OPERATING BUDGET

The budget request for 1971 for Research and Program Management was $692,300,000. The amount authorized by the Congress is $683,300,000 and the appropriations enacted are $678,725,000, a reduction of $13,575,000 from the amount requested. The initial NASA operating budget for 1971 was developed to conform to the lower level of funding by reducing personnel and related costs of $9,000,000 to conform to the limitation in the Authorization Act, and the balance, $4,575,000, from all other costs. In order to operate within the limitation on expenditures for personnel and related costs, it was necessary to reduce civil service employment by 700 above that already planned in the budget. This reduction was accomplished by conducting a reduction-in-force (RIF) at all major centers, except Goddard, in the summer of 1970. In carrying out the RIF, 570 employees were separated involuntarily, and 350 positions were

abolished as they became vacant through voluntary separations. In addition, the RIF resulted in over 450 secondary adverse actions, including changes to lower grade and reassignments without change in grade. In summary, the RIF involved nearly 1,500 personnel actions.

The initial operating budget was further adjusted as follows:

(1) The Appropriation Act includes a provision which makes $10,000,000 of the reduced Research and Program Management appropriation available only for "...use at the Mississippi Test Facility/Slidell Computer Complex and at other NASA facilities which can accommodate earth environmental studies to furnish, on a non-reimbursable basis, basic institutional and technical services to Federal agencies, resident at the complexes, in pursuit of space and environmental missions." Since the NASA 1971 budget request was based on reducing the NASA effort and manpower at MTF/Slidell to a minimum standby mode with the completion of the Saturn V test program, the funding of such services to other Federal agencies residing at these locations can only be covered by a reprogramming action.

(2) Pay costs in 1971 will be $29,854,000 more than planned because of pay legislation enacted in April 1970 (PL 91-207 and PL 91-231). The funds for these costs have been included in a government-wide supplemental appropriation request.

(3) The increased cost of the government's contribution for employees health insurance, $1,316,000, was absorbed within the reduced appropriation level.

(4) An amount of $146,000 was transferred to the General Services Administration for the operation of a film depository and distribution center.

In summary, the changes from the budget request which led to the current operating budget are:

1971 Budget Request		$692,300,000
Adjustments to meet Congressional Action:		-13,575,000
Decreases:		
-- Reduction in Personnel and Related Costs	$-9,000,000	
-- Reduction in other costs	-4,575,000	
Subtotal, 1971 Appropriation		$678,725,000

Increases:		$+39,854,000
-- Provision of institutional and technical services at MTF/Slidell required by the Appropriation Act	$+10,000,000	
-- Pay increases (PL 91-207 and PL 91-231)	+29,854,000	
Subtotal		$718,579,000
Transfer to GSA		-146,000
Total 1971 Operating Plan		$718,433,000

1972 BUDGET ESTIMATE

The following table distributes civil service positions by installation:

NUMBER OF PERSONNEL POSITIONS

	FY 1970	FY 1971	FY 1972
MANNED SPACE FLIGHT.....	13,030	12,605	11,986
John F. Kennedy Space Center, NASA...	2,779	2,681	2,544
Manned Spacecraft Center.....	4,249	4,120	3,935
Marshall Space Flight Center.....	6,002	5,804	5,507
SPACE SCIENCE AND APPLICATIONS.....	4,900	4,900	4,649
Goddard Space Flight Center.....	4,412	4,412	4,187
Wallops Station.....	488	488	462
ADVANCED RESEARCH AND TECHNOLOGY.....	11,294	10,448	9,915
Ames Research Center.....	1,972	1,922	1,824
Electronics Research Center.....	600	---	---
Flight Research Center.....	535	535	508
Langley Research Center.....	3,872	3,790	3,596
Lewis Research Center.....	4,201	4,087	3,879
Space Nuclear Systems Office.....	114	114	108

	FY 1970	FY 1971	FY 1972
SUPPORTING OPERATIONS			
NASA Headquarters.....	2,126	1,897	1,800
TOTAL PERMANENT POSITIONS.....	31,350	29,850	28,350
POSITIONS OTHER THAN PERMANENT..	2,094	2,300	2,300
TOTAL POSITIONS.....	33,444	32,150	30,650

The 1972 budget provides for a further reduction of 1,500 in NASA's permanent employment to a new level of 28,350. This reduction will bring the total reductions in filled permanent positions to 6,791 from the peak NASA employment reached in July 1967, and represents the lowest employment level since 1963.

The reduction of 1,500, about 5%, will be applied uniformly to each installation. Although this reduction will be accomplished by attrition to the maximum extent possible, it appears that involuntary separations by RIF procedures will be necessary at most installations to achieve the full reduction. Where RIF's are required, they are planned to be completed by October 1, 1971.

The plan, by installation, to achieve the June 30, 1972 employment level is as follows:

Center	Reduction
Kennedy	137
Manned	185
Marshall	297
Goddard	225
Wallops	26
Ames	98
Flight	27
Langley	194
Lewis	208
SNSO	6
Headquarters	97
Total	1,500

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1972 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 Systems Office	Headquarters
Personnel																
1970	$529,448	$229,473	$47,518	$78,871	$103,084	$76,377	$69,913	$6,464	$180,591	$31,865	$13,803	$8,507	$59,341	$64,982	$2,093	$43,007
1971	535,962	234,630	48,271	80,796	105,563	81,944	75,034	6,910	175,808	33,656	---	9,025	62,172	68,636	2,319	43,580
1972	530,916	230,088	47,659	78,654	103,775	82,319	75,384	6,935	177,405	33,346	---	9,064	63,029	69,575	2,391	41,104
Travel																
1970	15,195	6,638	687	3,648	2,303	2,186	2,038	148	3,502	698	325	185	1,168	941	185	2,869
1971	17,946	7,816	910	4,246	2,660	2,713	2,472	241	4,191	905	---	220	1,792	1,075	199	3,226
1972	17,061	7,334	760	4,074	2,500	2,571	2,372	199	4,115	866	---	220	1,816	1,017	196	3,041
Facilities Services																
1970	82,980	55,435	38,983	9,408	7,044	6,677	4,659	2,018	20,488	3,768	2,998	1,247	5,666	6,805	4	380
1971	90,176	65,446	36,874	9,107	19,465	6,230	4,300	1,930	17,622	4,203	---	1,351	5,656	6,412	---	878
1972	78,527	54,330	36,314	8,604	9,412	6,212	4,300	1,912	17,648	4,374	---	1,381	5,596	6,297	---	337
Technical Services																
1970	35,983	16,298	811	6,949	8,538	6,359	6,207	152	1,975	240	1,062	83	360	230	---	11,351
1971	33,654	16,077	986	7,317	7,774	5,768	5,616	152	614	122	---	68	352	72	---	11,195
1972	31,265	16,379	986	7,321	8,072	4,364	4,211	153	599	122	---	53	352	72	---	9,923
Administrative Support																
1970	38,572	21,992	9.583	7,685	4,724	4,541	3,635	906	6,488	1,031	918	286	3,316	937	---	5,551
1971	40,695	24,838	10,205	7,647	6,986	4,613	3,772	841	5,560	1,013	---	231	3,416	899	1	5,684
1972	39,581	23,874	9,840	7,602	6,432	4,860	4,032	828	5,571	1,011	---	256	3,398	905	1	5,276
Total																
1970	702,178	329,836	97,582	106,561	125,693	96,140	86,452	9,688	213,044	37,602	19,106	10,308	69,851	73,895	2,282	63,158
1971	718,433	348,807	97,246	109,113	142,448	101,268	91,194	10,074	203,795	39,899	---	10,895	73,388	77,094	2,519	64,563
1972	697,350	332,005	95,559	106,255	130,191	100,326	90,299	10,027	205,338	39,719	---	10,974	74,191	77,866	2,588	59,681

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1972 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

DISTRIBUTION OF OBLIGATIONS BY OBJECT CLASSIFICATION
BY FUNCTION

(Thousands of Dollars)

Object Classification	Total NASA	Personnel	Travel	Facilities Services	Technical Services	Administrative Support
Fiscal Year 1970						
Personnel compensation	488,188	488,188	---	---	---	---
Personnel benefits	38,060	38,060	---	---	---	---
Benefits for former personnel	154	154	---	---	---	---
Travel & transportation of persons	17,050	170	15,195	---	---	1,685
Transportation of things	3,487	422	---	---	80	2,985
Rent, communications and utilities	43,202	---	---	19,404	10,825	12,973
Printing and reproduction	5,381	---	---	---	700	4,681
Other services	88,121	2,454	---	54,651	23,288	7,728
Supplies and materials	14,122	---	---	6,823	367	6,932
Equipment	3,289	---	---	1,080	723	1,486
Lands and structures	1,022	---	---	1,022	---	---
Grants, subsidies and contributions	28	---	---	---	---	28
Insurance claims and indemnities	74	---	---	---	---	74
Totals	702,178	529,448	15,195	82,980	35,983	38,572
Fiscal Year 1971						
Personnel compensation	490,123	490,123	---	---	---	---
Personnel benefits	40,663	40,663	---	---	---	---
Benefits for former personnel	1,780	1,780	---	---	---	---
Travel & transportation of persons	19,750	220	17,946	---	---	1,584
Transportation of things	3,802	566	---	---	85	3,151
Rent, communications, and utilities	42,648	---	---	19,516	9,472	13,660
Printing and reproduction	5,655	---	---	---	743	4,912
Other services	97,446	2,610	---	62,418	22,698	9,720
Supplies and materials	12,824	---	---	6,039	352	6,433
Equipment	2,265	---	---	812	304	1,149
Lands and structures	1,391	---	---	1,391	---	---
Grants, subsidies and contributions	51	---	---	---	---	51
Insurance claims and indemnities	35	---	---	---	---	35
Totals	718,433	535,962	17,946	90,176	33,654	40,695
Fiscal Year 1972						
Personnel compensation	484,074	484,074	---	---	---	---
Personnel benefits	41,440	41,440	---	---	---	---
Benefits for former personnel	2,036	2,036	---	---	---	---
Travel & transportation of persons	18,961	228	17,061	---	---	1,672
Transportation of things	3,651	525	---	---	59	3,067
Rent, communications, and utilities	41,043	---	---	19,241	8,238	13,564
Printing and reproduction	5,173	---	---	---	647	4,526
Other services	85,629	2,613	---	51,659	21,906	9,451
Supplies and materials	12,495	---	---	5,914	332	6,249
Equipment	1,776	---	---	727	83	966
Lands and structures	986	---	---	986	---	---
Grants, subsidies and contributions	51	---	---	---	---	51
Insurance claims and indemnities	35	---	---	---	---	35
Totals	697,350	530,916	17,061	78,527	31,265	39,581

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1972 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

DISTRIBUTION OF OBLIGATIONS BY OBJECT CLASSIFICATION
BY INSTALLATION

(Thousands of dollars)

Object Classification	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	HDQTRS.
FISCAL YEAR 1970																
Personnel compensation	488,188	211,875	43,861	72,975	95,039	70,432	64,497	5,935	166,968	29,563	12,618	7,859	54,778	60,248	1,902	38,913
Personnel benefits	38,060	16,262	3,344	5,493	7,425	5,442	4,981	461	12,869	2,258	948	601	4,265	4,606	191	3,487
Benefits to former personnel	154	---	---	---	---	---	---	---	154	5	149	---	---	---	---	---
Travel & transportation of persons	17,050	8,095	1,617	3,905	2,373	2,296	2,071	225	3,761	705	344	200	1,384	945	183	2,838
Transportation of things	3,487	1,685	1,213	363	109	1,131	984	147	482	33	114	9	236	88	2	139
Rent, communications, and utilities	43,202	21,644	7,928	7,118	6,598	7,410	6,969	441	11,225	3,005	2,101	207	2,607	3,305	---	2,923
Printing and reproduction	5,381	3,580	2,535	655	390	202	152	50	412	10	50	8	258	86	---	1,187
Other services	88,121	57,148	12,644	13,212	11,292	5,757	4,610	1,147	12,575	1,539	2,473	1,060	3,987	3,512	4	12,641
Supplies and materials	14,122	7,384	3,488	2,358	2,038	2,149	1,092	1,057	4,581	397	244	228	1,973	739	---	508
Equipment	3,289	1,918	331	368	319	988	791	197	899	85	64	104	284	362	---	384
Lands and structures	1,322	678	414	113	51	331	304	27	113	2	1	32	78	---	---	---
Grants, subsidies & contributions	28	--	---	---	---	---	---	---	---	---	---	---	---	---	---	28
Insurance claims and indemnities	74	67	7	1	59	2	1	1	5	---	---	---	1	4	---	---
Totals	702,178	329,136	97,582	106,561	125,693	96,140	86,452	9,688	233,044	37,602	19,106	10,308	69,851	73,895	2,282	63,158
FISCAL YEAR 1971																
Personnel compensation	490,123	214,499	44,211	73,989	96,499	75,274	68,918	6,356	161,908	30,960	---	8,293	57,225	63,314	2,116	38,242
Personnel benefits	40,563	17,422	3,564	5,920	8,038	6,132	5,620	512	13,166	2,606	---	689	4,578	5,090	203	3,843
Benefits for former personnel	1,780	832	150	288	394	---	---	---	133	35	---	---	27	70	---	816
Travel and transportation of persons	19,750	9,114	1,943	4,516	2,755	2,835	2,511	324	4,633	920	---	220	2,010	1,087	200	3,264
Transportation of things	3,802	1,834	1,136	412	136	1,320	1,174	146	405	74	---	9	242	80	---	343
Rent, communications, and utilities	42,648	21,624	8,218	7,698	5,108	7,896	7,441	455	9,852	3,303	---	199	2,850	3,500	---	3,875
Printing and reproduction	5,655	3,955	2,890	650	415	172	121	51	363	10	---	8	260	85	---	1,165
Other services	97,446	70,830	31,186	12,911	26,633	5,080	3,880	1,200	9,577	1,379	---	1,328	3,820	3,150	---	12,059
Supplies and materials	12,824	7,400	3,408	2,140	1,852	2,038	1,138	900	2,896	300	---	158	2,025	413	---	490
Equipment	2,265	1,461	217	278	466	310	206	104	587	62	---	75	150	300	---	407
Lands and structures	1,191	716	257	309	150	210	185	25	465	250	---	15	200	---	---	---
Grants, subsidies & contributions	51	1	---	1	---	---	---	---	---	---	---	---	---	---	---	50
Insurance claims and indemnities	35	19	16	1	2	1	---	1	7	---	---	1	1	5	---	8
Totals	718,433	348,837	97,246	109,113	142,448	101,268	91,194	10,074	203,795	39,899	---	10,895	73,388	77,094	2,519	64,563
FISCAL YEAR 1972																
Personnel compensation	484,074	210,635	43,659	72,220	94,756	75,112	68,748	6,364	164,826	30,532	---	8,223	57,460	63,429	2,182	36,501
Personnel benefits	41,440	17,518	4,619	5,919	7,980	6,314	5,800	514	13,754	2,502	---	801	4,850	5,392	209	3,854
Benefits for former personnel	2,036	471	31	---	440	287	287	---	1,203	247	---	---	377	579	---	75
Travel & transportation of persons	18,961	8,819	1,852	4,335	2,632	2,694	2,411	283	4,369	880	---	220	2,042	1,030	197	3,079
Transportation of things	3,651	1,678	1,180	354	94	1,395	1,257	138	415	85	---	10	240	80	---	213
Rent, communications, and utilities	41,043	20,919	4,063	7,724	5,172	6,694	6,237	457	10,051	3,501	---	200	2,350	3,500	---	3,339
Printing and reproduction	5,173	3,715	2,635	700	400	173	121	52	363	10	---	8	260	85	---	902
Other services	85,629	60,048	30,751	12,516	16,801	4,998	3,775	1,223	9,495	1,377	---	1,216	3,311	3,091	---	11,068
Supplies and materials	12,495	7,114	3,352	2,140	1,652	2,048	1,157	891	2,900	325	---	175	2,000	400	---	403
Equipment	1,776	955	201	192	162	447	368	79	585	60	---	100	650	275	---	189
Lands and structures	986	443	209	153	100	163	138	25	370	200	---	20	150	---	---	---
Grants, subsidies & contributions	51	1	---	1	---	---	---	---	---	---	---	---	---	---	---	50
Insurance claims and indemnities	85	9	15	1	2	1	---	1	7	---	---	1	1	5	---	8
Totals	707,350	332,005	95,559	106,255	130,191	100,326	90,299	10,027	205,338	39,719	---	10,974	74,291	77,866	2,588	59,681

411-083 ...1 (Follows SUM-8) No. 1

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1972 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

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

The appropriation language provides for the acquisition of thirty-five 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 1972 is as follows:

	Total	Medium Sedans	Other Sedans	Station Wagons	Ambulances	Buses
Planned fleet, July 1, 1971	178	-	59	92	12	15
Number to be purchased in FY 1972.....	35	-	15	17	-	3
Number of disposals planned:	-35	-	-8	-24*	-	-3
To be replaced by identical vehicle type.....	(28)	(-)	(8)	(17)	(-)	(3)
To be replaced by another vehicle type.....	(7)	(-)	(-)	(7)*	(-)	(-)
Planned fleet, June 30, 1972.....	178	-	66	85	12	15

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

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

PERSONNEL

	1970	1971	1972	Change in 1972
Personnel.....	$529,448,000	$535,962,000	$530,916,000	$-5,046,000

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 non-Government institutions for personnel training are also included in this activity.

DISTRIBUTION OF FUND REQUIREMENTS BY INSTALLATION:

	1970	1971	1972
Kennedy Space Center.....	$47,518,000	$48,271,000	$47,659,000
Manned Spacecraft Center.....	78,871,000	80,796,000	78,654,000
Marshall Space Flight Center..	103,084,000	105,563,000	103,775,000
Goddard Space Flight Center...	69,913,000	75,034,000	75,384,000
Wallops Station.....	6,464,000	6,910,000	6,935,000
Ames Research Center.....	31,865,000	33,656,000	33,346,000
Electronics Research Center...	13,803,000	---	---
Flight Research Center.....	8,507,000	9,025,000	9,064,000
Langley Research Center.....	59,341,000	62,172,000	63,029,000
Lewis Research Center.....	64,982,000	68,636,000	69,575,000
Space Nuclear Systems Office..	2,093,000	2,319,000	2,391,000
NASA Headquarters.....	43,007,000	43,580,000	41,104,000
Total.....	$529,448,000	$535,962,000	$530,916,000

BASIS OF FUND REQUIREMENTS:

	1970	1971 With Pay Raise	1971 (Without Pay Raise)	1972
		(Dollars in Thousands)		
A. COMPENSATION AND BENEFITS				
1. COMPENSATION				
a. Permanent positions	$472,242	$475,986	($450,370)	$471,319
b. Nonpermanent positions	6,965	5,497	(5,163)	5,437
c. Reimbursable details	3,495	3,192	(2,998)	2,622
d. Overtime & other compensation	5,486	5,448	(5,213)	4,696
Subtotal, Compensation	$488,188	$490,123	($463,744)	$484,074
2. BENEFITS	$37,808	$41,801	($38,326)	$42,966
Subtotal, Compensation and Benefits	$525,996	$531,924	($502,070)	$527,040
B. SUPPORTING COSTS				
1. Transfer of personnel	$994	$1,453	($1,453)	$1,295
2. Civil Service Commission services	74	129	(129)	132
3. Personnel training	2,384	2,456	(2,456)	2,449
Subtotal, Supporting Costs	$3,452	$4,038	($4,038)	$3,876
Total, Personnel and Related Costs	$529,448	$535,962	($506,108)	$530,916
PERMANENT POSITIONS				
a. Permanent Positions	$472,242,000	$475,986,000		$471,319,000

The cost of compensation for permanent positions is the largest part of Personnel and Related Costs. The funds shown above will support 29,850 permanent positions in 1971 and 28,350 in 1972. These levels represent reductions of 1,500 (including 600 for ERC) in 1971 and 1,500 in 1972.

NUMBER OF PERMANENT POSITIONS

The number of permanent positions planned determines the funds required. As noted above, the planned number of positions for 1971 is 29,850 and 28,350 for 1972. The planned numbers of positions by installation are as follows:

DISTRIBUTION OF POSITIONS BY INSTALLATION

Permanent Positions	1970	1971	1972	Change in 1972
Kennedy Space Center	2,779	2,681	2,544	-137
Manned Spacecraft Center	4,249	4,120	3,935	-185
Marshall Space Flight Center	6,002	5,804	5,507	-297
Goddard Space Flight Center	4,412	4,412	4,187	-225
Wallops Station	488	488	462	-26
Ames Research Center	1,972	1,922	1,824	-98
Electronics Research Center	600	---	---	---
Flight Research Center	535	535	508	-27
Langley Research Center	3,872	3,790	3,596	-194
Lewis Research Center	4,201	4,087	3,879	-208
Space Nuclear Systems Office	114	114	108	-6
Headquarters	2,126	1,897	1,800	-97
Total	31,350	29,850	28,350	-1,500

The number of positions planned for in the 1971 budget for 1971 was 30,350. The limitation placed on expenditures for Personnel and Related Costs in the NASA 1971 Authorization Act required NASA to reduce that level through reduction-in-force procedures. The need to reduce planned Personnel and Related Costs expenditures by $9 million and to correct critical skill imbalances which had arisen because of three years of high forfeiture of attrition, necessitated a reduction of 700 positions in addition to the 200 already planned. In order to minimize the impact of the RIF, the entire 900 reduction was accomplished by October 1, 1970. The $475,986,000 shown for 1971 is based on the smaller position plan.

Based on the significant reductions in space activities over the past several years, NASA's civil service employment will be further reduced by 1,500 by June 1972 to a new level of 28,350.

This reduction will bring the total reductions in filled permanent positions to 6,791 from the peak NASA employment reached in July 1967, and represents the lowest employment level since 1963.

The reduction of 1,500, about 5%, will be applied uniformly to each installation, and will be accomplished through normal attrition to the maximum extent possible. It appears, however, that RIF procedures will be necessary at most installations to achieve the full reduction. Where RIF's are required, they are planned to be completed by October 1, 1971.

Over two thirds of NASA permanent positions are used in direct support of the various R&D programs. The following table summarizes the actual and planned utilization of positions for direct program activity and for indirect support:

DISTRIBUTION OF PERMANENT POSITIONS BY PROGRAM

	1970	1971	1972
Direct Positions			
Manned Space Flight	9,611	9,166	8,822
Apollo	5,497	4,243	2,580
Space flight operations	3,566	4,591	5,952
Advanced missions	548	332	290
Space Science and Applications	3,697	3,796	3,603
Physics and astronomy	1,639	1,614	1,397
Lunar and planetary exploration	532	558	704
Bioscience	173	139	---
Space applications	773	917	960
Launch vehicle procurement	580	568	542
University Affairs	12	9	6
Sustaining university program	12	9	6
Advanced Research and Technology	7,795	7,216	6,681
Aeronautical research and technology	3,927	3,894	3,901
Space research and technology	3,367	2,833	2,390
Nuclear power and propulsion	501	489	390

	1970	1971	1972
Tracking and Data Acquisition.....	1,093	1,059	1,020
Technology Utilization.....	49	47	45
Subtotal, direct positions.....	22,257	21,293	20,177
Indirect Positions			
Director and staff.....	821	754	735
Administrative support.....	4,359	4,096	3,903
Research and development support.....	3,913	3,707	3,535
Subtotal, indirect positions.....	9,093	8,557	8,173
Total, permanent positions.....	31,350	29,850	28,350
Other than permanent positions.....	2,094	2,300	2,300
Total.....	33,444	32,150	30,650

The above table illustrates the use to which positions are put. The distribution by occupation of our positions illustrates a significant characteristic of the NASA workforce. Professional engineers and scientists comprise almost 45% of the NASA workforce. Technicians and technically oriented wage board employees, working in direct support of the professional technical staff, make up another 27% of the complement. The following table summarizes by occupational group the NASA workforce:

	1970		1971		1972	
Occupational Group	Number	Percent	Number	Percent	Number	Percent
Professional scientists and engineers.....	13,891	44.3	13,292	44.5	12,690	44.8
Technicians.....	5,714	18.2	5,492	18.4	5,062	17.8
Wage board.....	2,908	9.3	2,650	8.9	2,516	8.9
Professional administrative..	4,445	14.2	4,179	14.0	3,943	13.9
Clerical.....	4,392	14.0	4,237	14.2	4,139	14.6
Total.....	31,350	100.0	29,850	100.0	28,350	100.0

BASIS OF COST FOR PERMANENT POSITIONS

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.

In 1972 the cost of permanent positions will be $471,319,000, a reduction of $4,667,000 from 1971. This reduction results as follows:

		(Thousands of Dollars)
Cost of Permanent Positions in 1971.....		$475,986
Cost Increases in 1972:		+14,346
Withingrade Advances and Career Development:		
Full Year Effect of 1971 Actions....	6,045	
1972 Actions....	4,993	
Full year cost of pay raises, effective in 1971.....	1,684	
Additional paid day in 1972.....	1,624	
Cost Decreases in 1972.....		-19,013
Abolished Positions:		
Full Year Effect of 1971 Actions....	-1,243	
1972 Actions....	-16,748	
Turnover Savings.....	-1,022	
Cost of Permanent Positions in 1972.....		$471,319

	1970	1971	1972
b. Nonpermanent positions			
Cost	$6,965,000	$5,497,000	$5,437,000
Number of Positions	2,094	2,300	2,300

The 1971 and 1972 plans include 2,300 non-permanent positions each year. These positions are required for a variety of programs, the largest of which is NASA summer employment. NASA hires college students and high school and college faculty members during the summer to provide these people exposure to NASA programs and government operations. NASA benefits from the employment of these highly skilled individuals, and the education and training they receive is a considerable asset to themselves and to the nation.

A portion of the non-permanent positions is used to provide for NASA's participation in the President's Youth Opportunity Campaign, which enables disadvantaged youths to work at unskilled summer jobs at NASA installations. Some of these positions are used during the school year as part of the President's Youth Opportunity Back to School Drive. During this phase, the youths' workweek is limited to 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.

	1970	1971	1972
c. Reimbursable details	$3,495,000	$3,192,000	$2,622,000

The services of a small group of military officers and civilian detailees from other government agencies are utilized in NASA's programs where such assignments are of mutual benefits. In accordance with existing agreements, NASA reimburses the parent organization for the salaries and related costs of the detailees. The reduction in 1972 results from a planned smaller number of detailees than in 1971.

	1970	1971	1972
d. Overtime and other compensation	$5,486,000	$5,488,000	$4,696,000

The reduction of $792,000 for overtime and other compensation planned for 1972 results from NASA's continued emphasis on reducing costs in this category to the lowest level consistent with mission and legal requirements.

	1970	1971	1972
2. BENEFITS.....	$37,808,000	$41,801,000	$42,966,000

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	1970	1971	1972
Contribution to the Civil Service Retirement Fund.....	$31,949,000	$33,230,000	$32,811,000
Contribution for employee life insurance.....	1,769,000	1,784,000	1,759,000
Contribution for employee health insurance.....	2,756,000	3,614,000	4,930,000
Contribution to FICA.....	228,000	203,000	203,000
Incentive awards.....	348,000	358,000	358,000
Other personnel benefits.....	651,000	832,000	869,000
Severance pay.....	107,000	1,780,000	2,036,000
Total.....	$37,808,000	$41,801,000	$42,966,000

The largest part of personnel benefits is the agency's contribution to the Civil Service Retirement fund, and the reduction in 1972 is related to the fewer permanent positions planned for 1972.

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 increase in health benefits insurance costs in 1972 is related to the full year cost of the increase in the government's share of the total premium cost which became effective in January 1971.

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 severance pay estimate is related to the legal requirement of severance pay for employees who are involuntarily separated from the rolls through no fault of their own. The amounts shown for 1971 and 1972 are related to the reductions-in-force which were and will be necessary to attain end year employment ceilings.

	1970	1971	1972
B. SUPPORTING COSTS.....	$3,452,000	$4,038,000	$3,876,000

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:

	1970	1971	1972
1. Transfer of personnel.....	$994,000	$1,453,000	$1,295,000

The 1966 legislation 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 to secure housing, and the cost of family relocation allowances. The estimated cost in 1972 is based on the number and historical average cost of relocations estimated at each installation.

	1970	1971	1972
2. Civil Service Commission services.....	$74,000	$129,000	$132,000

The Civil Service Commission conducts security investigations on new hires 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. There is also a payment to the Commission for recruitment advertising. The 1972 cost will be approximately the same as 1971.

	1970	1971	1972
3. Personnel training.....	$2,384,000	$2,456,000	$2,449,000

The maintenance and expansion of the skills of personnel is essential in carrying out the agency's many complex technical programs. Such training is provided within the framework of the Government Employees Training Act of 1958. Part of the training consists of courses offered by other government agencies, usually for a fee. The remainder of the training is provided through non-governmental 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 NASA employees receive training in subjects 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. The level of training in 1972 will be about that of 1971.

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

TRAVEL

	1970	1971	1972	Change in 1972
Travel	$15,195,000	$17,946,000	$17,061,000	$-885,000

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 and Related Costs.

The estimated cost of travel in 1972 will be $885,000 less than in 1971, based on the reduction in civil service employment and the level of planned program activity.

The following tables show the levels of travel by NASA installation and by subcategory of travel. The explanations following each subcategory will define the kinds of travel included in each.

DISTRIBUTION OF FUND REQUIREMENTS BY INSTALLATION:

	1970	1971	1972
Kennedy Space Center	$687,000	$910,000	$760,000
Manned Spacecraft Center	3,648,000	4,246,000	4,074,000
Marshall Space Flight Center	2,303,000	2,660,000	2,500,000
Goddard Space Flight Center	2,038,000	2,472,000	2,372,000
Wallops Station	148,000	241,000	199,000
Ames Research Center	698,000	905,000	866,000
Electronics Research Center	325,000	---	---
Flight Research Center	185,000	220,000	220,000
Langley Research Center	1,168,000	1,792,000	1,816,000
Lewis Research Center	941,000	1,075,000	1,017,000
Space Nuclear Systems Office	185,000	199,000	196,000
NASA Headquarters	2,869,000	3,226,000	3,041,000
Total	$15,195,000	$17,946,000	$17,061,000

BASIS OF FUND REQUIREMENTS:

SUMMARY OF TRAVEL BY MAJOR CATEGORY

	1970	1971	1972
Program Related Travel			
Direction, coordination, and management of Research and Development and Construction of Facilities program activities	$8,878,000	$10,662,000	$10,084,000
Flight mission support	1,314,000	1,703,000	1,584,000
Overseas travel to launch and tracking sites	727,000	878,000	838,000
Subtotal	$10,919,000	$13,243,000	$12,506,000
Meetings and Technical Seminars			
Government-sponsored meetings	$1,153,000	$1,321,000	$1,266,000
Other than government-sponsored meetings and technical seminars	1,135,000	1,106,000	1,027,000
Subtotal	$2,288,000	$2,427,000	$2,293,000
Administrative Travel	$1,988,000	$2,276,000	$2,262,000
Total, Travel	$15,195,000	$17,946,000	$17,061,000

	1970	1971	1972
Program Related Travel	$10,919,000	$13,243,000	$12,506,000

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 70% of the travel requirements for 1972.

	1970	1971	1972
Direction, coordination, and management of programs	$8,878,000	$10,662,000	$10,084,000

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 require frequent examination by personnel responsible for the program.

	1970	1971	1972
Flight mission support.....	$1,314,000	$1,703,000	$1,584,000

As projects reach the flight stage, support is required for pre-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 estimate for 1972 is in consonance with the launch schedule planned for in 1972.

	1970	1971	1972
Overseas travel to launch and tracking sites.....	$727,000	$878,000	$838,000

Overseas travel to launch and tracking sites includes travel required for instrumentation of the tracking sites, and inspection of the sites prior to launch.

	1970	1971	1972
Meetings and technical seminars.....	$2,288,000	$2,427,000	$2,293,000

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 meetings of the types described is granted only after assurance that attendance will be in the best interest of NASA.

	1970	1971	1972
Administrative travel.....	$1,988,000	$2,276,000	$2,262,000

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 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 centers, including bus and taxi services and rental of motor vehicles, and travel of unpaid members of research advisory committees.

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

FACILITIES SERVICES

	1970	1971	1972	Change in 1972
Facilities services....	$82,980,000	$90,176,000	$78,527,000	$-11,649,000

DESCRIPTION:

Facilities services includes the procurement of electricity, water, gas, and other utilities; maintenance of buildings and grounds; and minor construction and facility rentals. 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 mechanical, laboratory, and ship 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. In 1971 the cost of providing basic institutional and technical support for other Federal agencies, resident at the Mississippi Test Facility and Slidell Computer Complex, which are engaged in earth environmental and space research, is included on a non-reimbursable basis as required by the 1971 NASA appropriation language.

DISTRIBUTION OF FUND REQUIREMENTS BY INSTALLATION:

	1970	1971	1972
Kennedy Space Center.....	$38,983,000	$36,874,000	$36,314,000
Manned Spacecraft Center.....	9,408,000	9,107,000	8,604,000
Marshall Space Flight Center....	7,044,000	19,465,000	9,412,000
Goddard Space Flight Center.....	4,659,000	4,300,000	4,300,000
Wallops Station.....	2,018,000	1,930,000	1,912,000
Ames Research Center.....	3,768,000	4,203,000	4,374,000
Electronics Research Center.....	2,998,000	---	---
Flight Research Center.....	1,247,000	1,351,000	1,381,000
Langley Research Center.....	5,666,000	5,656,000	5,596,000
Lewis Research Center.....	6,805,000	6,412,000	6,297,000
Space Nuclear Systems Office....	4,000	---	---
NASA Headquarters.....	380,000	878,000	337,000
Total.....	$82,980,000	$90,176,000	$78,527,000

	1970	1971	1972
Minor construction and modifications.....	$1,022,000	$1,391,000	$1,026,000

This activity provides for additions, modifications, and minor construction of facilities within statutory limitations. The estimate for 1972 is based on the identified need for small minor construction and alteration projects and is a reduction of $265,000 from 1971.

	1970	1971	1972
Maintenance, repair, and alteration of buildings and grounds.....	$10,545,000	$9,442,000	$8,580,000

The amount required for maintenance, repair, and alteration of buildings and grounds is $862,000 less than in 1971. The decrease results largely because White Sands Test Facility will be placed on a "stand-by" mode in 1972, with a resulting decrease in costs.

	1970	1971	1972
Maintenance and repair of equipment.....	$2,095,000	$2,013,000	$2,105,000

Maintenance and repair of equipment consists of work necessary to keep mechanical, electrical, electronic, laboratory, and shop equipment operational. The 1972 estimate is based on maintaining the present minimum level of effort at currently negotiated manyear cost rates.

	1970	1971	1972
Custodial services.....	$9,729,000	$10,528,000	$11,014,000

The estimate for custodial services includes the cost for janitorial, cleaning, protective, security fire protection, and refuse handling services. The increase in costs in 1972 results from increased manyear cost rates contained in current contracts.

	1970	1971	1972
Utilities.....	$13,647,000	$14,534,000	$14,648,000

The cost of utilities, electricity, gas, water, etc., at each of the NASA installations is paid for from R&PM funds. The level of cost is related to the types of facilities operated, the time they are operated, and the unit cost rates for each utility consumed. In 1972 the level of usage is expected

BASIS OF FUND REQUIREMENTS:

SUMMARY OF FACILITIES SERVICES

	1970	1971	1972
Acquisition of Facilities			
Rental of real property.....	$1,750,000	$927,000	$513,000
Minor construction and modifications.....	1,022,000	1,391,000	1,026,000
Subtotal.....	$2,772,000	$2,318,000	$1,539,000
Maintenance and Related Services			
Maintenance, repair, and alteration of buildings and grounds.....	$10,545,000	$9,442,000	$8,580,000
Maintenance and repair of equipment.....	2,095,000	2,013,000	2,105,000
Custodial services.....	9,729,000	10,528,000	11,014,000
Subtotal.....	$22,369,000	$21,983,000	$21,699,000
Operation of Facilities			
Utilities.....	$13,647,000	$14,534,000	$14,648,000
Supplies and equipment.....	8,109,000	6,884,000	6,628,000
Subtotal.....	$21,756,000	$21,418,000	$21,276,000
Range Operations.....	$36,083,000	$34,457,000	$34,013,000
MTF Support.....	---	$10,000,000	---
Total, Facilities Services.....	$82,980,000	$90,176,000	$78,527,000

	1970	1971	1972
Rental of real property.....	$1,750,000	$927,000	$513,000

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. The majority of funds required for this purpose in 1972 are to rent storage and warehouse space at the Goddard Space Flight Center to accommodate the storage of equipment, largely related to GSFC's overseas tracking responsibilities, and to rent small facilities at various other installations. The reduction in requirements results from the termination of warehousing requirements for the final closeout of NASA activities at the Electronics Research Center.

to remain constant except at the Ames Research Center and the Goddard Space Flight Center. At Ames there will be an increase of $159,000 related to the increased operation of the Unitary Plan Wind Tunnels in support of the Aeronautical Research and Technology program. At Goddard costs are expected to be $131,000 less in 1972 because of changes in program operations. In addition there will be a minor increase of $59,000 at the Marshall Space Flight Center because of a rate increase of electricity.

	1970	1971	1972
Supplies and equipment.....	$8,109,000	$6,884,000	$6,628,000

The supplies, materials, and equipment used in the operation of the NASA facilities is budgeted for in this subcategory. The amount required is based on the number of personnel supported, the number of facilities operated, and the level of equipment replacement. The reduction of $256,000 is related to the reduction in the in-house level of personnel planned for 1972.

	1970	1971	1972
Range operations.....	$36,083,000	$34,457,000	$34,013,000

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 and utilities, and to support received from the Air Force Eastern Test Range. Services received through contractors are primarily utilized at the Merritt Island Launch Area. These 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 following table summarizes funding requirements by purpose:

	1970	1971	1972
ADP operations.....	$2,311,000	$2,133,000	$2,251,000
Utilities.....	4,210,000	4,051,000	4,036,000
Maintenance, repair, alterations, and operation of facilities..	13,365,000	13,868,000	13,781,000
Protective services.....	5,878,000	5,698,000	5,461,000
Janitorial and cleaning services	1,070,000	453,000	453,000
Support services.....	9,249,000	8,254,000	8,031,000
Total.....	$36,083,000	$34,457,000	$34,013,000

The cost of range services at KSC will be $34,013,000 for 1972, a reduction of $444,000 from 1971. This reduction results from the full year savings which will result from the consolidation of the three major support contracts into two contracts in 1971. The economies affected through consolidation will more than offset the increased manyear cost rates included in these contracts for 1972.

	1970	1971	1972
Mississippi Test Facility/ Slidell Support.....	---	$10,000,000	---

The FY 1971 Appropriation Act required that $10,000,000 be available only for use at the Mississippi Test Facility/Slidell Computer Complex and at other NASA facilities which can accommodate earth environmental studies to furnish, on a non-reimbursable basis, basic institutional and technical services to Federal agencies, resident at the complexes, in pursuit of space and environmental missions. The 1972 budget is based on the assumption that support to other agencies after 1971 will be provided on a reimbursable basis.

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

TECHNICAL SERVICES

	1970	1971	1972	Change in 1972
Technical services...	$35,983,000	$33,654,000	$31,265,000	$-2,389,000

DESCRIPTION:

The estimates for technical services provide for the costs of (1) automatic data processing (ADP) support, (2) engineering services, and (3) scientific and technical and educational/informational programs. Funds included for ADP support provide for the acquisition of 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.

Funds for engineering services provide for engineering design and reliability and quality assurance studies. The scientific and technical programs, which furnish up-to-date reporting of scientific and technical developments, 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.

The reduction of $2,389,000 in 1972 in this function is related to the lower level of support required by the fewer civil service employees than in 1971 and the government-wide reduction in information activities.

DISTRIBUTION OF FUND REQUIREMENTS BY INSTALLATION:

	1970	1971	1972
Kennedy Space Center.....	$811,000	$986,000	$986,000
Manned Spacecraft Center.....	6,949,000	7,317,000	7,321,000
Marshall Space Flight Center....	8,538,000	7,774,000	8,072,000
Goddard Space Flight Center.....	6,207,000	5,616,000	4,211,000
Wallops Station.....	152,000	152,000	153,000
Ames Research Center.....	240,000	122,000	122,000
Electronics Research Center.....	1,062,000	---	---
Flight Research Center.....	83,000	68,000	53,000
Langley Research Center.....	360,000	352,000	352,000
Lewis Research Center.....	230,000	72,000	72,000
NASA Headquarters.....	11,351,000	11,195,000	9,923,000
Total.....	$35,983,000	$33,654,000	$31,265,000

BASIS OF FUND REQUIREMENTS:

SUMMARY OF TECHNICAL SERVICES

	1970	1971	1972
AUTOMATIC DATA PROCESSING			
Lease of equipment.....	$10,804,000	$9,449,000	$8,215,000
Purchase of equipment.....	541,000	68,000	---
Maintenance of equipment.....	665,000	929,000	906,000
Subtotal, equipment.....	$12,010,000	$10,446,000	$9,121,000
Programming and operation services.....	9,139,000	8,653,000	8,661,000
Subtotal.....	$21,149,000	$19,099,000	$17,782,000
ENGINEERING SERVICES.....	$748,000	$528,000	$525,000
SCIENTIFIC AND TECHNICAL INFORMATION AND EDUCATIONAL PROGRAMS			
Operation of NASA technical libraries.....	1,773,000	1,412,000	1,406,000
Educational/informational programs.....	4,240,000	3,750,000	2,884,000

	1970	1971	1972
SCIENTIFIC AND TECHNICAL INFORMATION AND EDUCATIONAL PROGRAMS (Cont'd)			
Scientific and technical information.....	$8,073,000	$8,865,000	$8,668,000
Subtotal.....	$14,086,000	$14,027,000	$12,958,000
Total.....	$35,983,000	$33,654,000	$31,265,000
AUTOMATIC DATA PROCESSING.....	$21,149,000	$19,099,000	$17,782,000

The R&PM appropriation provides for the lease, purchase, maintenance, and programming and operations services of ADP equipment which is not dedicated to specific research or operational systems and is funded from the Research and Development appropriation. The reduction in costs in 1972 results from reduced rentals at the Goddard Space Flight Center because of equipment purchases made in 1971. Volume I of this budget contains the detailed analysis of leased equipment.

	1970	1971	1972
ENGINEERING SERVICES.....	$748,000	$528,000	$525,000

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. Funding requirements will remain essentially at the same level as 1971.

	1970	1971	1972
SCIENTIFIC AND TECHNICAL INFORMATION & EDUCATIONAL PROGRAMS....	$14,086,000	$14,027,000	$12,958,000

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 $12,958,000 in 1972, a decrease of $1,069,000 from the 1971 level. The costs are summarized as follows:

	1970	1971	1972
Operational of technical libraries.....	$1,773,000	$1,412,000	$1,406,000

The cost of the operation of technical libraries will be about the same in 1972 as in 1971.

	1970	1971	1972
Educational/Informational Programs.....	$4,240,000	$3,750,000	$2,884,000

The educational/informational programs provide for the gathering and dissemination of information about the agency's programs to the mass communications media, the general public, and to the educational community at the elementary and secondary levels. Assistance to the mass communications media includes the gathering and exposition of news-worthy material in support of their requests, and takes such forms as press kits, news releases, television and radio information tapes and clips, and feature material.

The cost for thes programs in 1972 is estimated to be $2,884,000, an $866,000 reduction from 1971, and is related to the government-wide cutback in such programs.

Research, development, and operational missions in aeronautics and space provide substantive knowledge and serve as an educational stimulus to students and teachers. NASA responds to expressed needs of students and teachers by developing cirriculum 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.

	1970	1971	1972
Scientific and technical information.....	$8,073,000	$8,865,000	$8,668,000

The scientific and technical information activity includes the cost of the NASA Scientific and Technical Information Facility, documentation and publication services, systems development, and translation services. The largest requirement is the NASA Scientific and Technical Information Facility, under the cognizance of Headquarters, which will cost $3.4 million in 1972. The level of cost for all other information services, estimated at $5.3 million, is essentially the same as 1971. These costs are for the documentation of worldwide aerospace journal and report literature; mongraphs 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 to keep abreast of world developments in the space sciences and related fields. The cost of scientific and technical information activities will be further reduced in 1972 by $197,000.

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

ADMINISTRATIVE SUPPORT

	1970	1971	1972	Change in 1972
Administrative support services.....	$38,572,000	$40,695,000	$39,581,000	$-1,114,000

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 and administrative aircraft services and operations), and medical services, are provided for in this function.

DISTRIBUTION OF FUND REQUIREMENTS BY INSTALLATION:

	1970	1971	1972
Kennedy Space Center.....	$9,583,000	$10,205,000	$9,840,000
Manned Spacecraft Center....	7,685,000	7,647,000	7,602,000
Marshall Space Flight Center	4,724,000	6,986,000	6,432,000
Goddard Space Flight Center.	3,635,000	3,772,000	4,032,000
Wallops Station.....	906,000	841,000	828,000
Ames Research Center.....	1,031,000	1,013,000	1,011,000
Electronics Research Center.	918,000	---	---
Flight Research Center.....	286,000	231,000	256,000
Langley Research Center.....	3,316,000	3,416,000	3,398,000
Lewis Research Center.....	937,000	899,000	905,000
Space Nuclear Systems Office	---	1,000	1,000
NASA Headquarters.....	5,551,000	5,684,000	5,276,000
Total.....	$38,572,000	$40,695,000	$39,581,0000

BASIS OF FUND REQUIREMENTS:

SUMMARY OF ADMINISTRATIVE SUPPORT SERVICES

	1970	1971	1972
COMMUNICATIONS			
Leased lines and long distance tolls.....	$4,265,000	$5,070,000	$4,944,000
Local telephone service.....	5,544,000	5,387,000	5,387,000
Other communications.	1,870,000	1,950,000	1,950,000
Subtotal.....	$11,679,000	$12,407,000	$12,281,000

	1970	1971	1972
ADMINISTRATIVE PRINTING	$5,032,000	$5,259,000	$4,873,000
SUPPLIES, MATERIALS, AND EQUIPMENT			
Supplies and materials	6,604,000	6,104,000	5,895,000
Equipment.....	1,430,000	1,167,000	891,000
Subtotal.....	8,034,000	7,271,000	6,786,000
TRANSPORTATION			
Center operations.....	5,661,000	6,829,000	6,961,000
Common carrier.....	757,000	783,000	700,000
Subtotal.....	6,418,000	7,612,000	7,661,000
ADMINISTRATIVE SUPPORT SERVICES			
Installation support services....	6,377,000	6,799,000	6,633,000
Medical services.....	1,032,000	1,347,000	1,347,000
Subtotal.....	7,409,000	8,146,000	7,980,000
Total, Administrative Support Services.....	$38,572,000	$40,695,000	$39,581,000

	1970	1971	1972
COMMUNICATIONS.....	$11,679,000	$12,407,000	$12,281,000

The funds required for communications represent a decrease of $126,000 from 1971. 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.

	1970	1971	1972
ADMINISTRATIVE PRINTING.	$5,032,000	$5,259,000	$4,873,000

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 1972, the costs for printing are $386,000 less than in 1971. This reduction is primarily attributable to reduction in requirements at the Kennedy Space Center associated with the reduced launch schedule planned for FY 1972.

	1970	1971	1972
SUPPLIES, MATERIALS AND EQUIPMENT.....	$8,034,000	$7,271,000	$6,786,000

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 1972, $5,895,000 is for supplies and materials, and $891,000 for purchased and rented equipment. The overall requirement decreases by $485,000. This reduction is primarily attributable to the lesser number of civil service personnel planned for 1972.

	1970	1971	1972
TRANSPORTATION.....	$6,418,000	$7,612,000	$7,661,000

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 $49,000 increase for 1972 includes a major increase of $159,000 at Goddard Space Flight Center for the replacement cost of 55 motor vehicles (12 of them passenger-carrying) in 1972. The increase is offset by reductions planned at other installations.

	1970	1971	1972
ADMINISTRATIVE SUPPORT SERVICES.....	$7,409,000	$8,146,000	$7,980,000

Administrative support services include those services which support the installation generally, such as logistics support, supply operations, mail and messenger services, center medical services, and other related services. The funding required for 1972 is $7,980,000, a reduction of $166,000 from 1971.

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 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 the Kennedy Space Center, the Air Force Eastern Test Range, and the Air Force Western Test Range. The Center is now concentrating on Apollo manned launches, preparations for Skylab launches, design of Space Shuttle launch facilities, as well as research and operational unmanned launches. The 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, including design of Space Shuttle launch facilities.

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 approximatley 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, 1970, was $1 005,148,000.

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

Functions	1970	1971	1972
Personnel	$47,518,000	$48,271,000	$47,659,000
Travel	687,000	910,000	760,000
Facilities services	38,983,000	36,874,000	36,314,000
Technical services	811,000	986,000	986,000
Administrative support	9,583,000	10,205,000	9,840,000
Total, fund requirements	$97,582,000	$97,246,000	$95,559,000

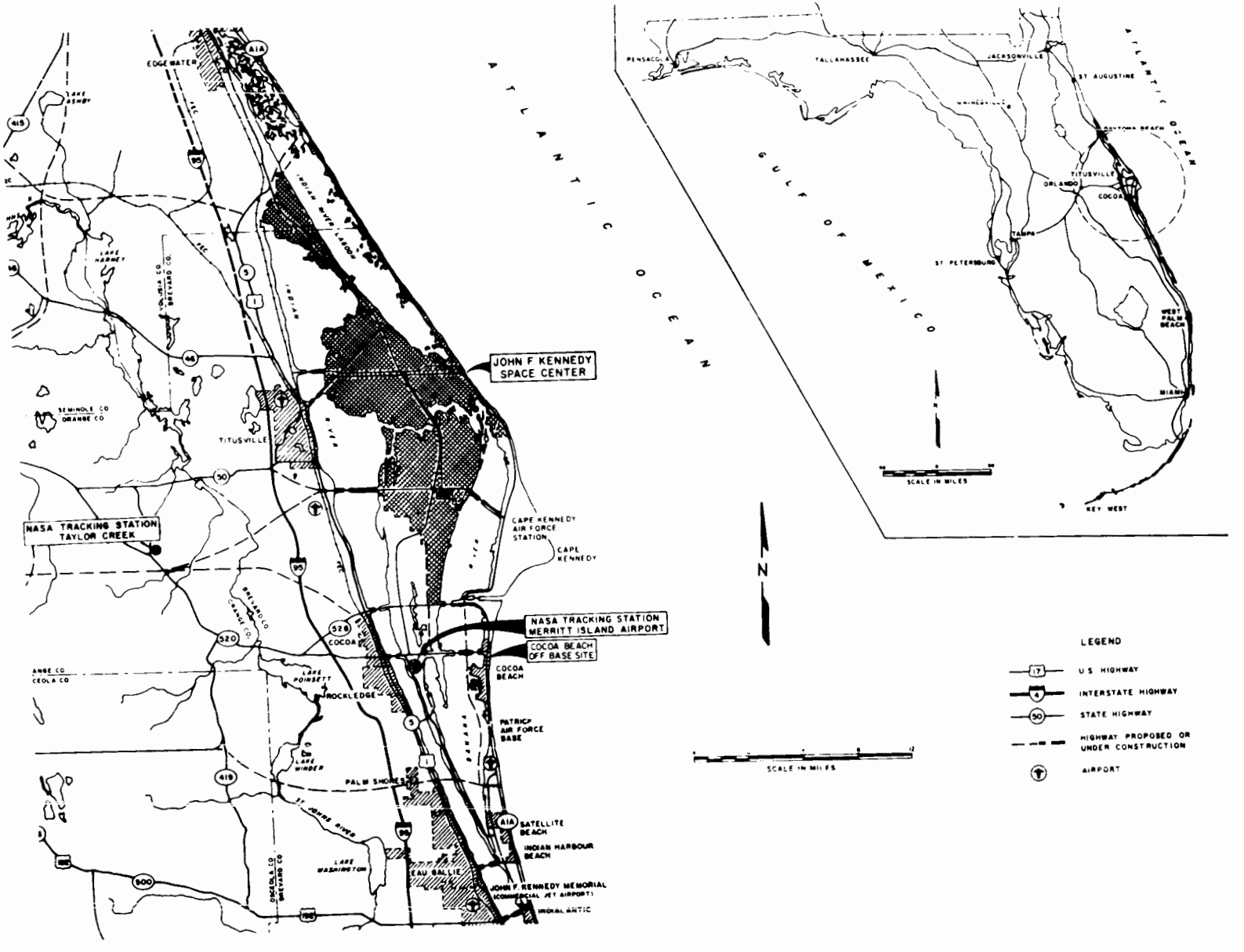
PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	1,759	1,573	800
Space flight operations	137	224	896
Advanced missions	15	33	33

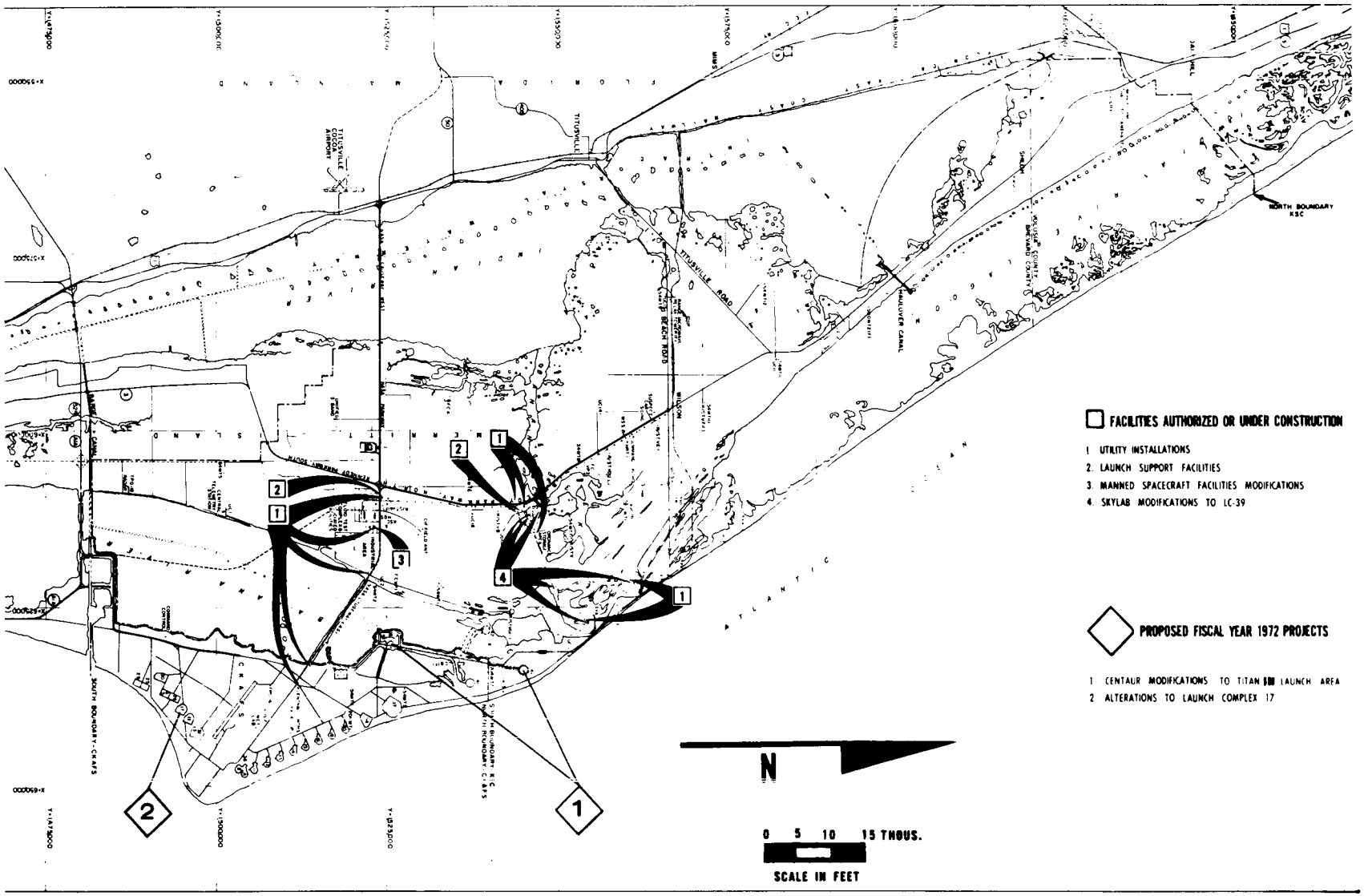
	1970	1971	1972
Space Science and Applications			
Launch vehicle procurement.....	143	143	143
Subtotal, positions by program...	2,054	1,973	1,872
2. Indirect Positions:			
Director and staff.....	107	99	99
Administrative support.....	417	408	372
Research and development support.....	201	201	201
Subtotal, indirect positions.....	725	708	672
Total, permanent positions.....	2,779	2,681	2,544

JOHN F. KENNEDY SPACE CENTER, NASA

VICINITY PLAN



JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1972 ESTIMATES
LOCATION PLAN



JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1972 ESTIMATES

LOCATION PLAN

INDUSTRIAL AREA

LEGEND

EXISTING FACILITIES

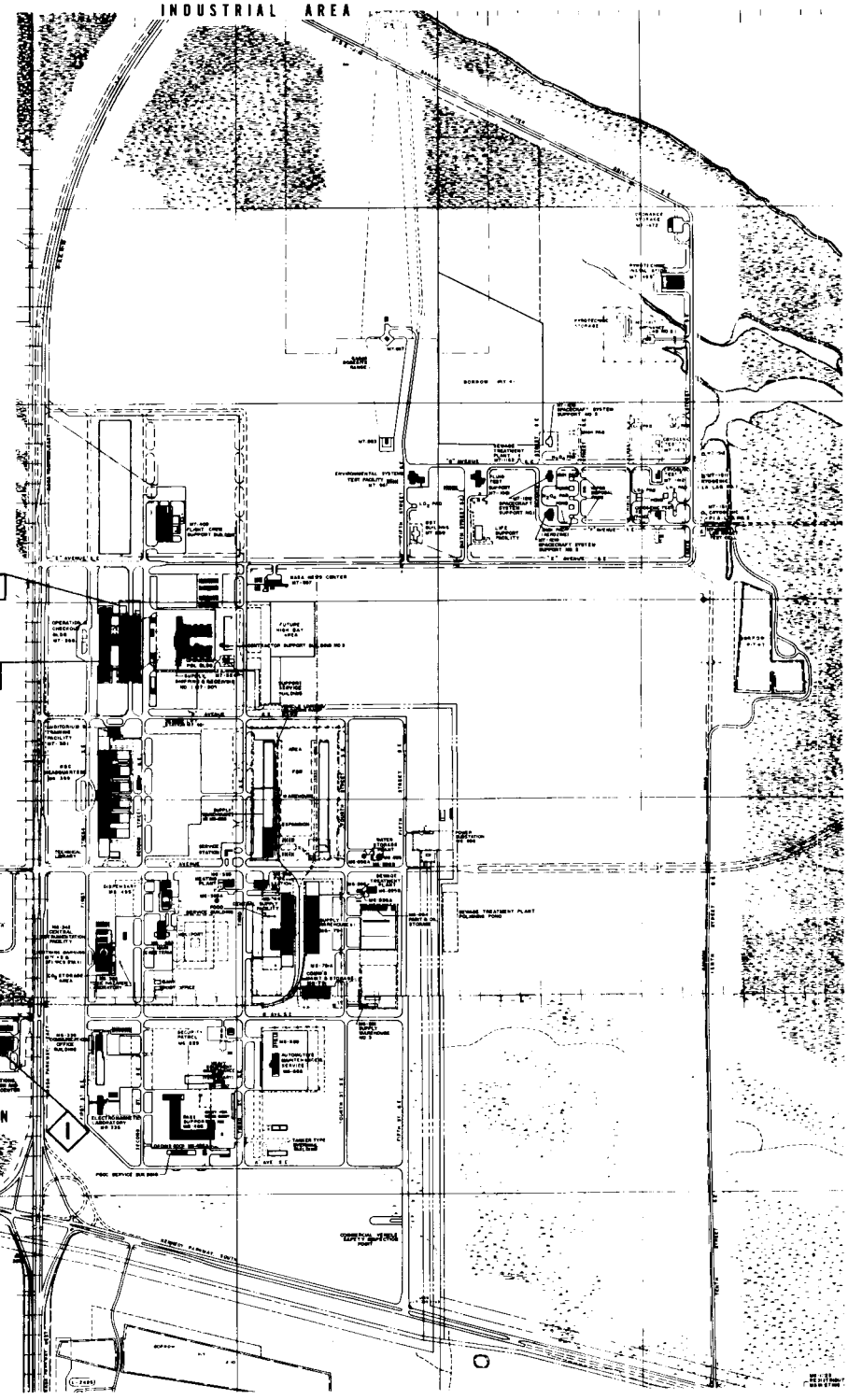
M6-38	PARKING SHEDS
M6-88	SOUTHERN BELL T. & T. PLANT WORK CENTER
M6-138	COMMUNICATIONS, DISTRIBUTION AND SWITCHING CENTER
M6-336	ELECTROMAGNETIC LABORATORY
M6-339	COMMUNICATIONS OFFICE BUILDING
M6-342	CENTRAL INSTRUMENTATION FACILITY
M6-392	TOXIC HAZARDS LABORATORY
M6-399	K S C HEADQUARTERS
M6-486	BASE 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
M6-898	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
M7-857	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

◇ AUTHORIZED FISCAL YEAR 1971 PROJECT

1. ADDITION TO COMMUNICATIONS, DISTRIBUTION AND SWITCHING CENTER

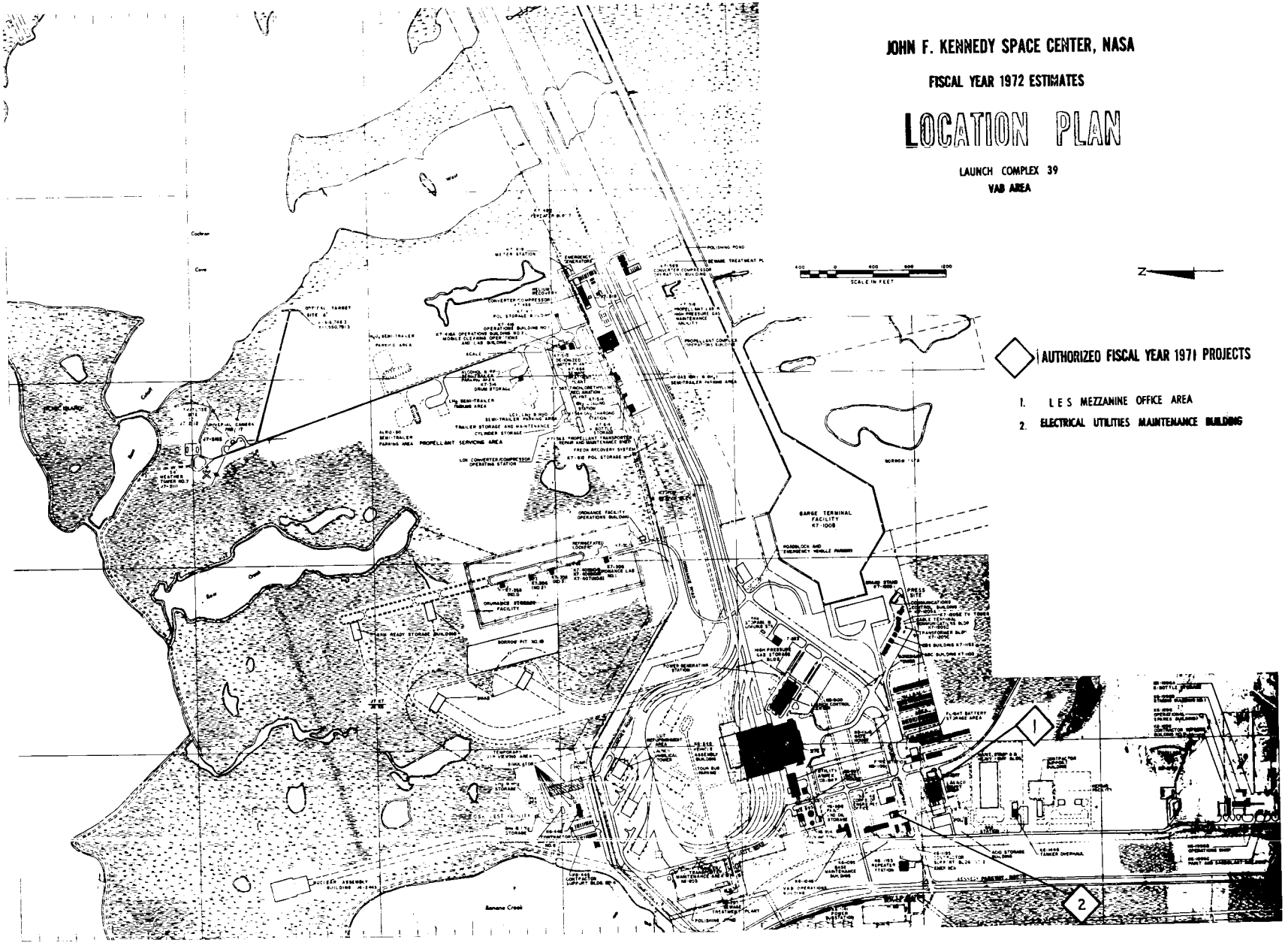


JOHN F. KENNEDY SPACE CENTER, NASA

FISCAL YEAR 1972 ESTIMATES

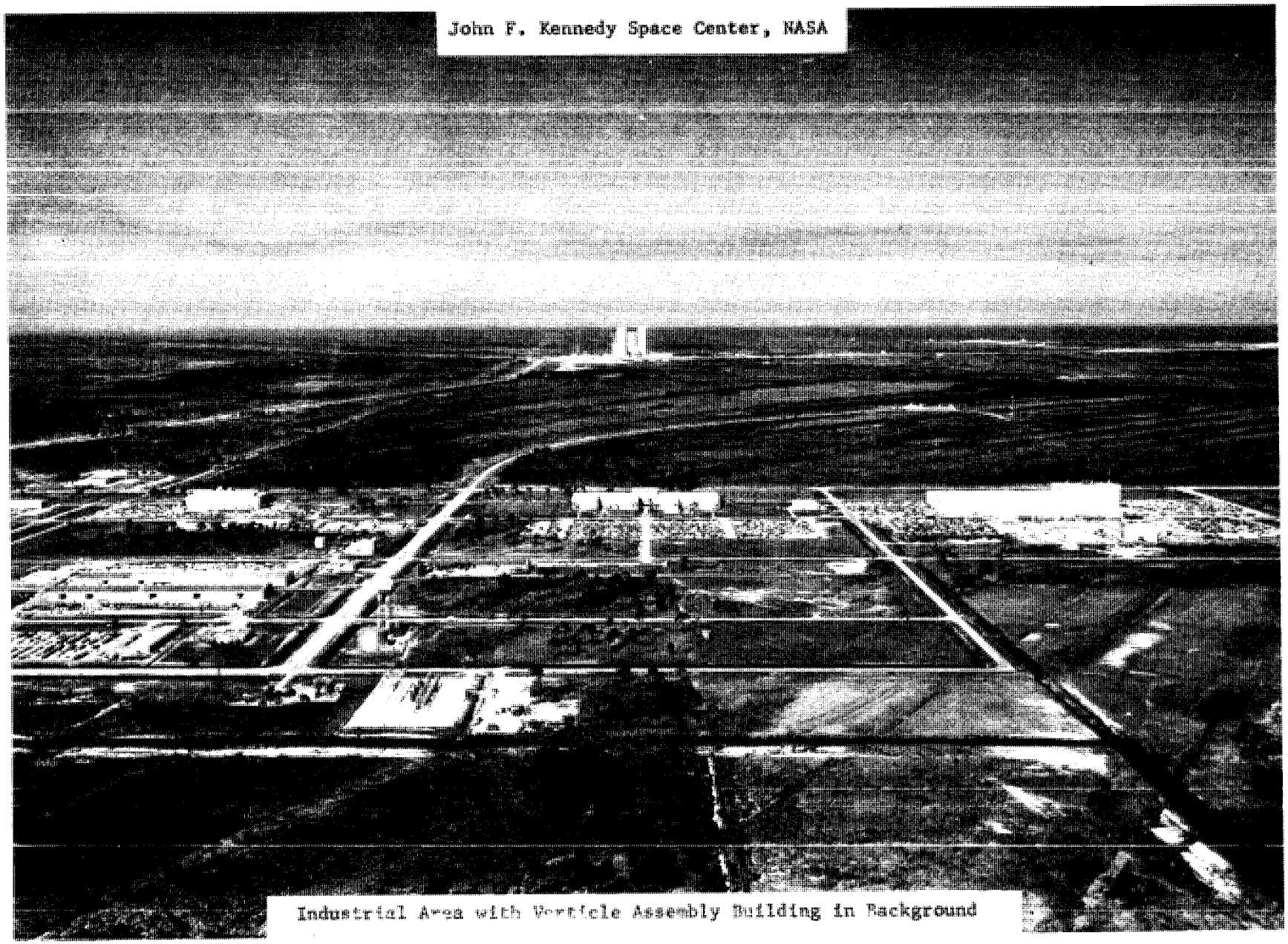
LOCATION PLAN

LAUNCH COMPLEX 39
VAB AREA

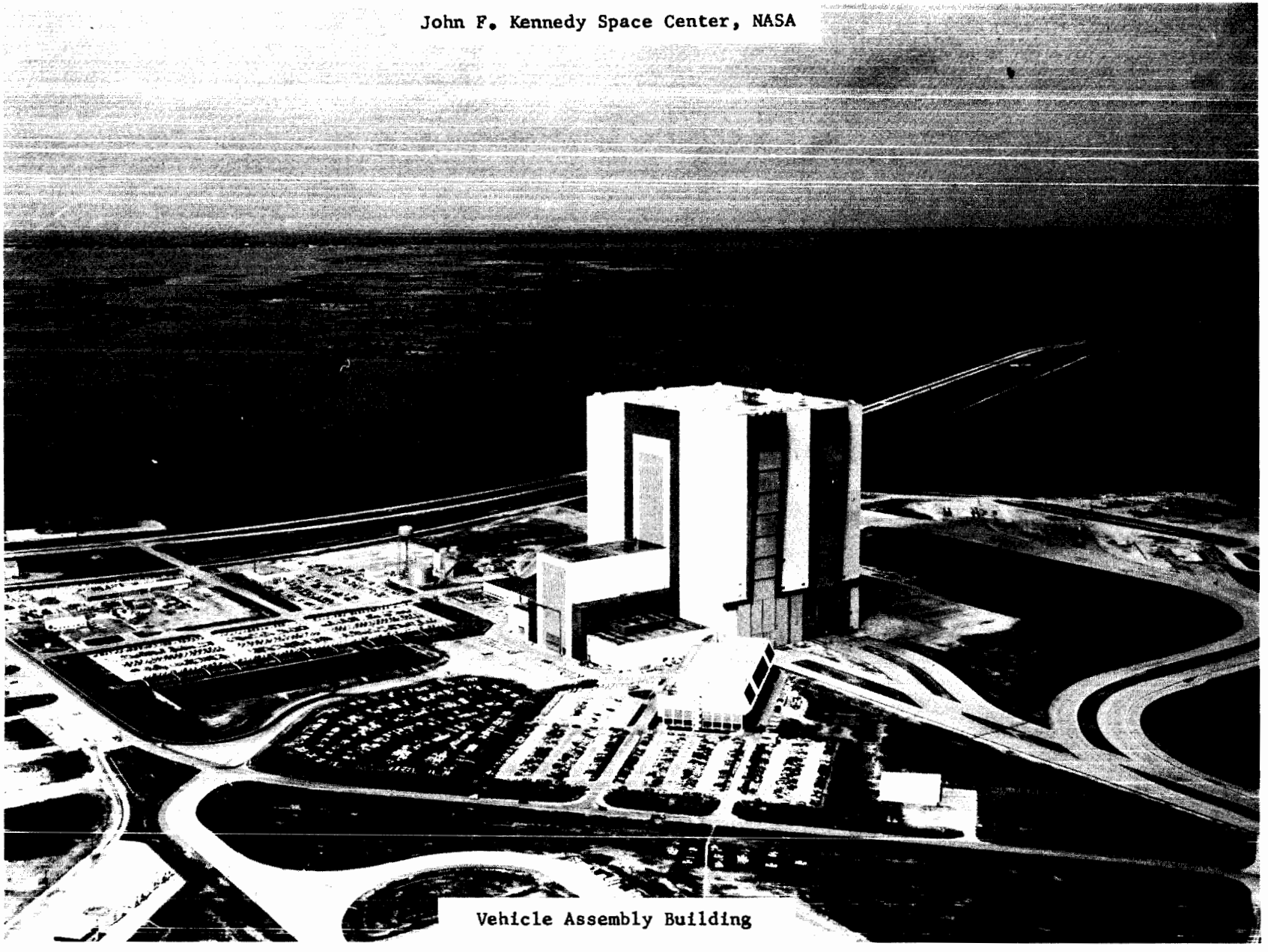


John F. Kennedy Space Center, NASA

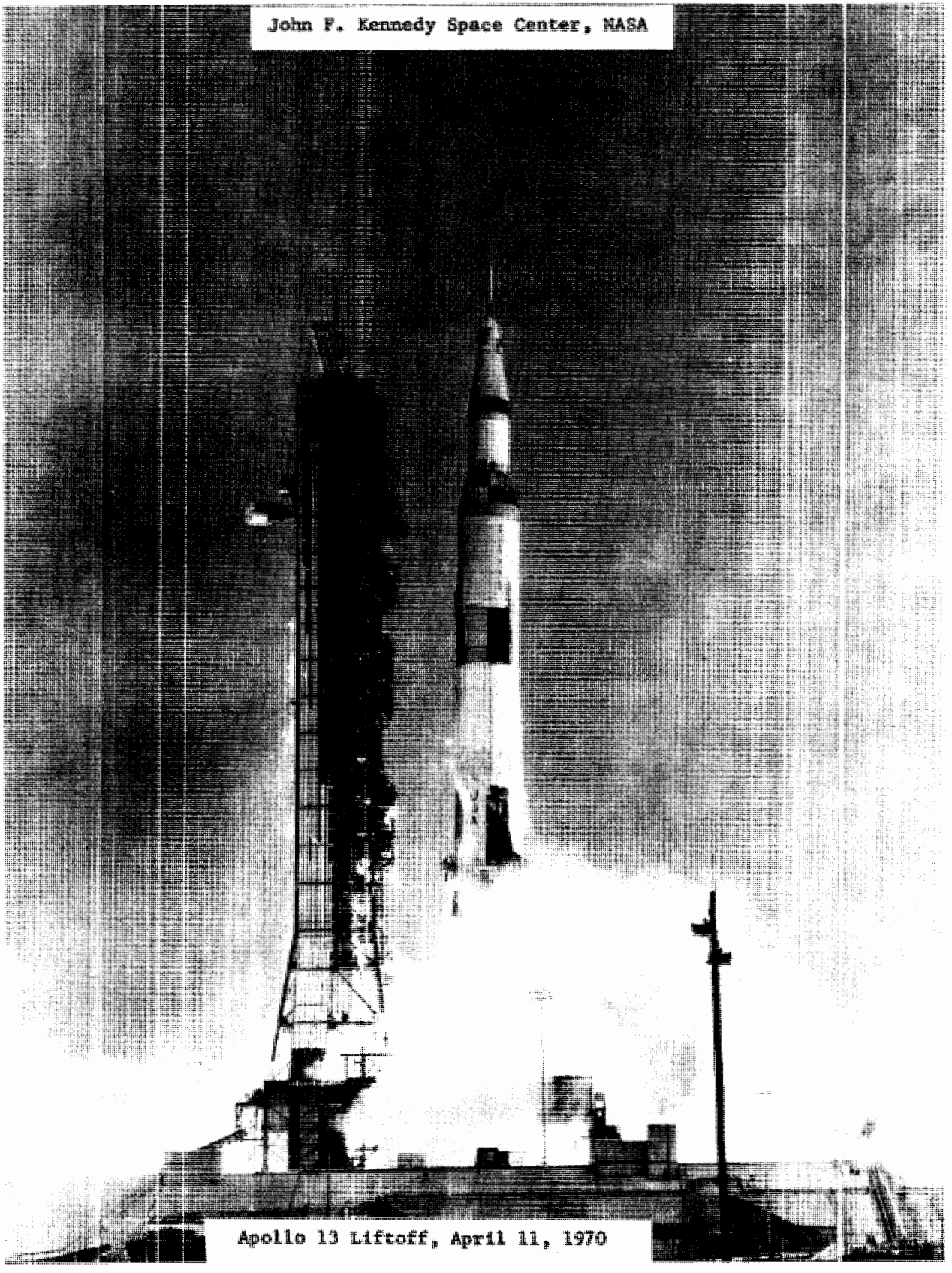
Industrial Area



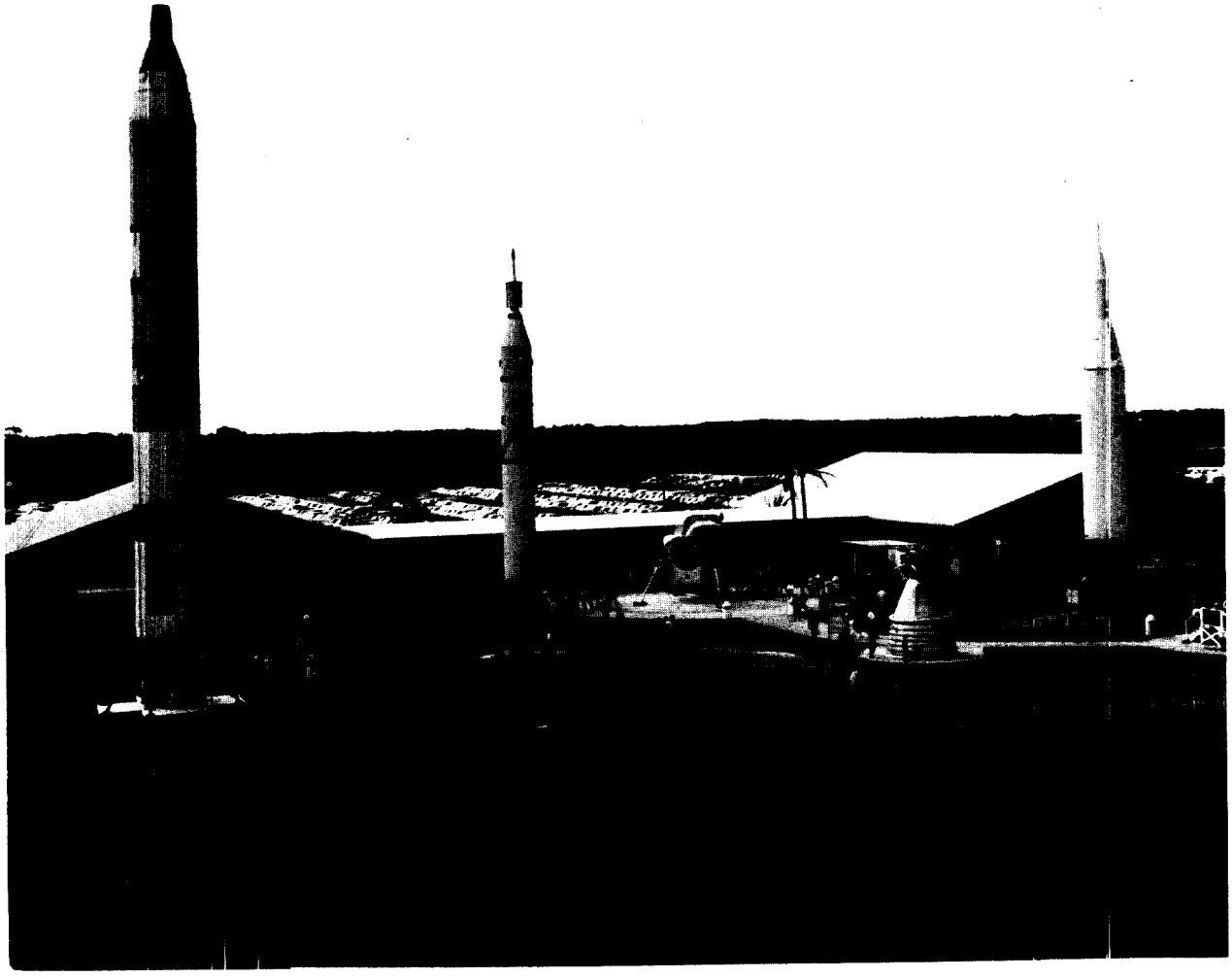
Industrial Area with Vehicle Assembly Building in Background



Vehicle Assembly Building



Apollo 13 Liftoff, April 11, 1970



Activity at Visitors Information Center

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 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 Skylab program. The Center's mission also involves the Earth Resources program as conducted by MSC through the Earth Resources Laboratory located at the Mississippi Test Facility. 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 are 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.

9. Conduct of research investigations in the Mississippi-Louisiana-Gulf area in the application of remotely sensed data obtained from aircraft and satellites, and dissemination of this knowledge to potential users or agencies charged with specific responsibilities for operational activities.

In the period ahead, MSC will also participate in the NASA program to produce a preliminary design and design verification of a space shuttle engine and airframe, and a space station module.

DESCRIPTION:

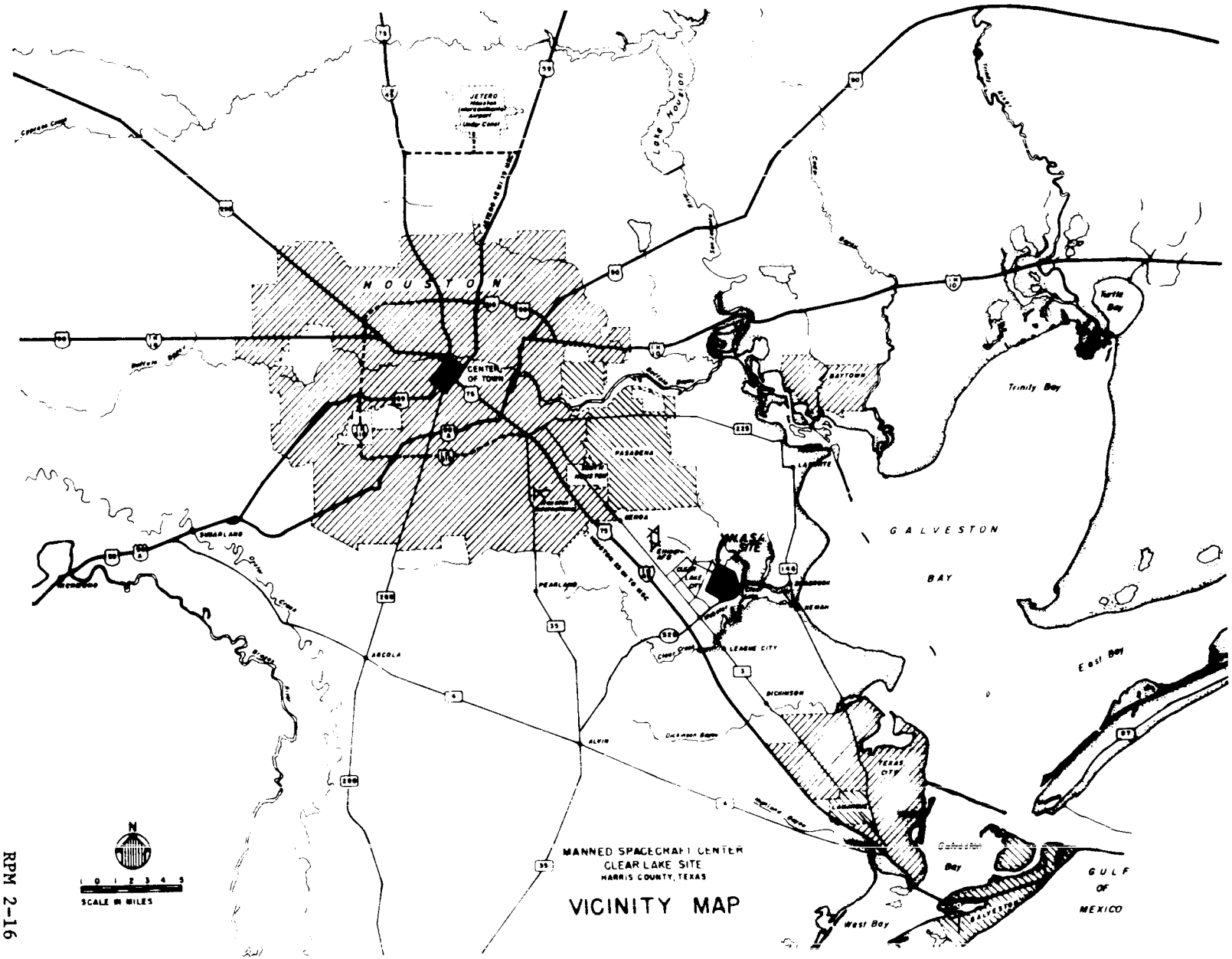
The Manned Spacecraft Center is located two miles east of the town of Webster, Texas. The site is approximately 20 miles southeast of downtown Houston and 25 miles northwest of Galveston, Texas. Total NASA-owned land at Houston consists of 1,620 acres. The Center also occupies an additional 55,861 acres at the White Sands Test Facility, Las Cruces, New Mexico. 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, 1970, was $748,579,000.

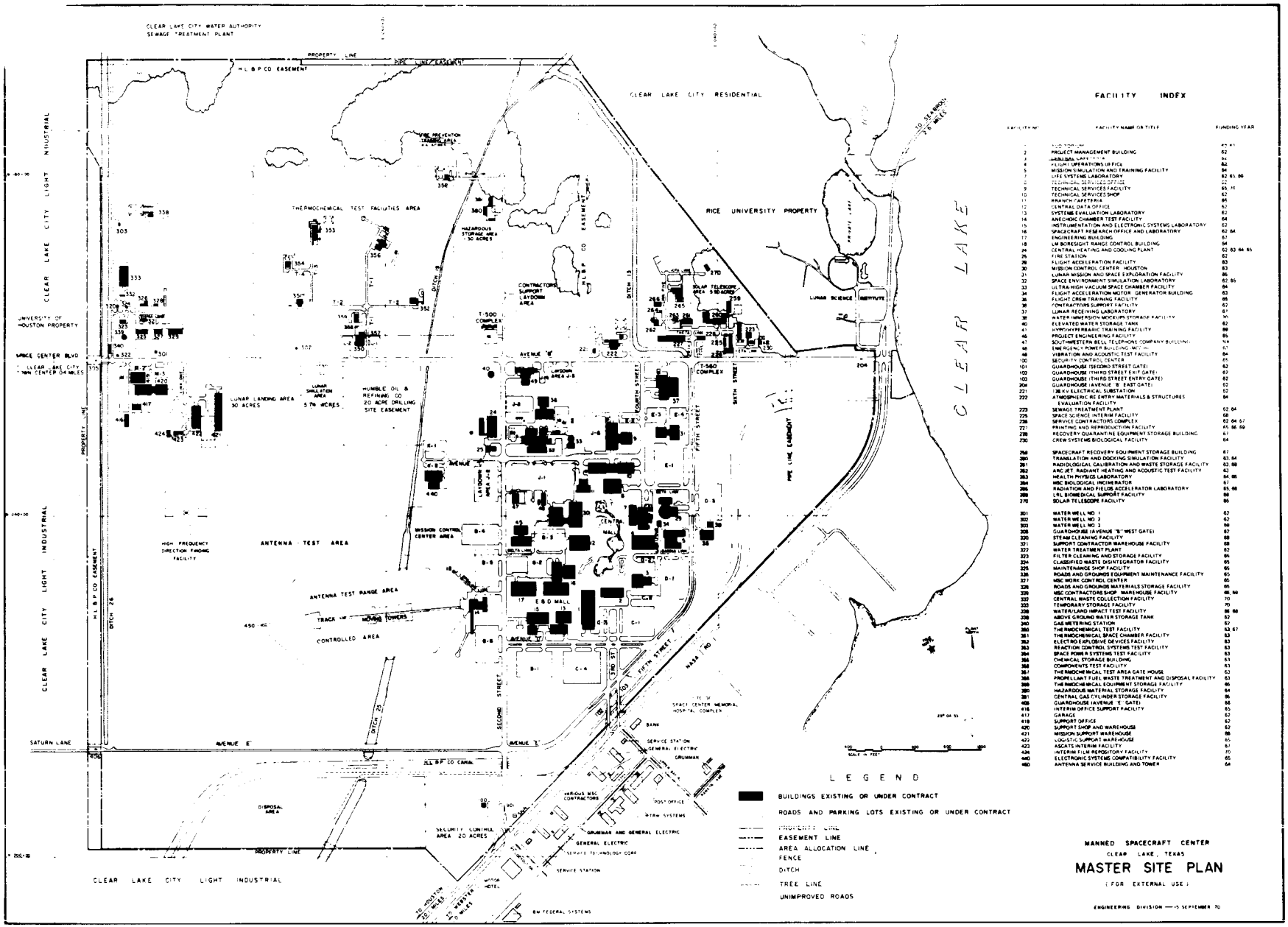
SUMMARY OF RESOURCES REQUIREMENTS:

	FUNDS		
Functions	1970	1971	1972
Personnel	$78,871,000	$80,796,000	$78,654,000
Travel	3,648,000	4,246,000	4,074,000
Facilities services	9,408,000	9,107,000	8,604,000
Technical services	6,949,000	7,317,000	7,321,000
Administrative support	7,685,000	7,647,000	7,602,000
Total, fund requirements	$106,561,000	$109,113,000	$106,255,000

PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	2,128	1,632	999
Space flight operations	677	1,138	1,659
Advanced missions	105	72	65
Space Science and Applications			
Physics and astronomy	35	21	23
Lunar and planetary exploration	28	7	8
Bioscience	1	1	---
Space applications	98	110	111
Advanced Research and Technology			
Space research and technology	32	41	20
Subtotal, positions by program	3,104	3,022	2,885
2. Indirect Positions:			
Director and staff	64	64	70
Administrative support	665	636	602
Research and development support	416	398	378
Subtotal, indirect positions	1,145	1,098	1,050
Total, permanent positions	4,249	4,120	3,935


HOUSTON
CENTER OF TOWN
JETERO
LAKE HOUSTON
PASADENA
BAYTOWN
Trinity Bay
GALVESTON
BAY
East Bay
West Bay
Galveston Bay
GULF OF MEXICO
MSC SITE
PEARLAND
ARCOLA
ALVIN
DICKINSON
LEAGUE CITY
TEXAS CITY
N
1 0 1 2 3 4 5
SCALE IN MILES
MANNED SPACECRAFT CENTER
CLEAR LAKE SITE
HARRIS COUNTY, TEXAS
VICINITY MAP



FACILITY INDEX

FACILITY NO.	FACILITY NAME OR TITLE	FUNDING YEAR
1	[illegible]	[illegible]
2	PROJECT MANAGEMENT BUILDING	62
3	[illegible]	[illegible]
4	FLIGHT OPERATIONS OFFICE	62
5	MISSION SIMULATION AND TRAINING FACILITY	64
7	LIFE SYSTEMS LABORATORY	62 65 66
8	TECHNICAL SERVICES OFFICE	62
9	TECHNICAL SERVICES FACILITY	65 70
10	TECHNICAL SERVICES SHOP	62
11	BRANCH CAFETERIA	65
12	CENTRAL DATA OFFICE	62
13	SYSTEMS EVALUATION LABORATORY	62
14	ANECHOIC CHAMBER TEST FACILITY	64
15	INSTRUMENTATION AND ELECTRONIC SYSTEMS LABORATORY	62
16	SPACECRAFT RESEARCH OFFICE AND LABORATORY	62 64
17	ENGINEERING BUILDING	67
18	LM BIORESIGHT RANGE CONTROL BUILDING	64
24	CENTRAL HEATING AND COOLING PLANT	62 63 64 65
25	FIRE STATION	62
29	FLIGHT ACCELERATION FACILITY	63
30	MISSION CONTROL CENTER - HOUSTON	63
31	LUNAR MISSION AND SPACE EXPLORATION FACILITY	66
32	SPACE ENVIRONMENT SIMULATION LABORATORY	62 65
33	ULTRA HIGH VACUUM SPACE CHAMBER FACILITY	64
34	FLIGHT ACCELERATION MOTOR - GENERATOR BUILDING	63
36	FLIGHT CREW TRAINING FACILITY	65
38	CONTRACTORS SUPPORT FACILITY	62
39	LUNAR RECEIVING LABORATORY	67
40	WATER IMMERSION MOCKUPS STORAGE FACILITY	70
41	ELEVATED WATER STORAGE TANK	62
43	HYPERBARIC TRAINING FACILITY	69
45	PROJECT ENGINEERING FACILITY	65
47	SOUTHWESTERN BELL TELEPHONE COMPANY BUILDING	N/A
48	EMERGENCY POWER BUILDING NO. 1	63
49	VIBRATION AND ACOUSTIC TEST FACILITY	64
100	SECURITY CONTROL CENTER	65
101	GUARDHOUSE (SECOND STREET GATE)	62
102	GUARDHOUSE (THIRD STREET EXIT GATE)	62
103	GUARDHOUSE (THIRD STREET ENTRY GATE)	62
104	GUARDHOUSE (AVENUE 'B' EAST GATE)	62
221	138 KV ELECTRICAL SUBSTATION	62
222	ATMOSPHERIC RE ENTRY MATERIALS & STRUCTURES EVALUATION FACILITY	64
223	SEWAGE TREATMENT PLANT	62 64
225	SPACE SCIENCE INTERIM FACILITY	68
228	SERVICE CONTRACTORS COMPLEX	62 64 67
229	PRINTING AND REPRODUCTION FACILITY	65 66 69
230	RECOVERY QUARANTINE EQUIPMENT STORAGE BUILDING	67
270	CREW SYSTEMS BIOLOGICAL FACILITY	64
258	SPACECRAFT RECOVERY EQUIPMENT STORAGE BUILDING	67
260	TRANSLATION AND DOCKING SIMULATION FACILITY	63 64
261	RADIOLOGICAL CALIBRATION AND WASTE STORAGE FACILITY	63 68
262	ARC JET RADIANT HEATING AND ACOUSTIC TEST FACILITY	63
263	HEALTH PHYSICS LABORATORY	64 65
264	MSC BIOLOGICAL INCINERATOR	67
265	RADIATION AND FIELDS ACCELERATOR LABORATORY	65 68
266	LRL BIOMEDICAL SUPPORT FACILITY	68
270	SOLAR TELESCOPE FACILITY	65
301	WATER WELL NO 1	62
302	WATER WELL NO 2	62
303	WATER WELL NO 3	69
308	GUARDHOUSE (AVENUE 'B' WEST GATE)	67
320	STEAM CLEANING FACILITY	68
321	SUPPORT CONTRACTOR WAREHOUSE FACILITY	68
322	WATER TREATMENT PLANT	62
323	FILTER CLEANING AND STORAGE FACILITY	66
324	CLASSIFIED WASTE DISINTEGRATOR FACILITY	65
325	MAINTENANCE SHOP FACILITY	65
326	ROADS AND GROUNDS EQUIPMENT MAINTENANCE FACILITY	65
327	MSC WORK CONTROL CENTER	66
328	ROADS AND GROUNDS MATERIALS STORAGE FACILITY	65
329	MSC CONTRACTORS SHOP - WAREHOUSE FACILITY	68 69
332	CENTRAL WASTE COLLECTION FACILITY	70
333	TEMPORARY STORAGE FACILITY	70
334	WATER/LAND IMPACT TEST FACILITY	68 68
338	ABOVE GROUND WATER STORAGE TANK	62
340	GAS METERING STATION	67
350	THERMOCHEMICAL TEST FACILITY	63 67
351	THERMOCHEMICAL SPACE CHAMBER FACILITY	63
352	ELECTRO EXPLOSIVE DEVICES FACILITY	63
353	REACTION CONTROL SYSTEMS TEST FACILITY	63
354	SPACE POWER SYSTEMS TEST FACILITY	63
355	CHEMICAL STORAGE BUILDING	63
356	COMPONENTS TEST FACILITY	63
357	THERMOCHEMICAL TEST AREA GATE HOUSE	63
358	PROPELLANT FUEL WASTE TREATMENT AND DISPOSAL FACILITY	63
359	THERMOCHEMICAL EQUIPMENT STORAGE FACILITY	66
360	HAZARDOUS MATERIAL STORAGE FACILITY	64
361	CENTRAL GAS CYLINDER STORAGE FACILITY	66
408	GUARDHOUSE (AVENUE 'E' GATE)	68
416	INTERIM OFFICE SUPPORT FACILITY	65
417	GARAGE	62
418	SUPPORT OFFICE	62
420	SUPPORT SHOP AND WAREHOUSE	62
421	MISSION SUPPORT WAREHOUSE	66
425	LOGISTIC SUPPORT WAREHOUSE	65
423	ASCATE INTERIM FACILITY	67
424	INTERIM FILM REPOSITORY FACILITY	70
440	ELECTRONIC SYSTEMS COMPATIBILITY FACILITY	65
450	ANTENNA SERVICE BUILDING AND TOWER	64

LEGEND

- BUILDINGS EXISTING OR UNDER CONTRACT
- ROADS AND PARKING LOTS EXISTING OR UNDER CONTRACT
- EASEMENT LINE
- AREA ALLOCATION LINE
- FENCE
- DITCH
- TREE LINE
- UNIMPROVED ROADS

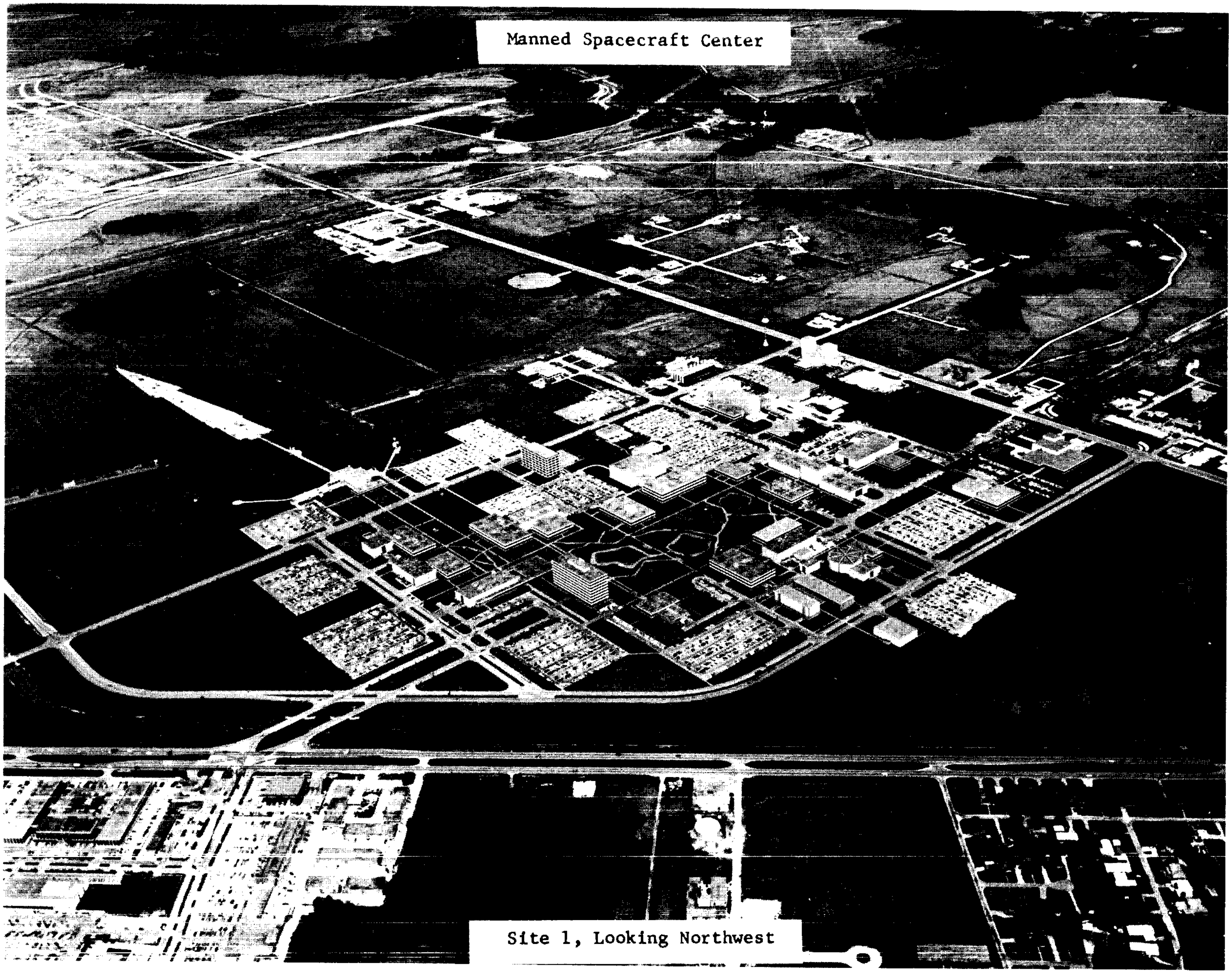
MANNED SPACECRAFT CENTER
CLEAR LAKE, TEXAS

MASTER SITE PLAN

(FOR EXTERNAL USE)

ENGINEERING DIVISION — 15 SEPTEMBER 70

RPM 2-17



Manned Spacecraft Center

Site 1, Looking Northwest

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

MARSHALL SPACE FLIGHT CENTER

MISSION:

The Marshall Space Flight Center (MSFC) at Huntsville, Alabama, became a part of NASA in July 1960. Marshall serves as NASA's primary center for the design, development, and testing of large launch vehicles and space transportation systems, and is engaged in the program management and payload integration of the Skylab Flights. MSFC also directs activities at the Michoud Assembly Facility (MAF) at New Orleans, Louisiana; the Slidell Computer Facility at Slidell, Louisiana; and the Mississippi Test Facility (MTF) in Bay St. Louis, southwest Mississippi. The Center is involved in the direction and management of the following ongoing programs:

1. The Saturn V program, which provides the nation's only launch vehicle for manned lunar landing missions and very large payloads, such as the Skylab Workshop.

2. The Skylab program, including development of ground support equipment and cluster modules such as the Orbital Workshop, Apollo Telescope Mount, Airlock Module, and Multiple Docking Adapter, management of selected experiments, and overall systems engineering and integration of the total Skylab cluster.

3. The Saturn IB program, which serves as a launch vehicle for earth orbital manned missions.

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

5. The Space Shuttle main engine, a high thrust, throttleable liquid hydrogen, liquid oxygen fueled rocket engine capable of many reuses. The Center is also associated with other centers in directing the preliminary design and technology verification of the Space Shuttle vehicle.

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

1. Design and develop large launch space 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 ongoing and future space exploration.

3. Develop and integrate scientific experiment payload packages to be flown on Saturn/Apollo vehicles and Skylab or subsequent post-Apollo missions.

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

5. Conduct technical and program management of industrial programs involving space vehicles, payloads and systems.

In support of its assigned mission, the Marshall Center also maintains an in-depth capability to perform research and development in a wide range of scientific and technical disciplines, and to conduct studies of future launch vehicle and space systems such as the Space Shuttle. Its capability for research and for the management of large industrial programs gives the Center a highly flexible base for ongoing and future space programs.

DESCRIPTION:

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

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, 1970, was approximately $383,719,000. Certain facilities such as the Redstone Arsenal Air Field and some utilities are used jointly by NASA and the Army. The Huntsville location has deepwater access via the Tennessee, Ohio, and Mississippi Rivers.

The Michoud Assembly Facility is located 15 miles east of New Orleans, Louisiana. The main facility occupies 891 acres. The Slidell Central Computer Facility, a satellite facility 20 miles to the northeast, occupies 14 additional acres bringing the total acreage to 905. The capital investment as of June 30, 1970, was approximately $159,874,000.

The Michoud Facility provides 3,559,256 square feet of space, including the main assembly plant, covering an area of 43 acres under one roof. The Facility is located on the Gulf Intra-Coastal Waterway and has deepwater access via the Mississippi River.

The Mississippi Test Facility is located 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, 7,568 acres are owned by NASA, and 117,874 acres

are under restrictive easements. Capital investment for the Mississippi Test Facility as of June 30, 1970, was approximately $276,771,000. 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). The site has deepwater access via the Pearl River and the Intra-Coastal Waterway.

The total capital investment of the Marshall Space Flight Center and its installations at Mississippi and Louisiana, including fixed assets in progress and contractor-held facilities at various locations, as of June 30, 1970, was $1,055,859,000.

SUMMARY OF RESOURCES REQUIREMENTS:

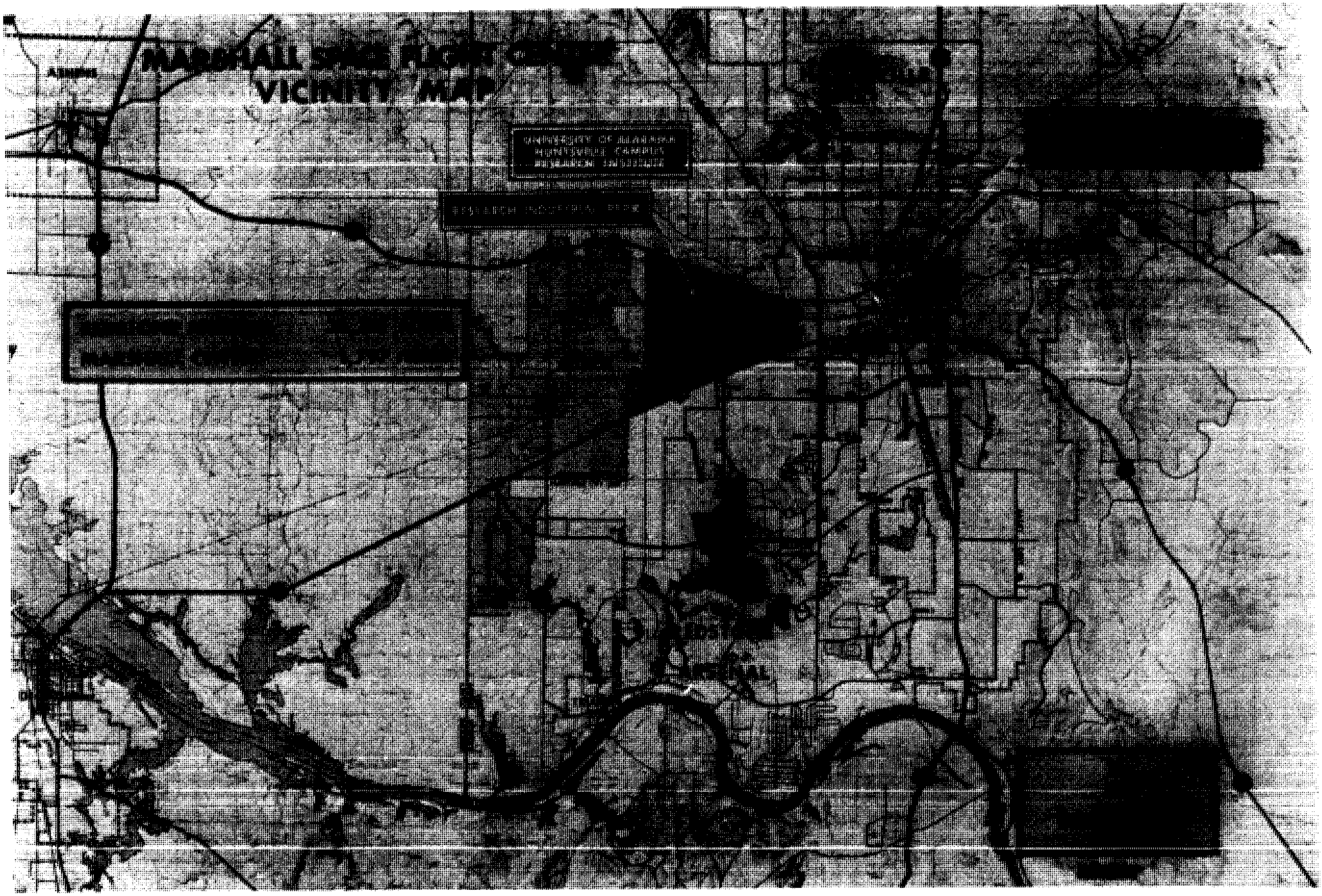
FUNDS

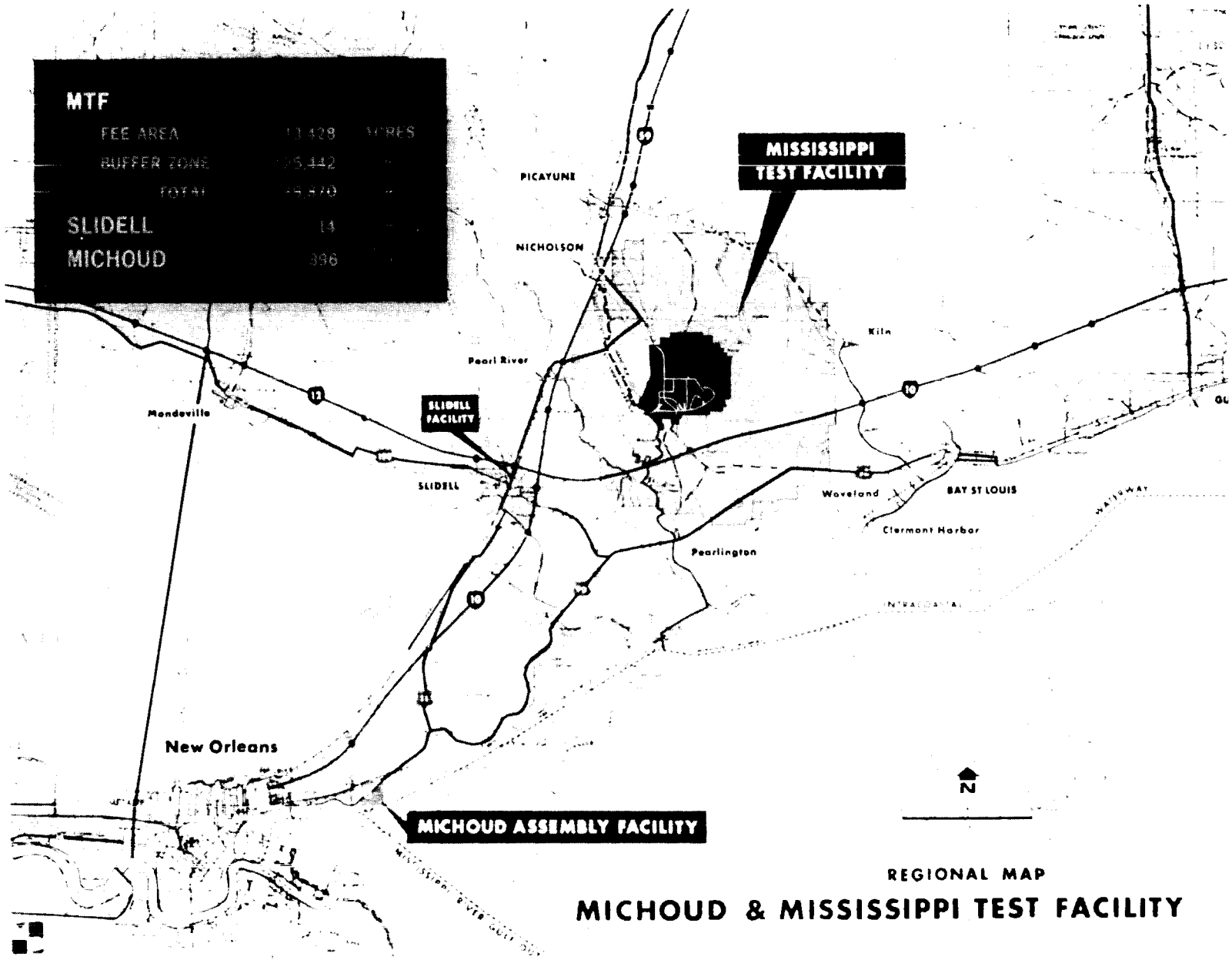
Functions	1970	1971	1972
Personnel	$103,084,000	$105,563,000	$103,775,000
Travel	2,303,000	2,660,000	2,500,000
Facilities services	7,044,000	19,465,000	9,412,000
Technical services	8,538,000	7,774,000	8,072,000
Administrative support	4,724,000	6,986,000	6,432,000
Total, fund requirements	$125,693,000	$142,448,000	$130,191,000

PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	1,409	920	675
Space flight operations	2,535	3,025	3,105
Advanced missions	374	185	150

	1970	1971	1972
Space Science and Applications			
Physics and astronomy	51	88	87
Lunar and planetary exploration	26	31	24
Bioscience	8	6	---
Space applications	4	4	3
Launch vehicle procurement	4	6	6
Advanced Research and Technology			
Aeronautical research and technology	14	11	9
Space research and technology	232	221	191
Nuclear power and propulsion	9	9	10
Tracking and Data Acquisition	8	8	10
Technology Utilization	12	12	12
Subtotal, positions by program	4,686	4,526	4,282
2. Indirect Positions:			
Director and staff	86	77	74
Administrative support	697	684	655
Research and development support	533	517	496
Subtotal, indirect positions	1,316	1,278	1,225
Total, permanent positions	6,002	5,804	5,507


MARSHALL SPACE FLIGHT CENTER
VICINITY MAP

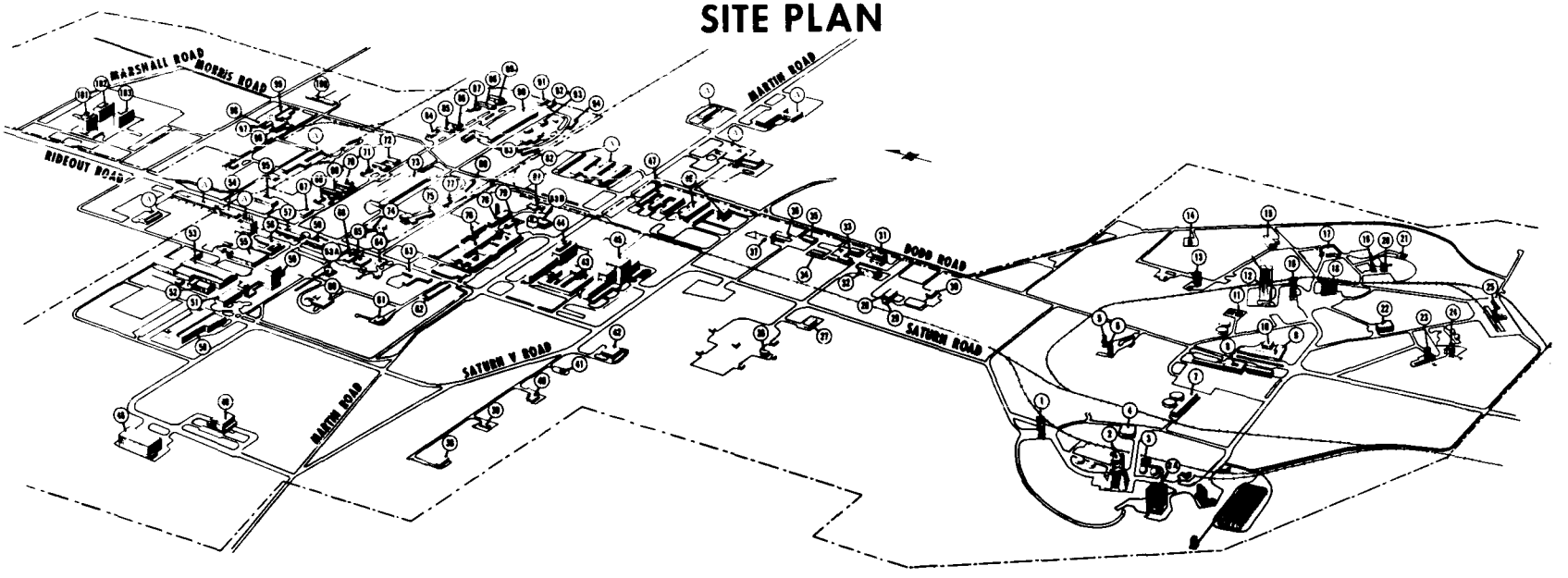


REGIONAL MAP

MICHOUD & MISSISSIPPI TEST FACILITY

RM 2-24

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	4605	NON-DESTRUCTIVE TEST LABORATORY
43	4612	MATERIALS LABORATORY
44	4610	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
53A	4775	EXPERIMENTAL TEST FACILITY
53B	4467	SATURN V LAY - ALIGN STATION
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	4311	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	4352	NITROGEN STORAGE BUILDING
85	4351	ADMINISTRATIVE BUILDING
86	4353	PHOTOGRAPHIC LABORATORY
87	4372	EQUIPMENT STORAGE
88	4371	STORAGE AND OFFICES
89	4373	GSE LABORATORY
90	4481	ENGINEERING AND MACHINE SHOP/OFFICE
91	S-4498	STORAGE BUILDING (QUONSET)
92	S-4499	STORAGE BUILDING (QUONSET)
93	4482	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	4674	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
3A	4699	S-II STRUCTURAL TEST STAND

EAST AREA

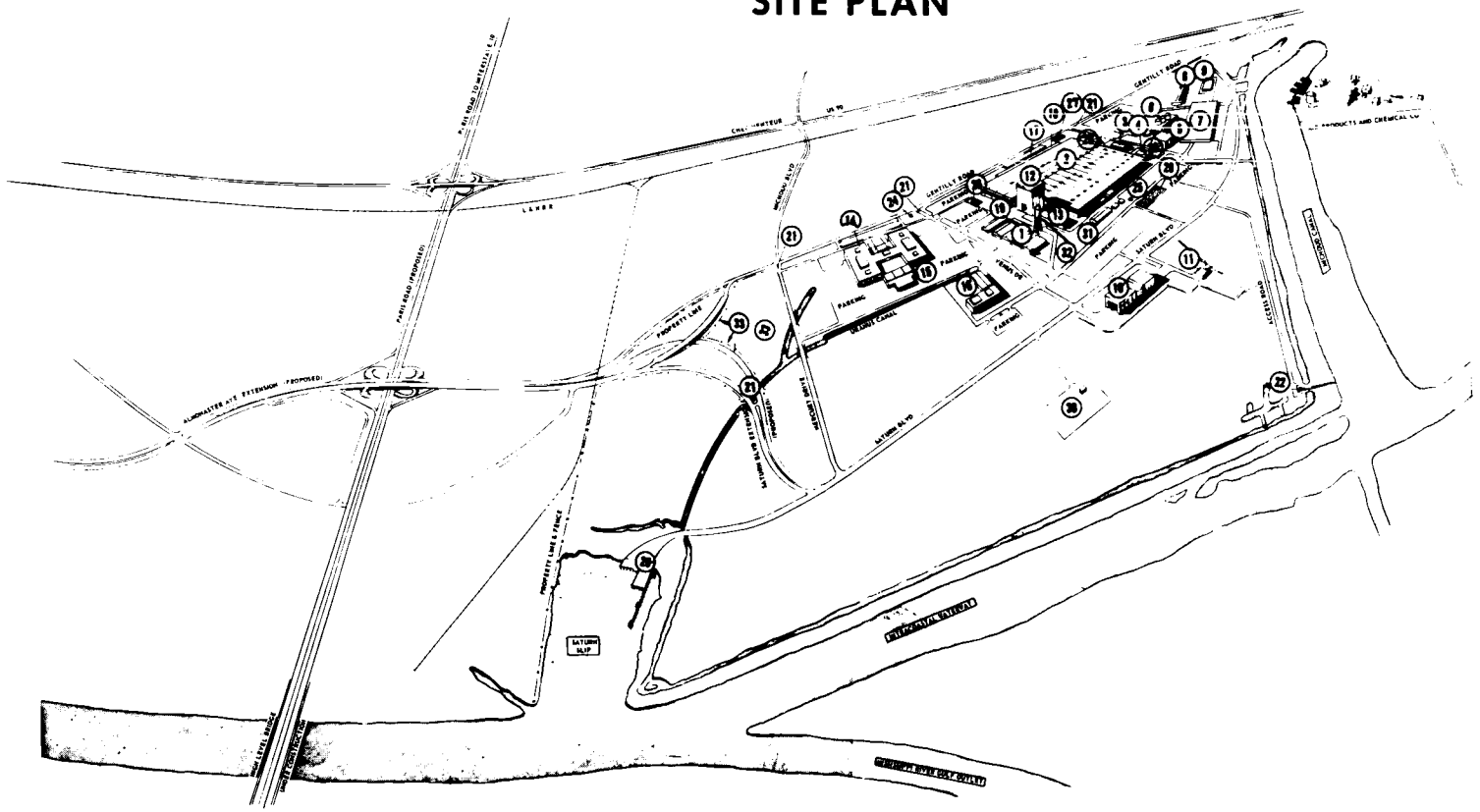
9	4566	ENGINEERING BUILDING
10	4567	BOILER HOUSE AND PUMP STATION
11	S-4549	DEIONIZED WATER TREATMENT PLANT
12	4550	ADVANCED SATURN DYNAMIC TEST STAND
13	4522	TEST STAND (LOX-LH_2 COMPONENTS)
14	4530	TEST STAND (LOX-RP COMPONENTS)
15	4561	CONTROL AND SERVICE CENTER
16	4557	DYNAMIC TEST STAND (SATURN I/IB)
17	4583	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-4660	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

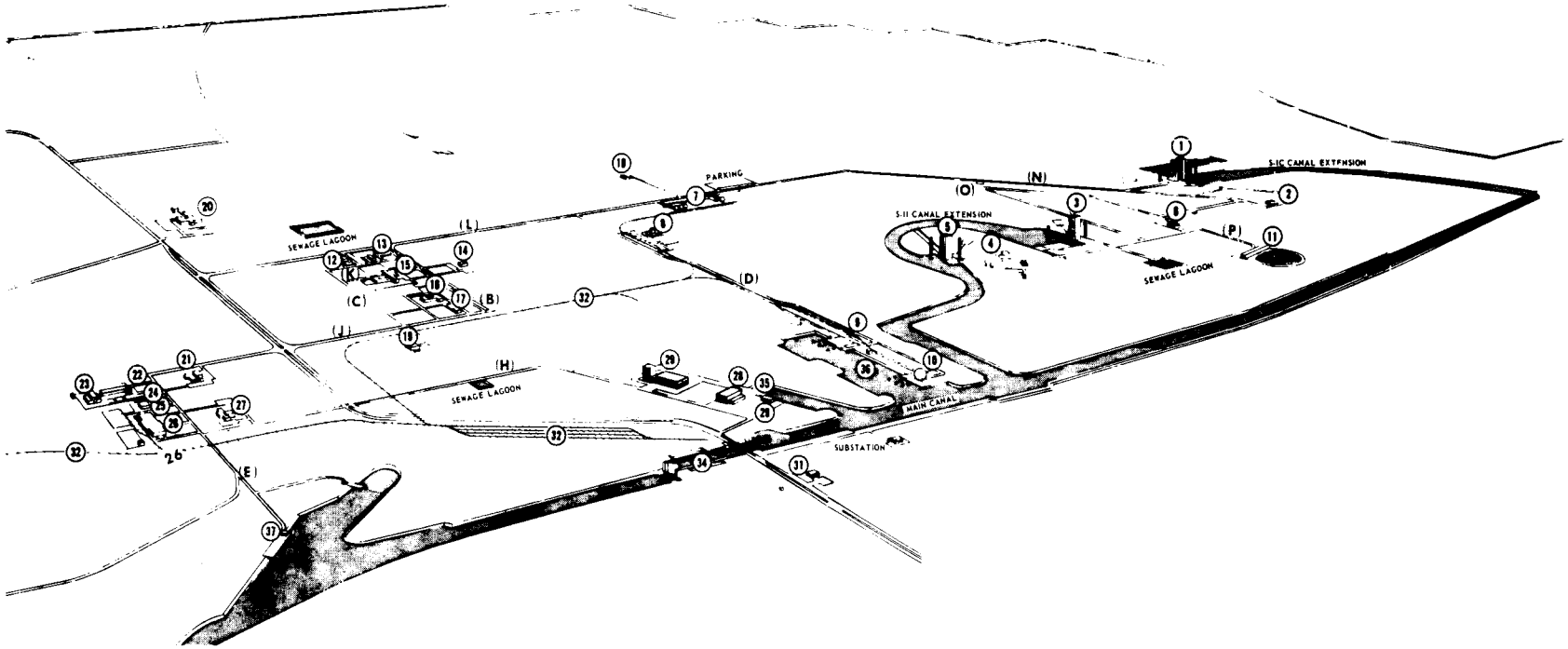
ENGINEERING & ADMINISTRATION

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

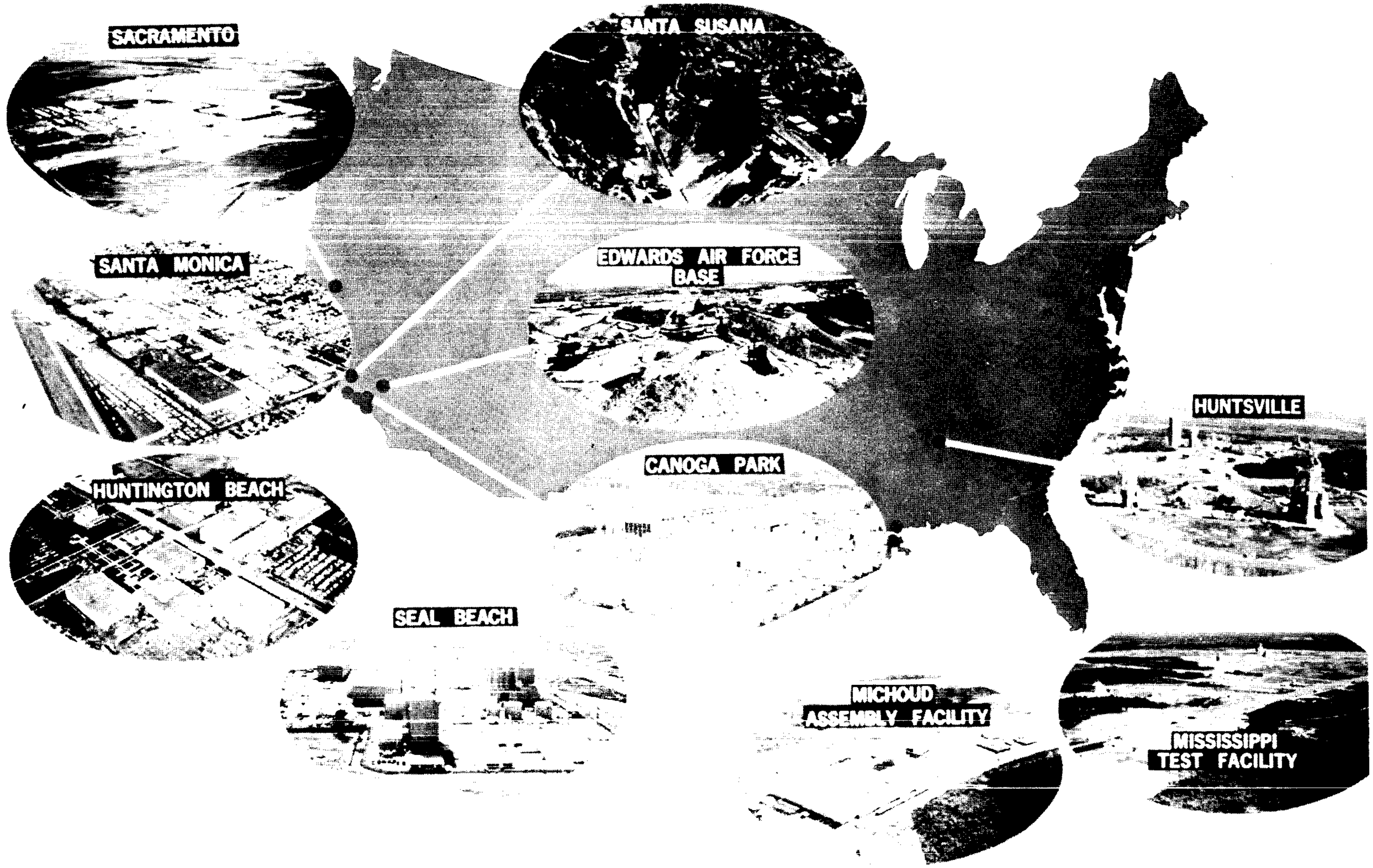
INDUSTRIAL COMPLEX

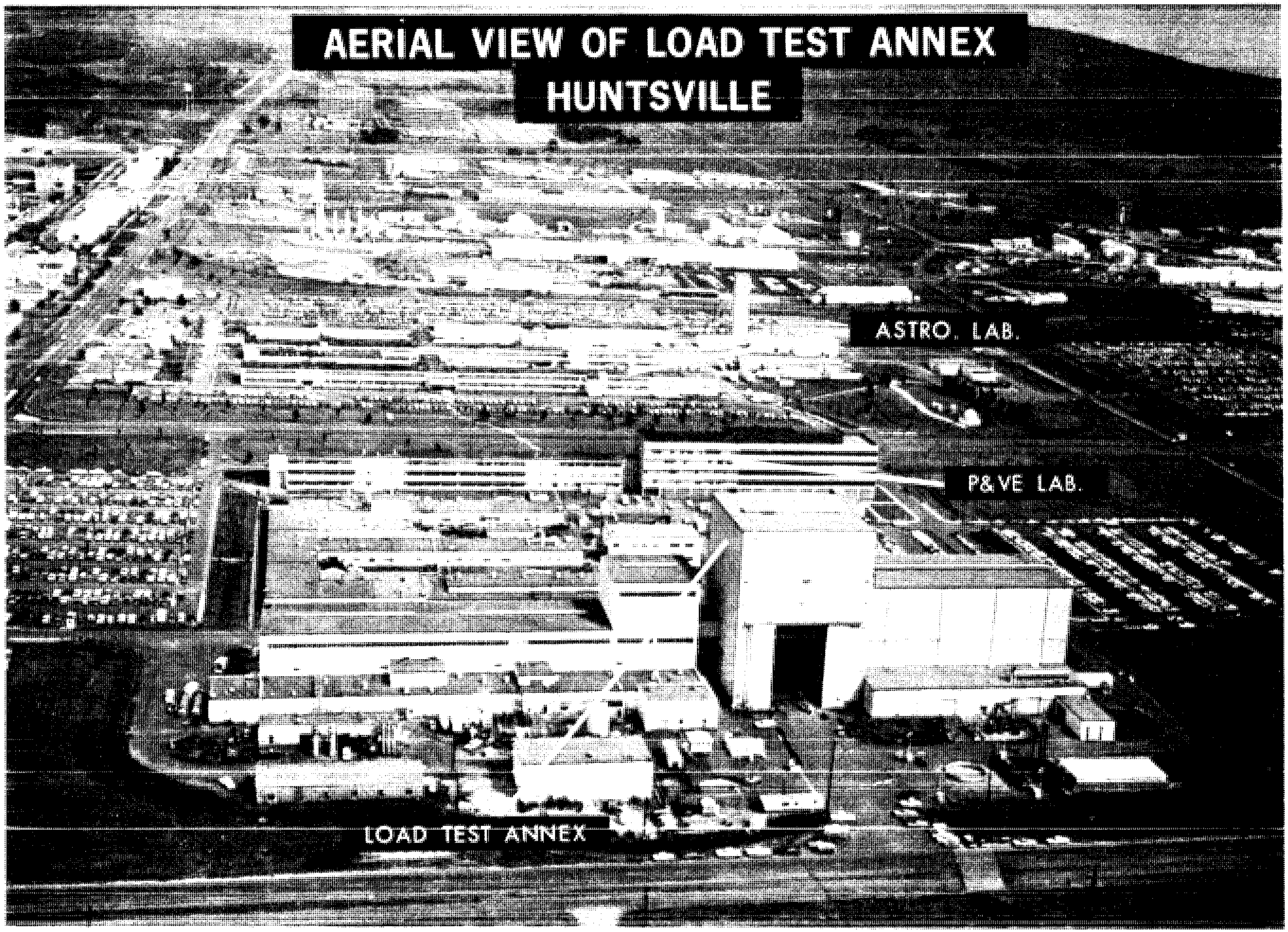
20	8100	COMPONENTS SERVICE FACILITY
21	2101	EMERGENCY SERVICES BLDG.
22	2201	SITE MAINTENANCE BLDG.
23	2205	TEST MAINTENANCE BLDG
24	2202	COMPRESSED GAS CYLINDER STORAGE
25	2203	INFLAMMABLE MATERIAL STORAGE
26	2204	WAREHOUSE
27	2105	MOBILE EQUIPMENT OPERATION BLDG.
28	3202	S-IC STAGE STORAGE BUILDING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

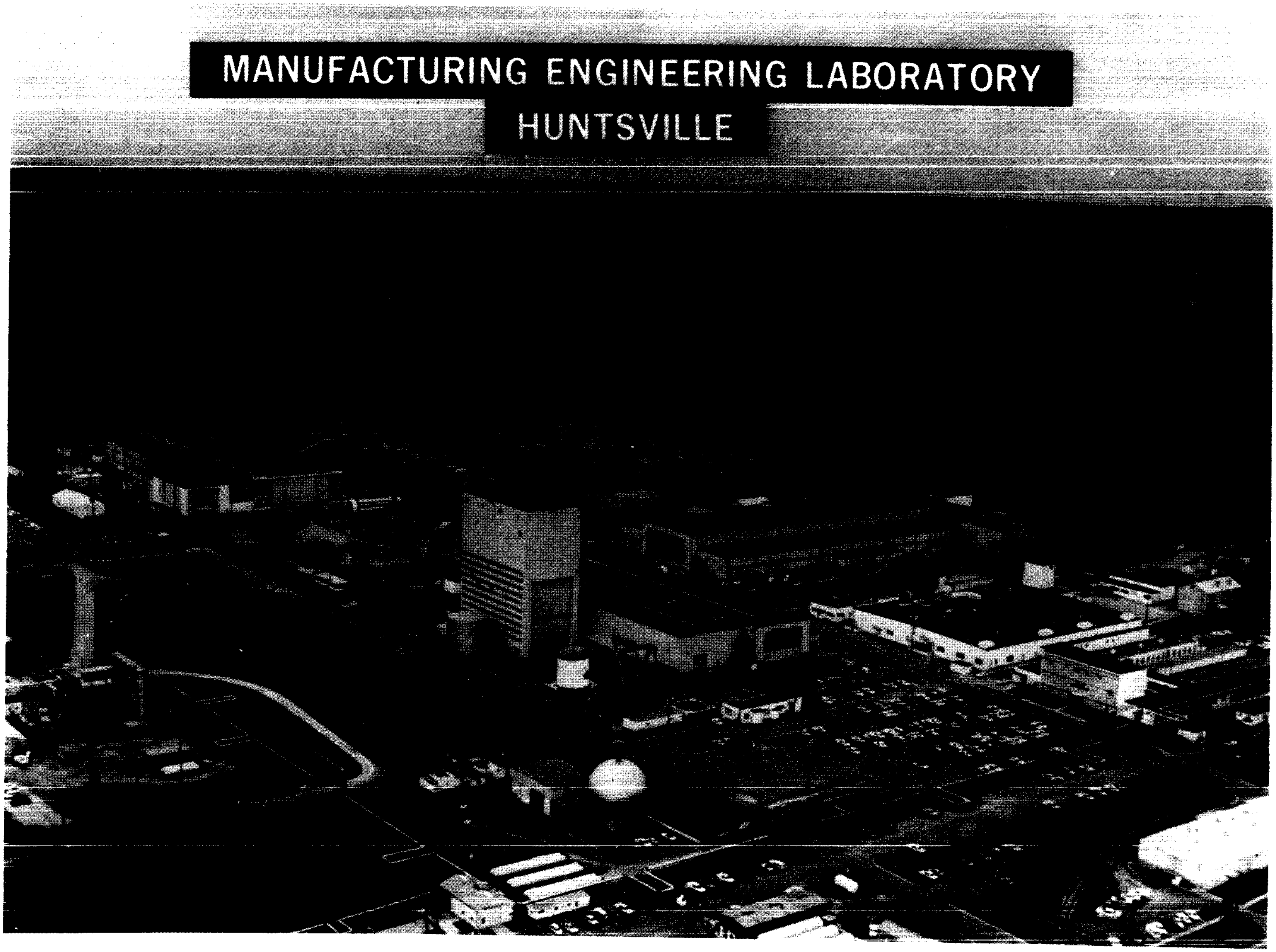
TRANSPORTATION & MISC.

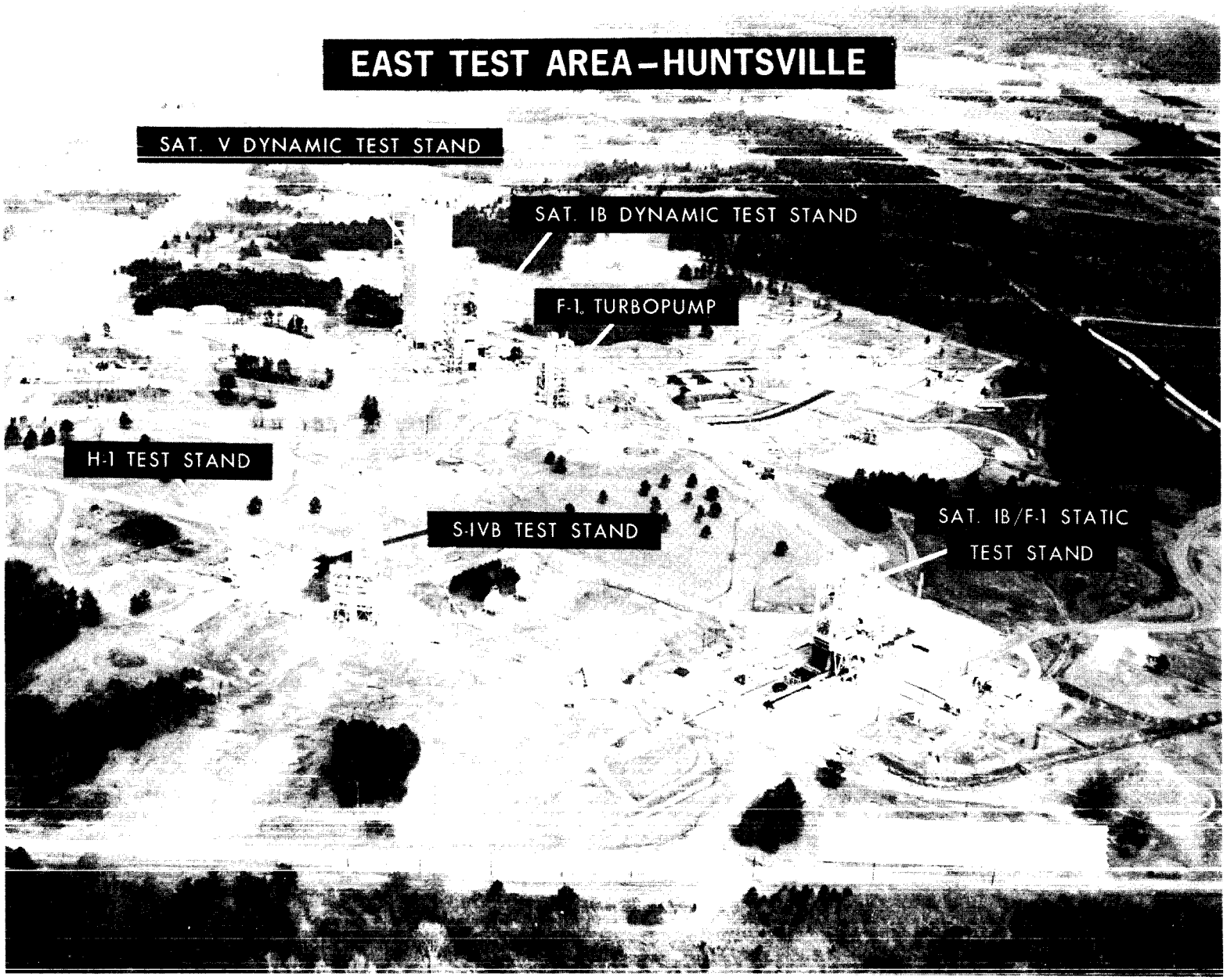
32		RAILROAD & SWITCHING YARD
33	2402	RP-1 TRANSFER DOCK
34	2315	NAVIGATION LOCK & BRIDGE
35		BOOSTER TRANSFER DOCK
36		CRYOGENIC DOCK & CANAL EXTEN
37	2401	CONSTRUCTION DOCK

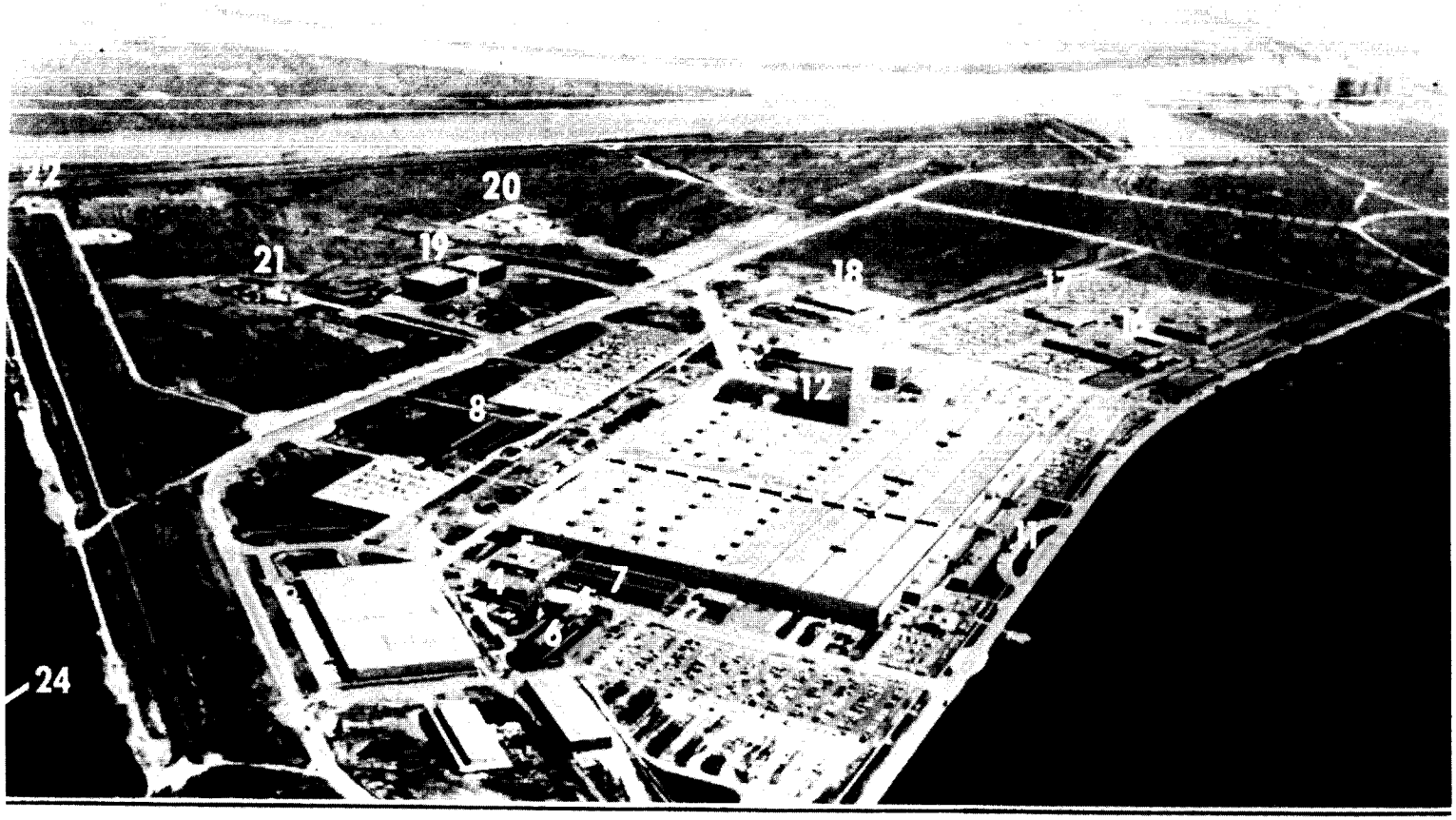
MARSHALL SPACE FLIGHT CENTER
PROGRAM FACILITIES




AERIAL VIEW OF LOAD TEST ANNEX
HUNTSVILLE
ASTRO. LAB.
P&VE LAB.
LOAD TEST ANNEX

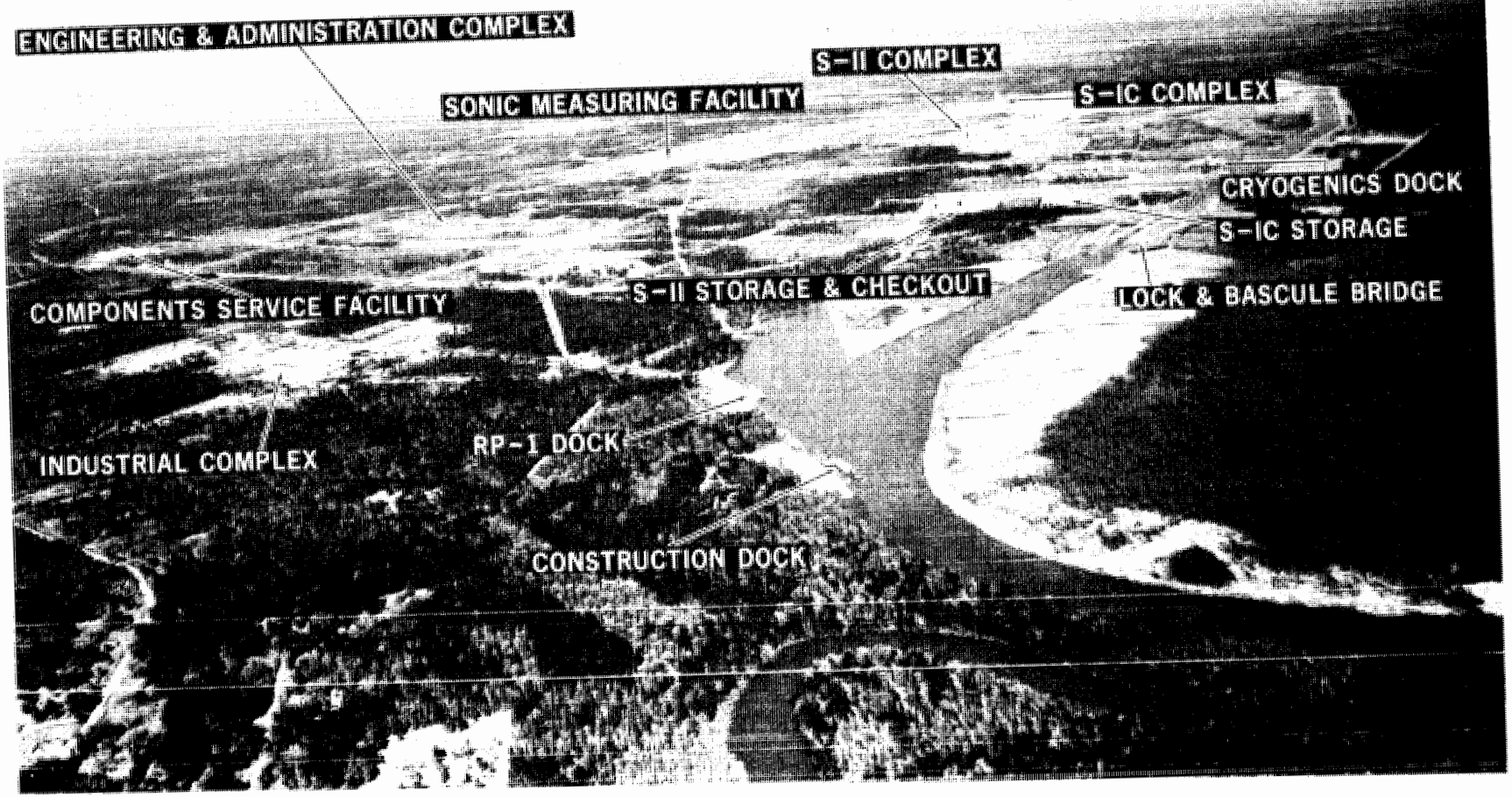

MANUFACTURING ENGINEERING LABORATORY
HUNTSVILLE


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 1972 ESTIMATES

GODDARD SPACE FLIGHT CENTER

MISSION:

The Goddard Space Flight Center, established in 1959 as the first major United States installation devoted to the investigation and exploration of space, conducts a wide-ranging program of experimentation in space science and applications. The Goddard 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.

The majority of the Goddard Center's personnel are located at Greenbelt, Md.; 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 is responsible for the management of communications and earth observation satellite programs, such as the Applications Technology, Nimbus, and Earth Resources Technology satellites; the management of scientific satellite projects which include the 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.

Major Goddard activities during the year were concerned with work in the following areas:

International 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, two communications satellites, NATO-1 and Skynet-2, were launched for the North Atlantic Treaty Organization and United Kingdom respectively. 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. In addition to launching ITOS-1 and Nimbus-4 during the year, the Center began work on two advanced programs, Earth Resources Technology Satellites (ERTS) and Applications Technology Satellites F&G (ATS F&G). The ERTS satellites will investigate the Earth's resources from space while the ATS F&G satellites will carry advanced meteorological, communications, air traffic control and scientific experiments.

Sounding Rockets - During 1970 more than 160 sounding rocket launchings, primarily at the Wallops Station, were conducted by Goddard, bringing to 1,400 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 one Apollo manned flight during the year.

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 nearby 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, 1970, was $628,794,000 (including capital type facilities of the MSF and STADAN network and other supporting activities including equipment aboard ships and aircraft).

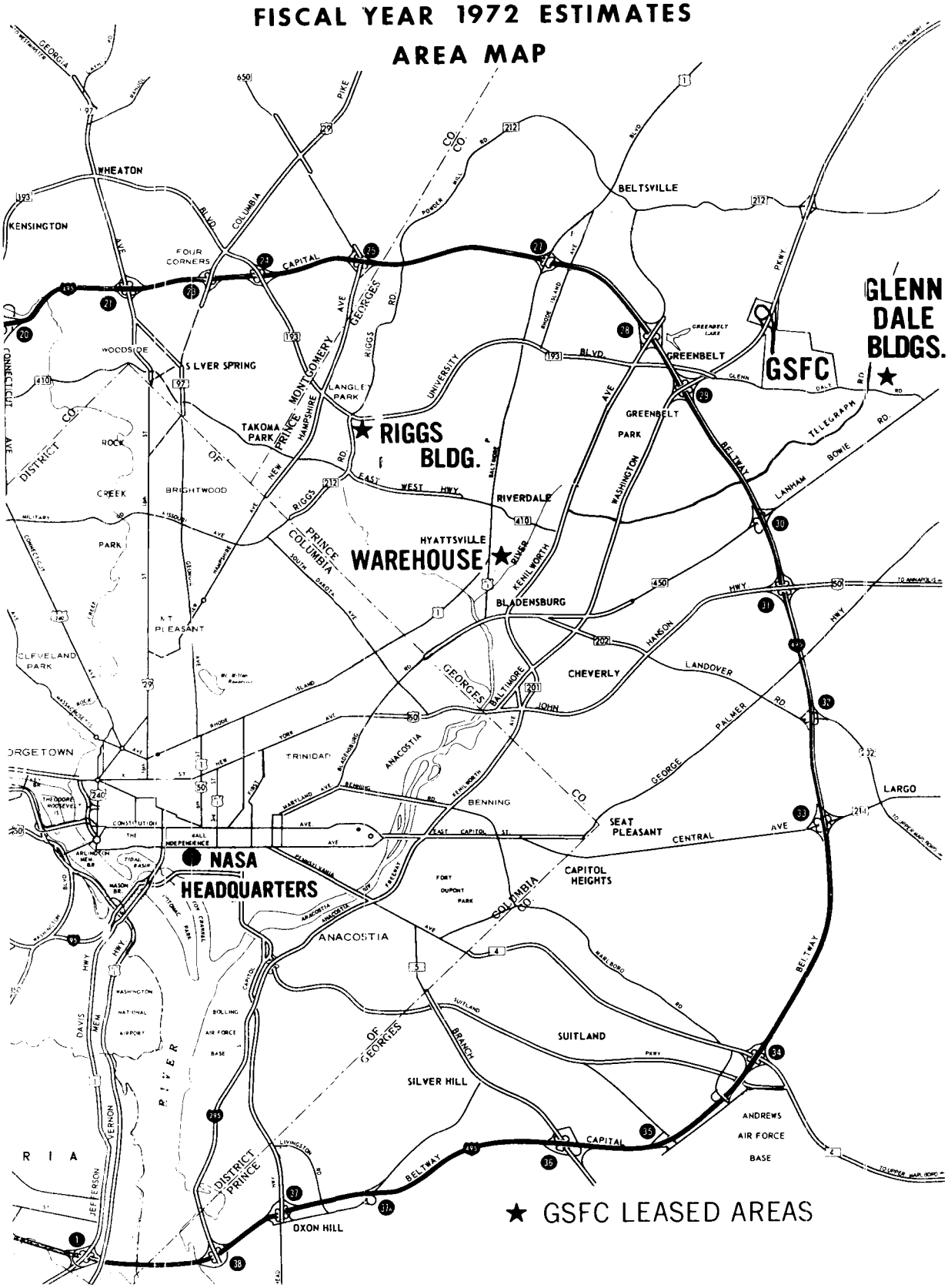
SUMMARY OF RESOURCES REQUIREMENTS:

	FUNDS		
Functions	1970	1971	1972
Personnel	$69,913,000	$75,034,000	$75,384,000
Travel	2,038,000	2,472,000	2,372,000
Facilities services	4,659,000	4,300,000	4,300,000
Technical services	6,207,000	5,616,000	4,211,000
Administrative support	3,635,000	3,772,000	4,032,000
Total, fund requirements	$86,452,000	$91,194,000	$90,299,000

PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	3	10	11
Space flight operations	2	1	1
Space Science and Applications			
Physics and astronomy	1,331	1,294	1,087
Lunar and planetary exploration	100	106	111
Bioscience	3	---	---
Space applications	512	634	681
Launch vehicle procurement	49	53	50
Advanced Research and Technology			
Space research and technology	177	125	153
Tracking and Data Acquisition	846	806	780
Subtotal, positions by program	3,023	3,029	2,874
2. Indirect Positions:			
Director and staff	16	16	16
Administrative support	950	947	907
Research and development support	423	420	390
Subtotal, indirect positions	1,389	1,383	1,313
Total, permanent positions	4,412	4,412	4,187

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1972 ESTIMATES
AREA MAP



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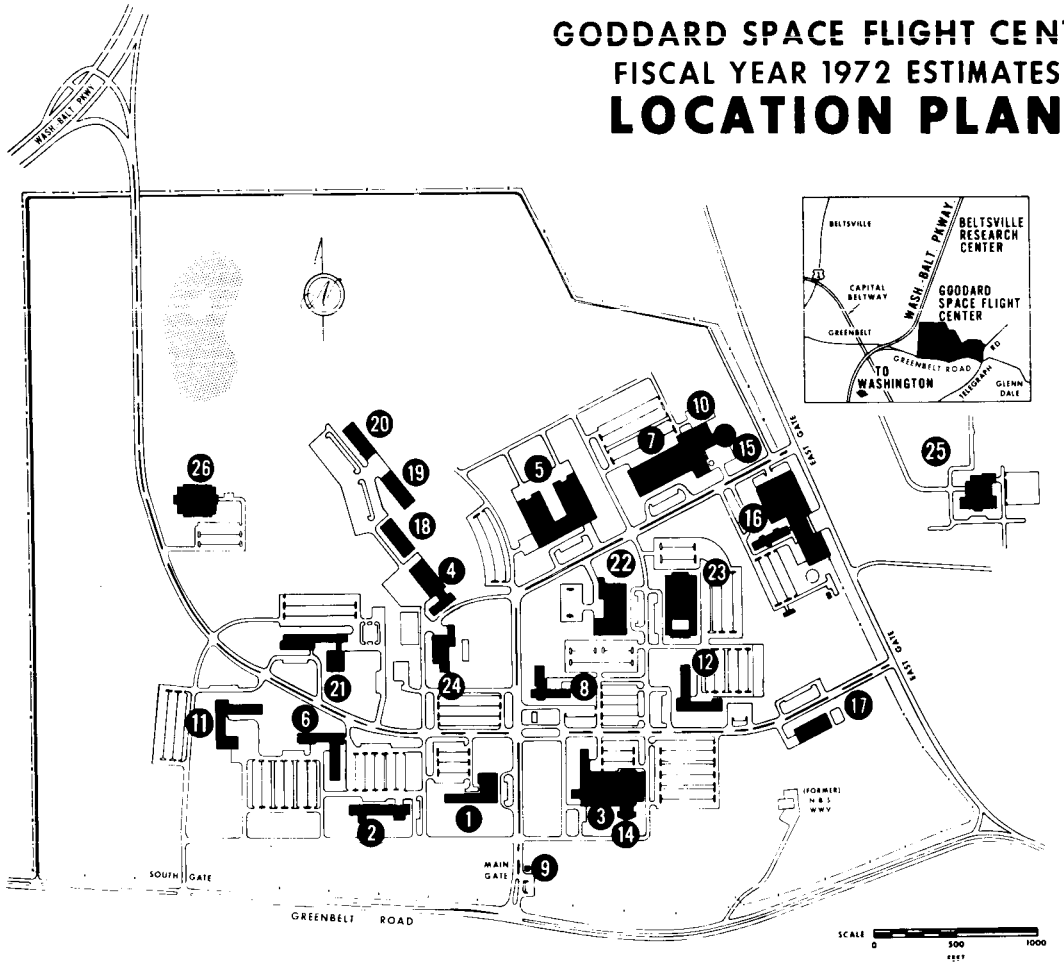
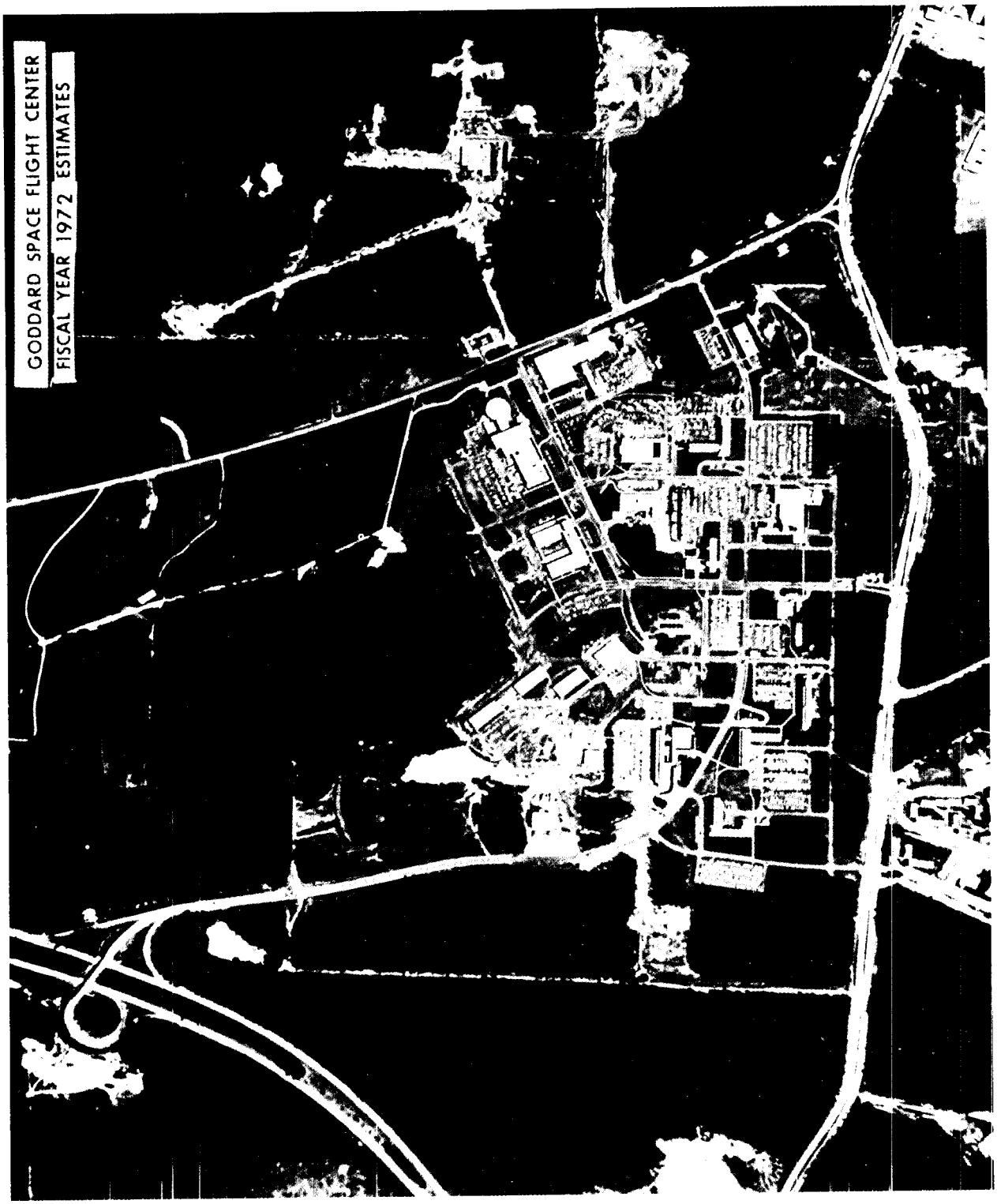
GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1972 ESTIMATES
LOCATION PLAN



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


GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1972 ESTIMATES

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

WALLOPS STATION

MISSION:

Wallops Station is responsible for planning and conducting applied research and development with emphasis on scientific payload development, instrumentation, facilities and techniques utilized in rocket borne experiments, aeronautical and terminal area research projects and ecological studies.

Wallops Station prepares, assembles, launches, tracks and acquires scientific information from space vehicles. Its facilities are utilized by the scientists and engineers from the laboratories and research centers of NASA, other governmental agencies, colleges and universities, and the worldwide scientific community. Wallops Station personnel assist these scientific research teams with their projects; develop, as necessary, special types of instrumentation and equipment to complete the mission; and manage NASA research projects.

Research at Wallops Station is directed toward gathering information about the earth's atmosphere and it's near space environment. The Station utilized launch vehicles ranging in size from the small Arcas and Hasp meteorological rockets to the 72 foot Scout rocket with orbital capability in obtaining scientific data about the atmosphere and the near space environment. Thirteen satellites have been launched. Wallops Station has launched more than 7,500 research vehicles consisting of from one to seven stages in the quest for scientific knowledge.

Wallops facilities are utilized for many other research projects, such as space component tests, helicopter and aircraft drop tests, helicopter and aircraft noise abatement projects, anti-skid tests on grooved runways, V/STOL terminal air research, collision avoidance programs, laser and radar tracking of aircraft and satellites.

Wallops Station exercises project management responsibility for several NASA sponsored projects such as Orbiting Frog Otolith (OFO), the Experimental Inter-American Meteorological Rocket Network (EXAMETNET), the German-American barium project, a Bio-Space Technology Training Program for bio-scientists, operation of remote site launching and tracking facilities, operation of NASA's portable range facilities for sounding rockets, and an Arctic launch site at Point Barrow, Alaska.

The Station is also responsible for a portion of the National Sounding Rocket Program. This requires program interface with the scientific,

university and international community; engineering support including analytical, feasibility, and design studies, payload, vehicles and recovery system engineering, test and evaluation; and data analysis and reporting.

A portion of the Station's effort is devoted to NASA's program of international cooperation in space research. Foreign countries are provided with training programs for their personnel, assistance in activation of launch sites, and with technical assistance and advice in launching experiments and in operation of their ranges. Representatives of eighteen countries have visited Wallops Station to observe operations or seek assistance in establishing sounding rocket facilities of their own.

Wallops Station is involved in establishing the Chesapeake Bay area as a multidisciplinary ecological test site for developing the applications of remote sensing from aircraft and space platforms. As part of the program the Station is working closely with user groups to develop remote sensing analysis and monitoring techniques for studying the ecology of the area.

DESCRIPTION:

The 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 site. The administrative offices, range control center, support shops, and 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 only one-half mile wide at its widest point. Located on the island are rocket storage buildings, blockhouses, assembly shops and the launch sites. The Wallops mainland site is a one-half mile strip west of the island which houses the radar and optical tracking sites. The Eastville, Va., down range tracking site is located about 50 miles south of the 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, including fixed assets in progress and contractor-held facilities at various locations, as of June 30, 1970, was $110,364,000.

SUMMARY OF RESOURCES REQUIREMENTS:

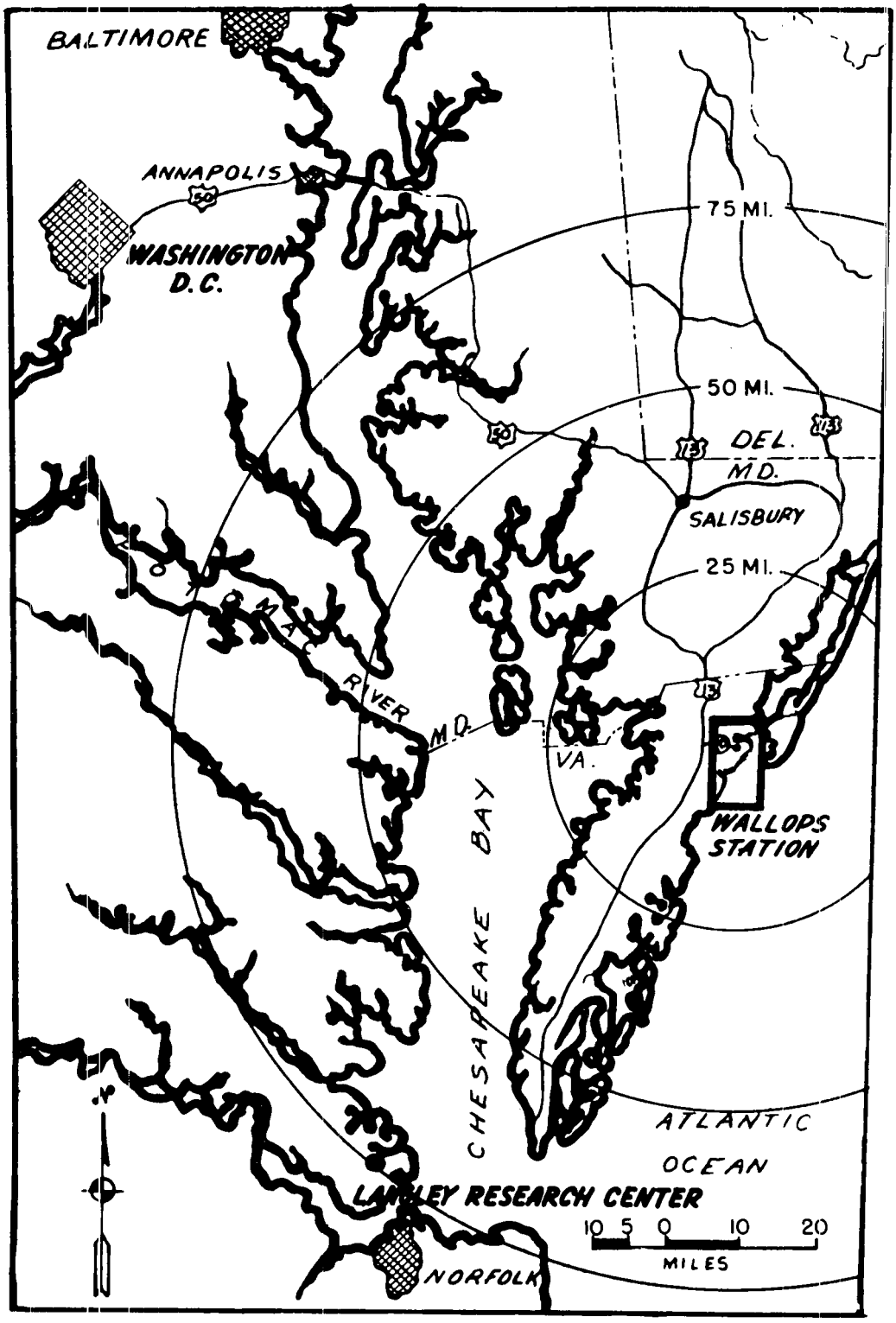
FUNDS

Functions	1970	1971	1972
Personnel	$6,464,000	$6,910,000	$6,935,000
Travel	148,000	241,000	199,000
Facilities services	2,018,000	1,930,000	1,912,000
Technical services	152,000	152,000	153,000
Administrative support	906,000	841,000	828,000
Total, fund requirements	$9,688,000	$10,074,000	$10,027,000

PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Space Science and Applications			
Physics and astronomy	75	75	72
Bioscience	7	3	---
Space applications	29	32	32
Launch vehicle procurement	1	1	1
Advanced Research and Technology			
Aeronautical research and technology	10	12	12
Space research and technology	18	16	16
Tracking and Data Acquisition	118	120	120
Subtotal, positions by program	258	259	253
2. Indirect Positions:			
Director and staff	6	6	6
Administrative support	98	97	90
Research and development support	126	126	113
Subtotal, indirect positions	230	229	209
Total, permanent positions	488	488	462

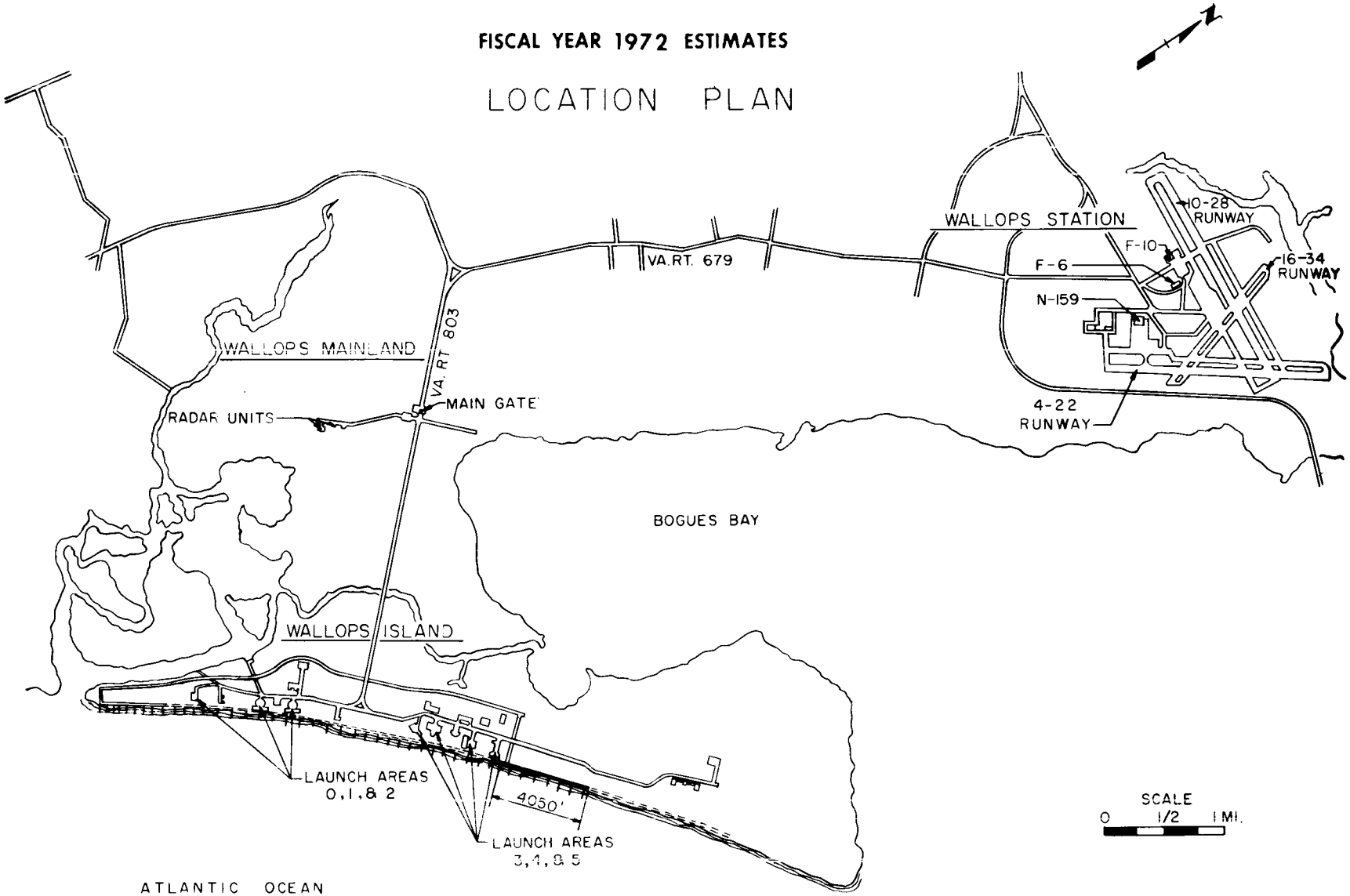
WALLOPS STATION LOCATION



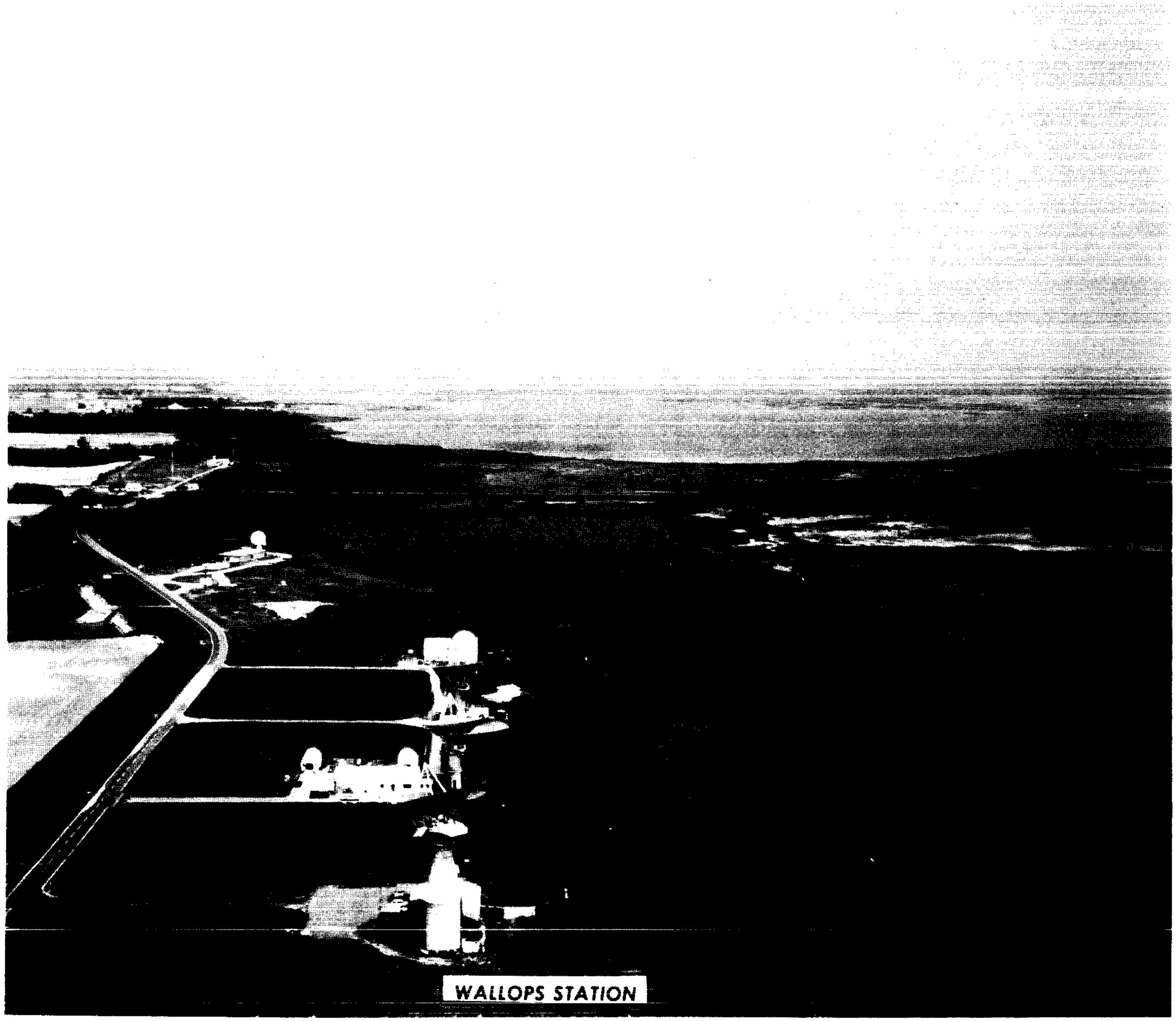
WALLOPS STATION

FISCAL YEAR 1972 ESTIMATES

LOCATION PLAN




WALLOPS STATION



Tracking Radar Facilities on Wallops Mainland

South Wallops Island Looking North

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

AMES RESEARCH CENTER

MISSION:

The programs at the Ames Research Center are directed at research and development in the fields of aeronautics, space science and spacecraft technology as well as applications to national needs of the new science and technology growing out of the aerospace program. Specifically, the Center's major responsibilities are concentrated in five areas: Aeronautics, Space Shuttle/Station, Life Sciences, Planetary Science and Astrophysics and the Pioneer Project.

The aeronautical research program at Ames is among the most important R&D efforts at the Center. To provide a guide for pursuing our experimental research, emphasis is placed on theoretical analyses as a basis for the prediction and understanding of fluid flows that is intended to lead to a much stronger role of the computer in the design of aeronautical vehicles throughout the speed range. Efforts are under way to exploit the great potential for using computational fluid dynamics in the future in place of certain types of more costly and time consuming wind tunnel experiments. In addition to the more basic areas, the Center is also a major contributor to V/STOL technology. VTOL and STOL aircraft are important in both civil and military aviation. Success in these applications will depend upon efficient flight and upon the ability to land and take-off quickly and precisely from small areas with safety and regularity under all-weather conditions. Research investigations are being carried out on specific concepts to achieve these broad objectives. This research involves systematic analytical studies and wind tunnel investigations to define and evaluate concepts, study of the flight characteristics of the concepts using flight simulators and finally flight verification with flight vehicles of the technological advances indicated in the research program.

Military aircraft development programs historically have been supported through investigations in the Center's wind tunnels and simulators, many of which have unique test capabilities. This activity will be continued at a high level because it is vital to specific aircraft programs and because it affords insight into problems requiring further research for application to the design of future aircraft.

The Space Shuttle/Station programs are being supported in a number of areas at Ames. Past research at the Center has contributed significantly to the solution of the problem of the survival of spacecraft during the very high aerodynamic heating attendant to high speed entry into the earth's atmosphere. The heat protection systems for a relatively highly maneuverable reusable

craft such as the Space Shuttle presents a very different problem from that of previous spacecraft which followed essentially a ballistic trajectory and were designed on the basis of a single mission. Thermal protection system research is one area of space shuttle support being carried out at Ames. Other areas involve studies of the aerodynamic performance, stability and control of various booster and orbiter vehicle concepts under consideration, the definition of dynamic loads and vehicle response to be expected, and the guidance, control and piloting problems to be encountered in landing such vehicles. Studies are also being made to help provide a definition of research to be conducted in a space station, the design of the life support systems, a better understanding of the space station environmental effects of human performance and the effects of long term exposure to weightlessness on the physiology of humans.

Research in the life sciences is conducted in three major areas: (1) basic research in the physiological and behavioral sciences concerned with obtaining an understanding of the effects of aeronautical and space flight stresses upon man; (2) 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 in a hostile environment; and (3) studies in exobiology oriented towards the prediction, detection, and study of extraterrestrial fossils, chemicals, and life forms.

Research in space science includes studies of solar physics, planetary environments and geophysics. The studies pertain to magnetic fields and plasmas in space, the composition and structure of planets and of planetary and stellar atmospheres, and cratering mechanics in natural materials to aid in understanding the structure of lunar surfaces. Also of concern is the planet earth and how the technology that has been developed in the space program can be used to improve our understanding of the earth and the conservation of its resources. The studies are both theoretical in nature and experimental using laboratory equipment, sounding rockets and experiments carried on satellites and space probes. Experiments are also conducted on a specially outfitted aircraft which serves as an airborne laboratory to provide, for example, a platform for an infrared telescope for astronomical observations which are highly degraded from surface locations by the filtering effects of the atmosphere. Researchers throughout the scientific community are invited to participate in studies conducted from the airborne laboratory.

Ames has flight project management responsibility for the Pioneer Project. Pioneer provides scientific observations of phenomena in interplanetary space from an unmanned spacecraft. Four Pioneer spacecraft are currently in separate orbits about the sun near the earth's orbit and all regularly provide information on solar radiation. One of these is in its sixth year of operation. Pioneer F and G spacecraft are being readied for the study of interplanetary fields and particles beyond the earth's radius, the asteroid belt and the environment of Jupiter.

In carrying out its mission, Ames works closely with the aerospace and educational communities and with other Government agencies. A number of cooperative or joint programs are currently in progress with the Department of Transportation.

DESCRIPTION:

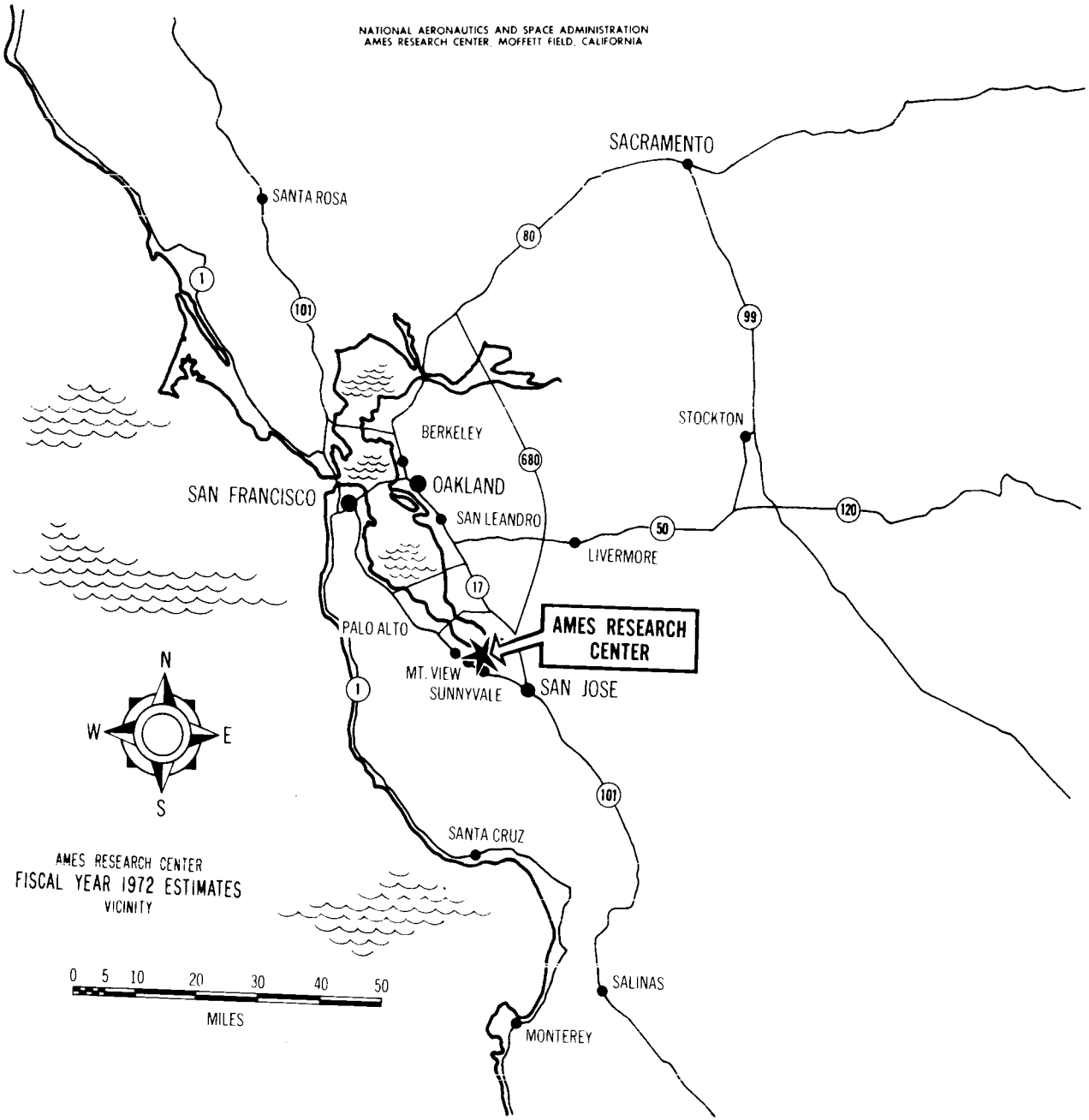
The Ames Research Center was established in 1940, and is located at the southern end of San Francisco Bay on land contiguous to the U.S. Naval Air Station, Moffett Field, California. Its physical plant comprises many specialized facilities for aerospace research in the physical sciences as well as the space sciences and life sciences, all of which are included in the mission of the Center. These include 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, 1970, was $256,217,000. Also housed at the Ames Research Center is the U.S. Army Air Mobility, Research and Development Laboratory. Personnel from this Laboratory work closely with Ames personnel on research of mutual interest.

SUMMARY OF RESOURCES REQUIREMENTS:

	FUNDS		
Functions	1970	1971	1972
Personnel	$31,865,000	$33,656,000	$33,346,000
Travel	698,000	905,000	366,000
Facilities services	3,768,000	4,203,000	4,374,000
Technical services	240,000	122,000	122,000
Administrative support	1,031,000	1,013,000	1,011,000
Total, fund requirements	$37,602,000	$39,899,000	$39,719,000

PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	19	---	---
Space flight operations	7	7	22
Space Science and Applications			
Physics and astronomy	65	57	54
Lunar and planetary exploration	129	123	194
Bioscience	120	102	---
Space applications	6	5	5
Advanced Research and Technology			
Aeronautical research and technology	796	841	835
Space research and technology	404	367	324
Nuclear power and propulsion	26	27	20
Technology Utilization	4	4	4
Subtotal, direct positions	1,576	1,533	1,458
2. Indirect Positions:			
Director and staff	37	37	37
Administrative support	234	218	206
Research and development support	125	134	123
Subtotal, indirect positions	396	389	366
Total, permanent positions	1,972	1,922	1,824


NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA
SACRAMENTO
SANTA ROSA
80
1
101
99
BERKELEY
STOCKTON
680
OAKLAND
SAN FRANCISCO
SAN LEANDRO
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50
LIVERMORE
17
AMES RESEARCH CENTER
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SAN JOSE
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SANTA CRUZ
AMES RESEARCH CENTER
FISCAL YEAR 1972 ESTIMATES
VICINITY
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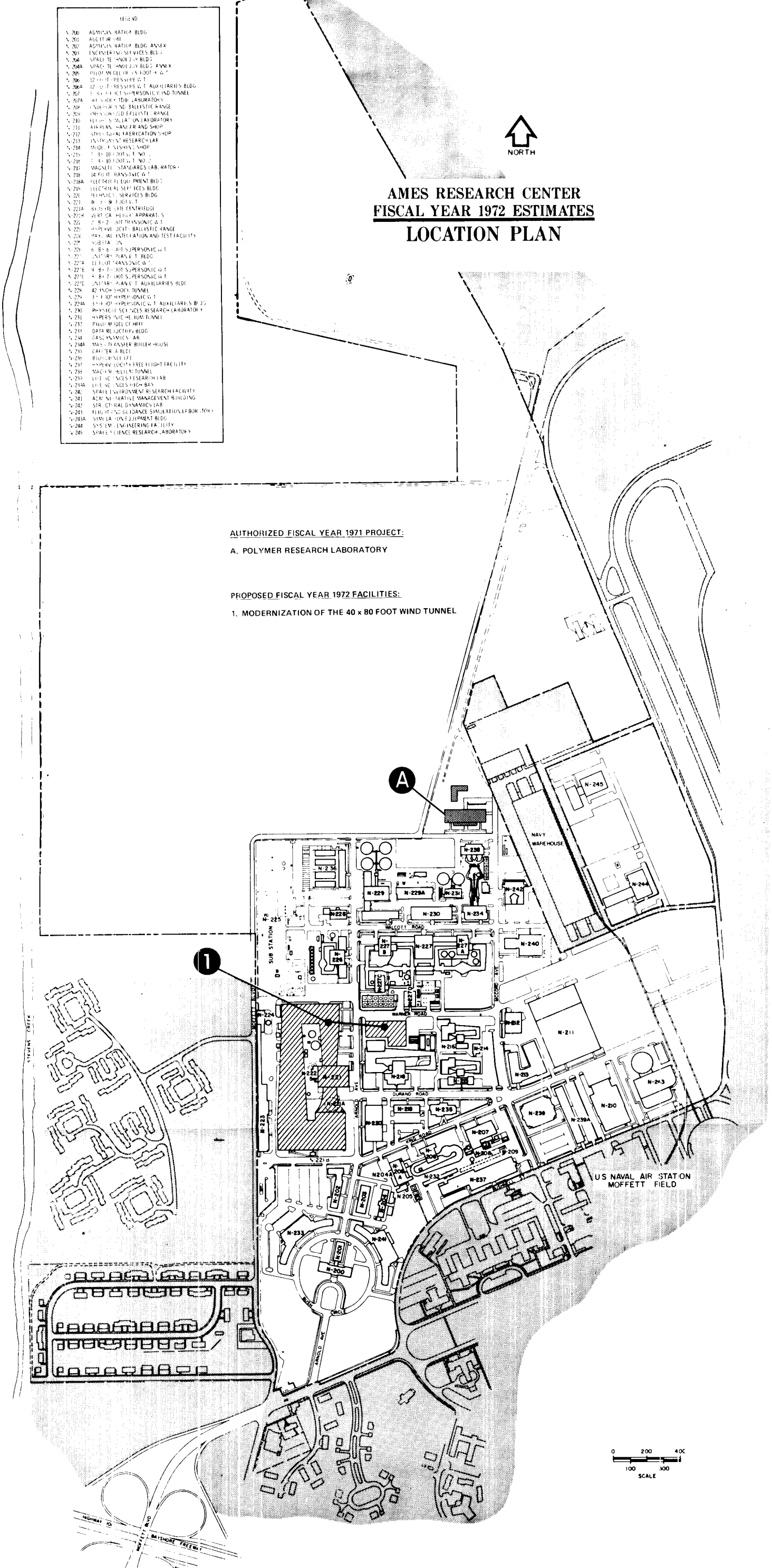
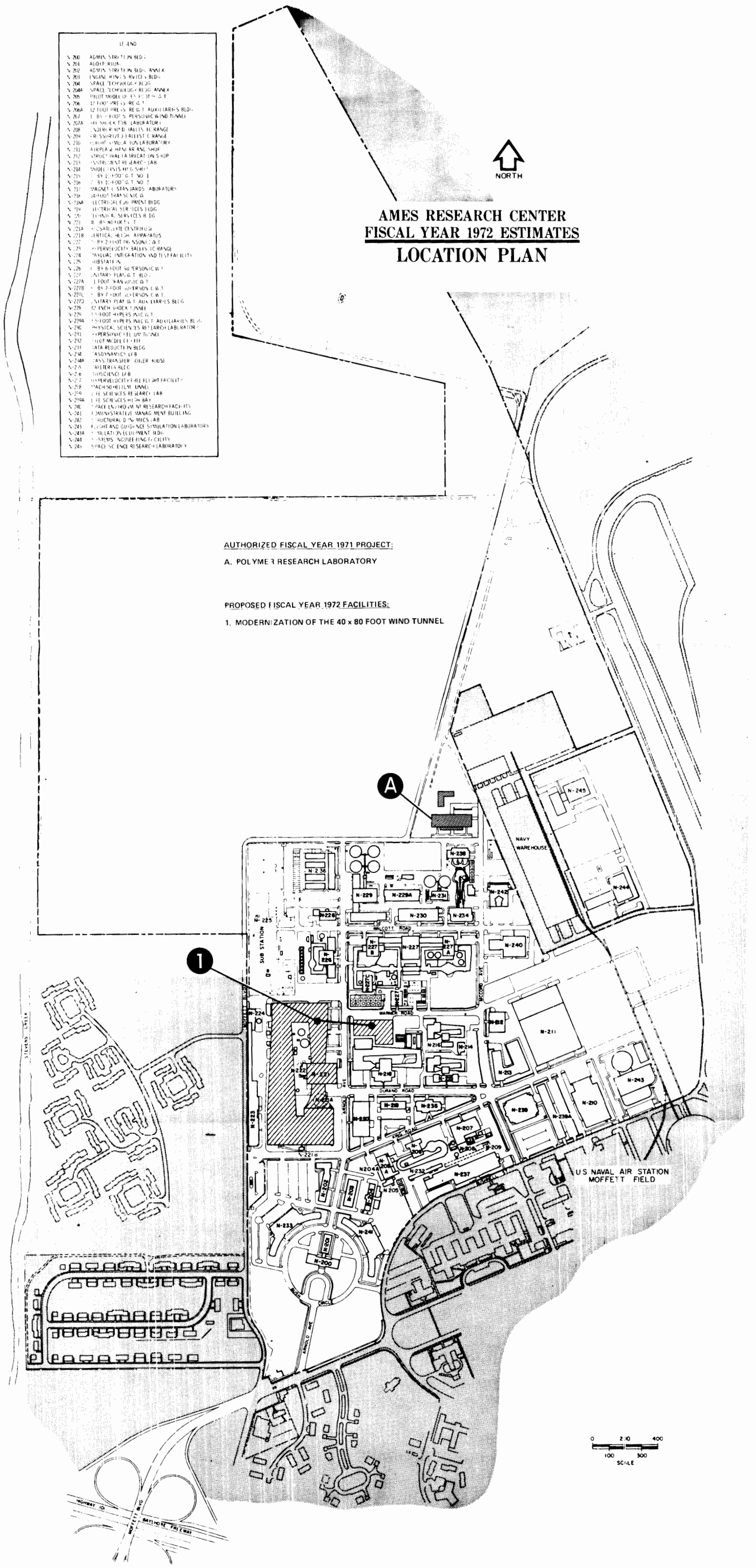
MILES
SALINAS
MONTEREY

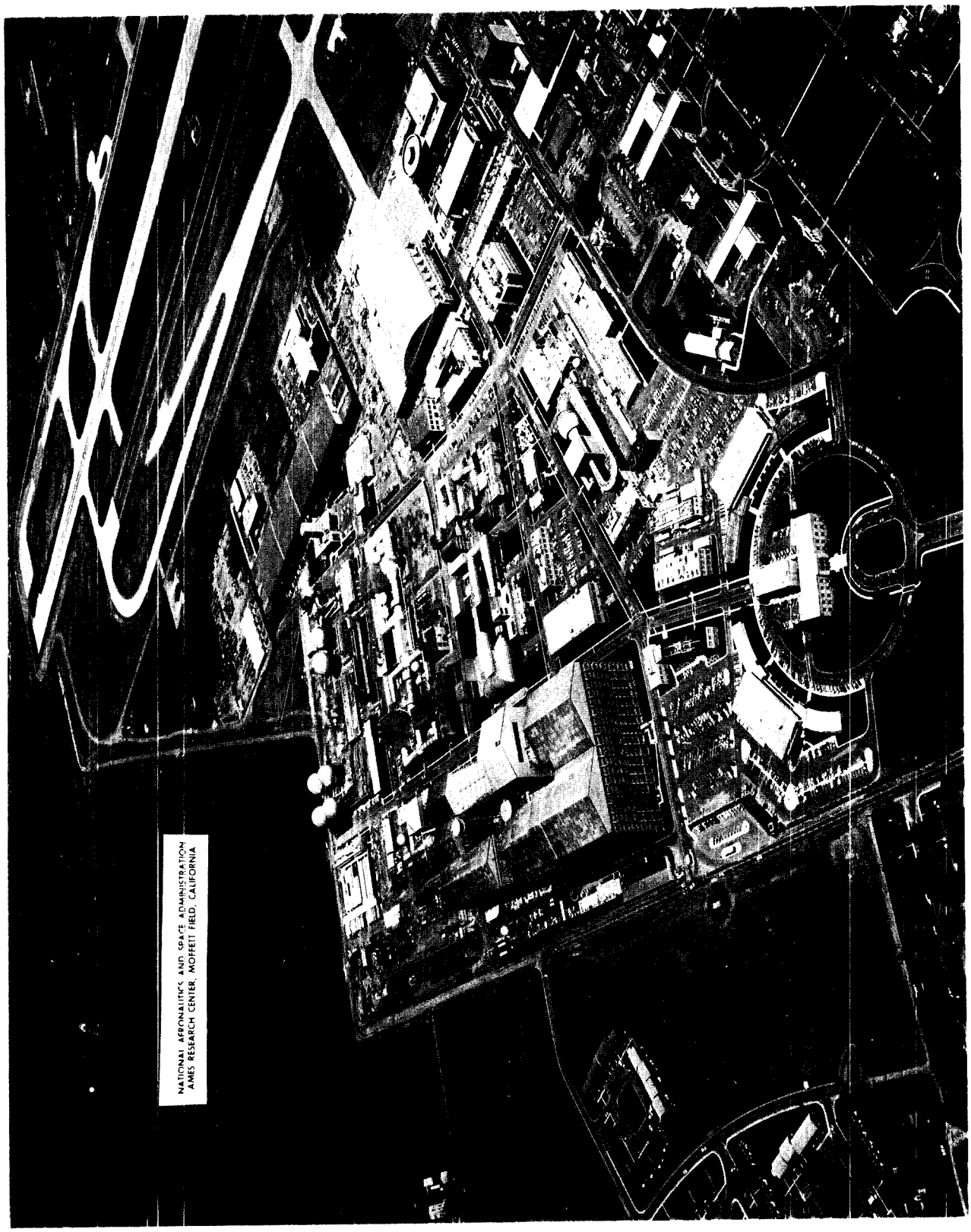
RPM 2-52

AMES RESEARCH CENTER
FISCAL YEAR 1972 ESTIMATES
LOCATION PLAN



AMES RESEARCH CENTER
FISCAL YEAR 1972 ESTIMATES
LOCATION PLAN




NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AMES RESEARCH CENTER, MOFFETT FIELD, CALIFORNIA

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

ELECTRONICS RESEARCH CENTER

MISSION:

The Electronics Research Center, established in September 1964, was closed in 1970 following a redirection of the nation's space program undertaken during the fiscal year 1971 budget process.

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

Functions	1970	1971	1972
Personnel	$13,803,000	---	---
Travel	325,000	---	---
Facilities services	2,998,000	---	---
Technical services	1,062,000	---	---
Administrative support	918,000	---	---
Total, fund requirements	$19,106,000	---	---

PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	1	---	---
Space Science and Applications			
Physics and astronomy	5	---	---
Lunar and planetary exploration	1	---	---
Space applications	18	---	---
Launch vehicle procurement	19	---	---
Advanced Research and Technology			
Aeronautical research and technology	110	---	---
Space research and technology	246	---	---
Subtotal, positions by program	400	---	---
2. Indirect Positions:			
Director and staff	21	---	---
Administrative support	120	---	---
Research and development support	59	---	---
Subtotal, indirect positions	200	---	---
Total, permanent positions	600	---	---

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

FLIGHT RESEARCH CENTER

MISSION:

The Flight Research Center, established in 1947, conducts aeronautical and space related research 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, STOL research, 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 is 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, STOL, 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 leased from 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, 1970, was $63,228,000.

SUMMARY OF RESOURCES REQUIREMENTS:

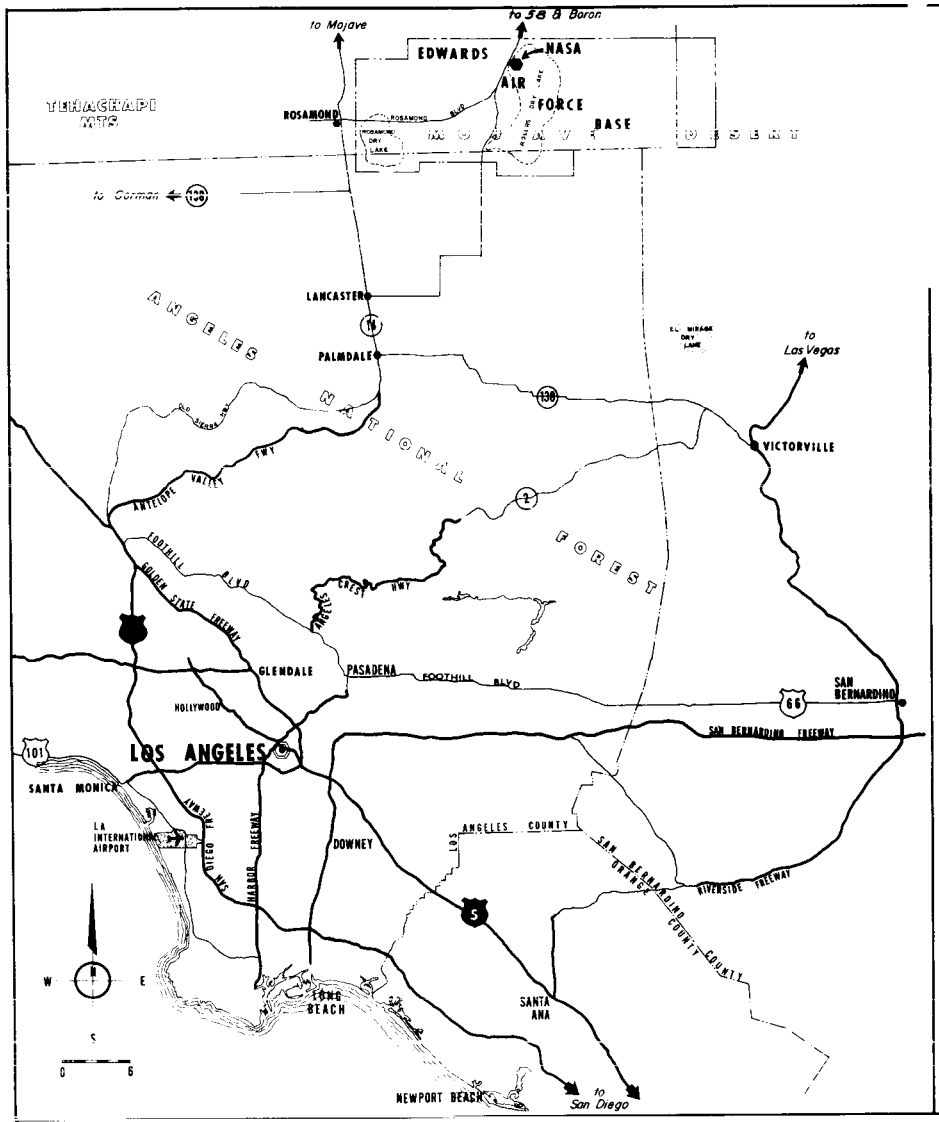
FUNDS

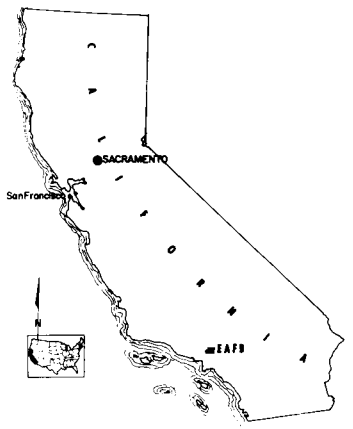
Functions	1970	1971	1972
Personnel	$8,507,000	$9,025,000	$9,064,000
Travel	185,000	220,000	220,000
Facilities services	1,247,000	1,351,000	1,381,000
Technical services	83,000	68,000	53,000
Administrative support	286,000	231,000	256,000
Total, fund requirements	$10,308,000	$10,895,000	$10,974,000

PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Advanced Research and Technology			
Aeronautical research and technology	330	330	319
Space research and technology	82	82	66
Tracking and Data Acquisition	32	32	32
Technology Utilization	1	1	1
Subtotal, positions by program	445	445	418
2. Indirect Positions:			
Director and staff	11	10	10
Administrative support	79	80	80
Subtotal, indirect positions	90	90	90
Total, permanent positions	535	535	508

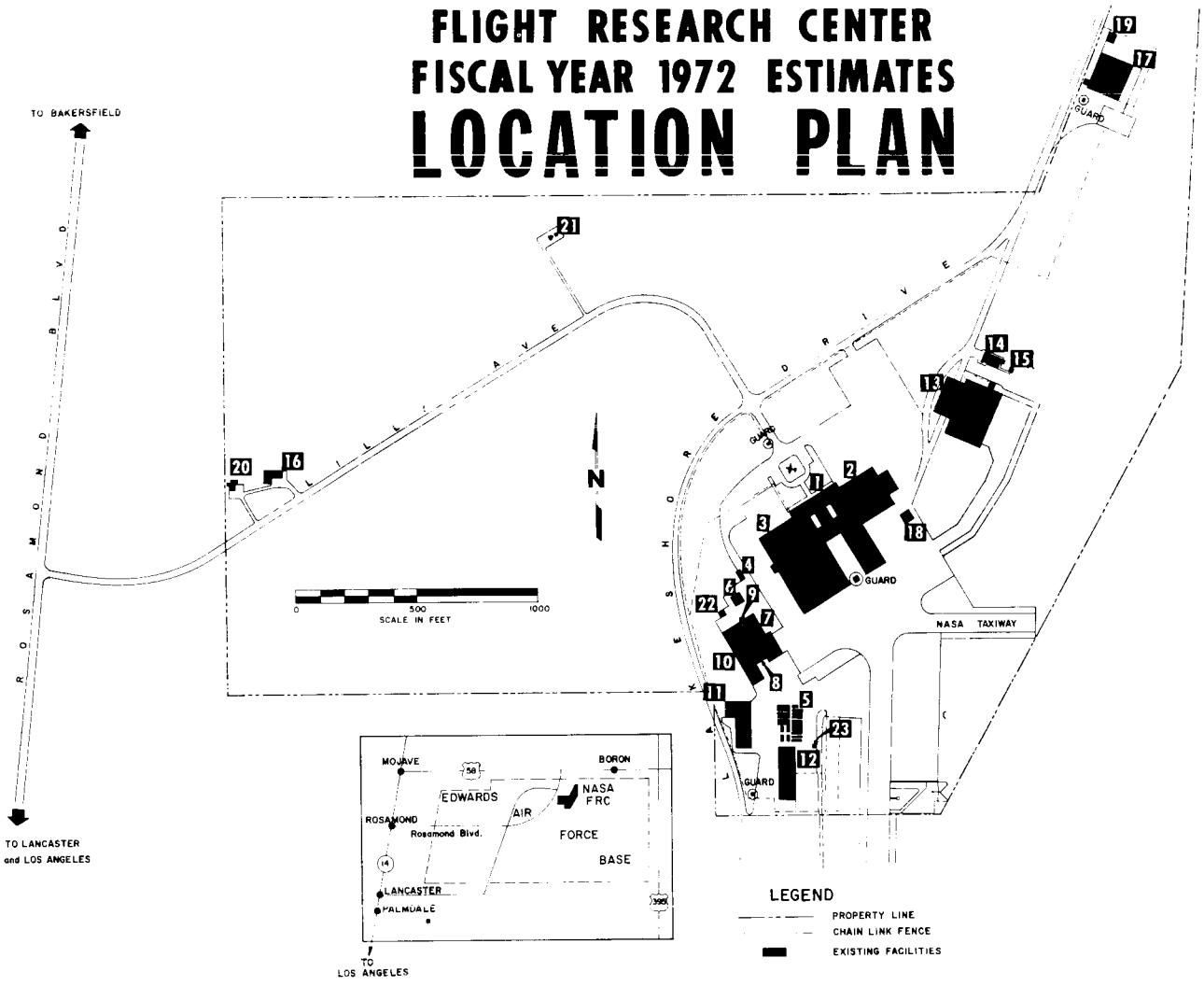
FLIGHT RESEARCH CENTER
FISCAL YEAR 1972 ESTIMATES
VICINITY MAP





KEY PLAN

FLIGHT RESEARCH CENTER
FISCAL YEAR 1972 ESTIMATES
LOCATION PLAN

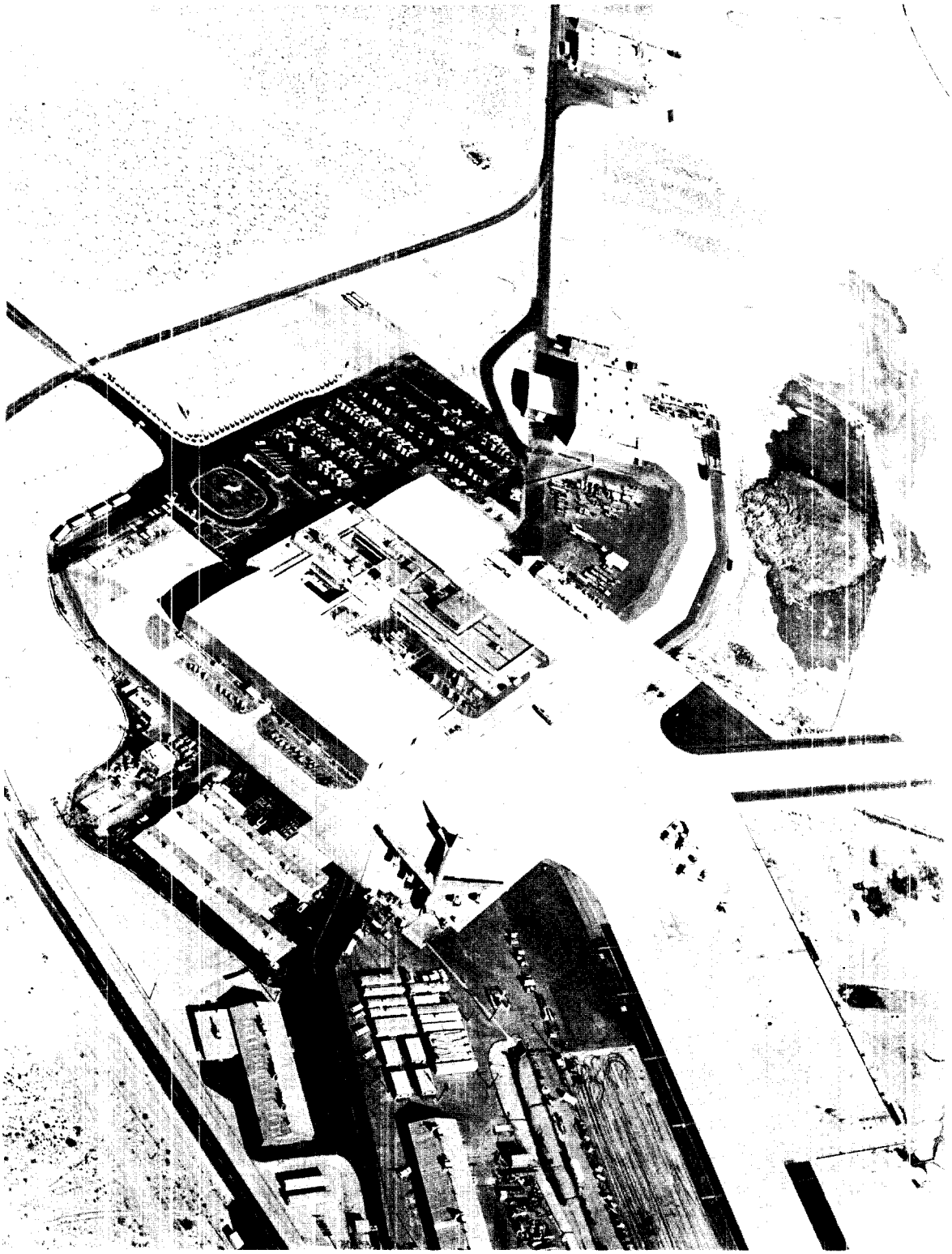


1. LABORATORY BUILDING (4800)
2. AIRCRAFT CONSTRUCTION AND MODIFICATION HANGAR (4801)
3. MAIN HANGAR (4802)
4. FIBERGLASS SPRAY BOOTH (4803)
5. TRAILER PARK AND MODULAR BUILDINGS
6. BOILER HOUSE (4805)
7. SHOPS (AGE, MODEL, BATTERY, GARAGE)(4806)
8. STORAGE BUILDING (4807A)
9. PHYSIOLOGY STRESS LAB. (4807B)
10. WAREHOUSE №2 (4808)
11. WAREHOUSE №3 (4809)
12. WAREHOUSE №4 (4810)
13. HIGH TEMPERATURE LOADS CALIBRATION FACILITY (4820)
14. PAINT SPRAY BUILDING (4821)
15. PAINT STORAGE BUILDING (4822)
16. COMMUNICATIONS BUILDING (4824)
17. MAINTENANCE DOCK (4826)
18. AUXILIARY POWER UNIT (4830)
19. WAREHOUSE №5 (4831)
20. RADAR BUILDING (4870)
21. 100 FT. TOWER, BORESIGHT TARGET ASSEMBLY AND EQUIPMENT (4887)
22. CENTRAL STANDBY ELECTRICAL POWER FACILITY (4889)
23. STORAGE BUILDING (4804)

RPM 2-60

FLIGHT RESEARCH CENTER

FISCAL YEAR 1972 ESTIMATES



RPM 2-61

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

LANGLEY RESEARCH CENTER

MISSION:

The Langley Research Center strives to maintain the leadership of the United States in aeronautics and space activities through the conduct of a broadly based research and technology development program to identify and investigate the fundamental technical problems confronting the advancement of flight in the atmosphere and in space. It attempts to discover and to assess opportunities for the exploitation of important new flight systems and through its research program to improve the technological base for the design, construction, and operation of advanced aircraft and space vehicles. It manages the execution of nationally significant flight projects. Through its granting and contracting capabilities it involves elements of the nation's entire research community, especially among the nation's universities, in its research programs. It disseminates the implications of its research results for the nation's entire industrial base.

Langley is directing an increasing and substantial portion of its research programs to the development of advanced concepts and new technology on which future aircraft with increased performance, range, and greater safety and economy can be based. Special emphasis is placed on the application of the revolutionary supercritical wing concept to the development of an advanced transport which maximizes cruise efficiency to improve aircraft productivity and decrease operating costs. In 1971 the practical construction of this wing and the performance of an aircraft with this wing at near full scale will be investigated. In 1972 the investigation will be extended to examine a more complete aircraft with realistic flight controls and high lift devices. Increased emphasis is being placed on the development of a technological base to support a national V/STOL aircraft construction program and to evolve systems for optimum terminal area instrument operation and air traffic control integration.

Emphasis will continue on the improvement of the supersonic flight capabilities for both transport and military aircraft. Configurations are being studied that attempt to maximize the favorable interference effects of aerodynamics, with advanced structures and propulsion. The advanced research program is also aimed at the technology required

for aircraft whose performance extends into the hypersonic speed range. The evolution of materials and structural systems for critical temperature environments is in progress and practical methods for active cooling of high heat areas of aircraft surfaces are being developed. Work is also proceeding on the development of hypersonic ramjet engine technology.

Other programs at the Langley Center are focused on the critical problems of aircraft propulsion noise and sonic boom alleviation, the detection of clear air turbulence and aircraft trailing vortices, the improvement of landing gears and improved traction and control under adverse weather conditions.

In support of general aviation, Langley will continue its studies to identify problems and their resolution for current designs, to consolidate data and techniques for new designs, to collect data to update load requirements, and to develop new devices for high lift, control systems and gust-alleviation to improve operational capabilities. Simplified low-cost electronic systems to aid stability, navigation communication and collision warning are under development.

A large portion of the Center's skills and resources is directed to the management of important space flight projects. Langley has overall management responsibility for the NASA Viking project which plans to orbit and soft land unmanned instrumented vehicles at Mars in 1976. The project will provide a detailed study of Martian geophysics, atmospheric characteristics and surface properties. Especially significant are its experiments to indicate the presence of life-forms. The support of Viking and other national space flight efforts is based on extensive experience and continuing contributions to advanced technology in such areas as atmosphere entry heat shielding, space vehicle recovery systems, rocket propulsion, instrumentation and electronic equipment, and spacecraft sterilization.

Space technology programs have been expanded to support the selection and development of manned systems such as the space shuttle and space station/base. They include mission flight mechanics, trajectory selection, vehicle configuration and performance, loads, structures, and cryogenic tankage, refurbishable thermal protection systems, on-board power systems, and life support systems, and the development and integration of mission experiments.

Contributions will continue to be made to the technology of automated spacecraft, such as space telescopes, sensors and data handling for earth resources satellites, payloads for micrometeoroid and radiation environment surveys as well as the definition of the upper atmosphere. The Langley Center is responsible for providing crucial technology as well as experiments for the Apollo and Skylab programs. It is also responsible for the acquisition, operation, and improvement of the Scout launch vehicle in its application to national and international satellite experiments.

The Center's ground-based research program includes comprehensive investigations of the effects of the environment on space vehicles including heat, vacuum, noise, micrometeoroid and radiation; the development and application of advanced composite and polymeric materials to structures and thermal control systems; and improved technology for entry communication blackout alleviation, horizon sensing, antenna and power amplifiers, batteries, high capacity computer memories, logic circuits and other advanced microelectronic devices.

Langley will continue its pioneering role in the definition of man's capabilities and adaptation for performance of space missions by work on projects relating to rendezvous and docking, extra vehicular operations, space assembly and maintenance and complex experiments.

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, 1970, was $402,968,000.

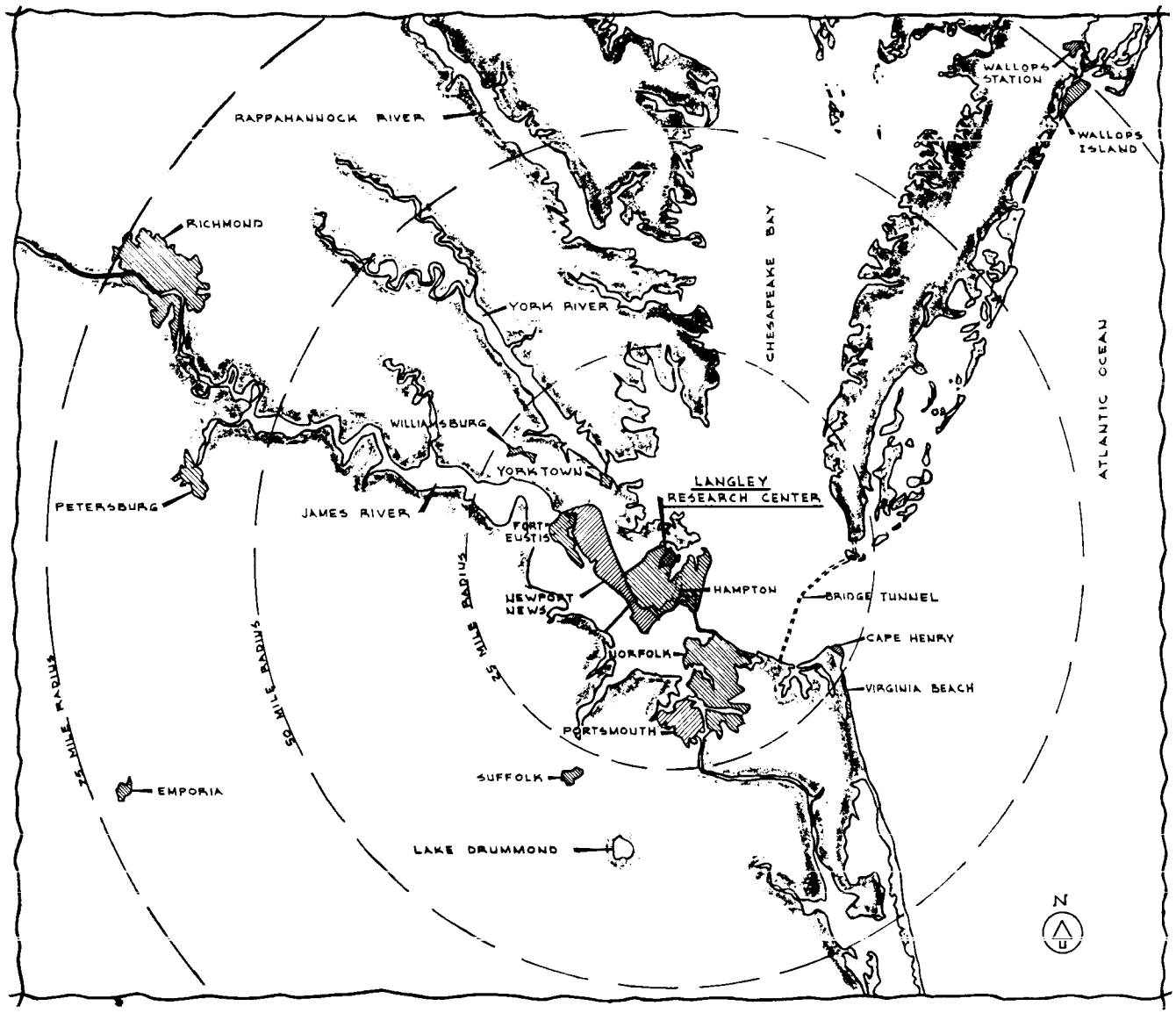
SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

Functions	1970	1971	1972
Personnel	$59,341,000	$62,172,000	$63,029,000
Travel	1,168,000	1,792,000	1,816,000
Facilities services	5,666,000	5,656,000	5,596,000
Technical services	360,000	352,000	352,000
Administrative support	3,316,000	3,416,000	3,398,000
Total, fund requirements	$69,851,000	$73,388,000	$74,191,000

PERSONNEL

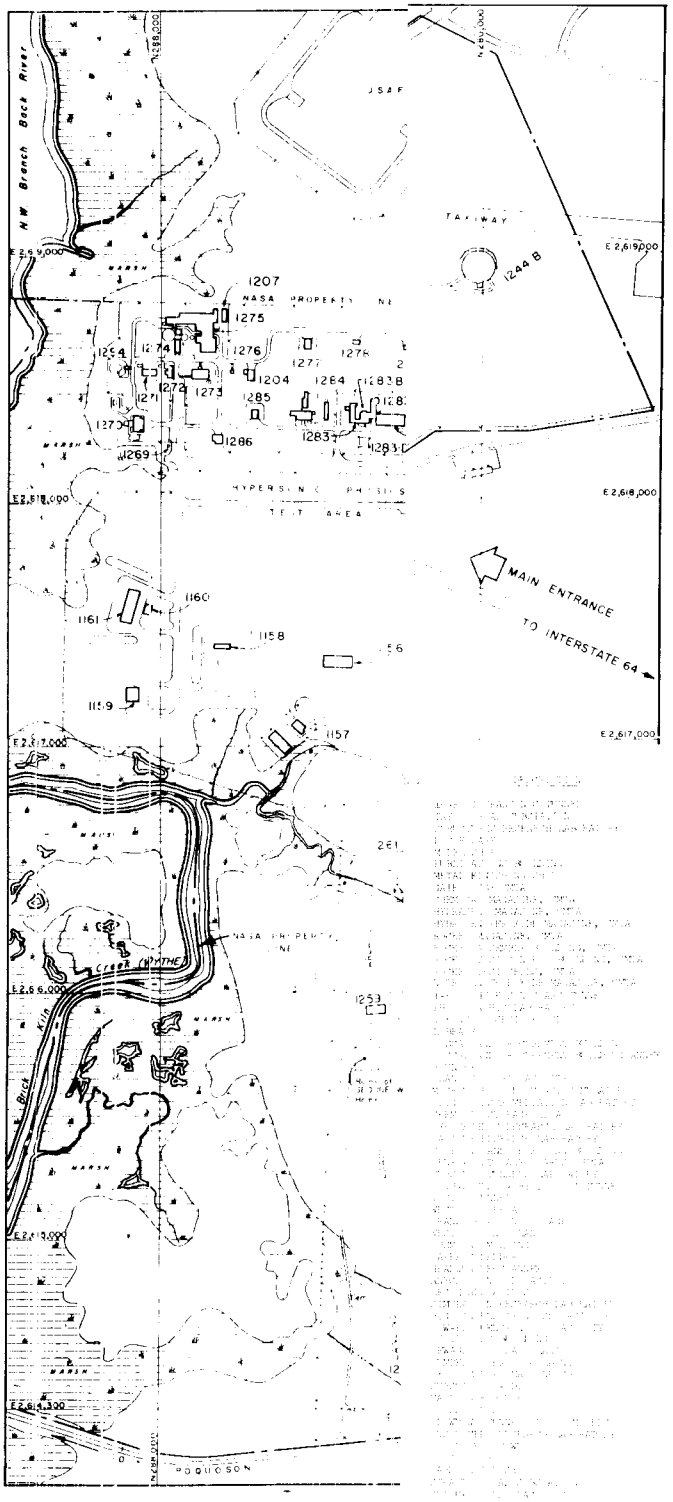
	1970	1971	1972
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	35	9	1
Space flight operations	19	31	104
Advanced missions	14	2	4
Space Science and Applications			
Physics and astronomy	19	27	25
Lunar and planetary exploration	190	239	304
Bioscience	5	3	---
Space applications	27	39	38
Launch vehicle procurement	35	41	32
Advanced Research and Technology			
Aeronautical research and technology	1,270	1,320	1,307
Space research and technology	969	850	611
Nuclear power and propulsion	62	62	42
Tracking and Data Acquisition	34	40	28
Technology Utilization	5	5	5
Subtotal, positions by program	2,684	2,668	2,501
2. Indirect Positions:			
Director and staff	8	8	8
Administrative support	448	420	415
Research and development support	732	694	672
Subtotal, indirect positions	1,188	1,122	1,095
Total, permanent positions	3,872	3,790	3,596



LANGLEY RESEARCH CENTER AND VICINITY

1" = 8 MILES

RFM 2-66



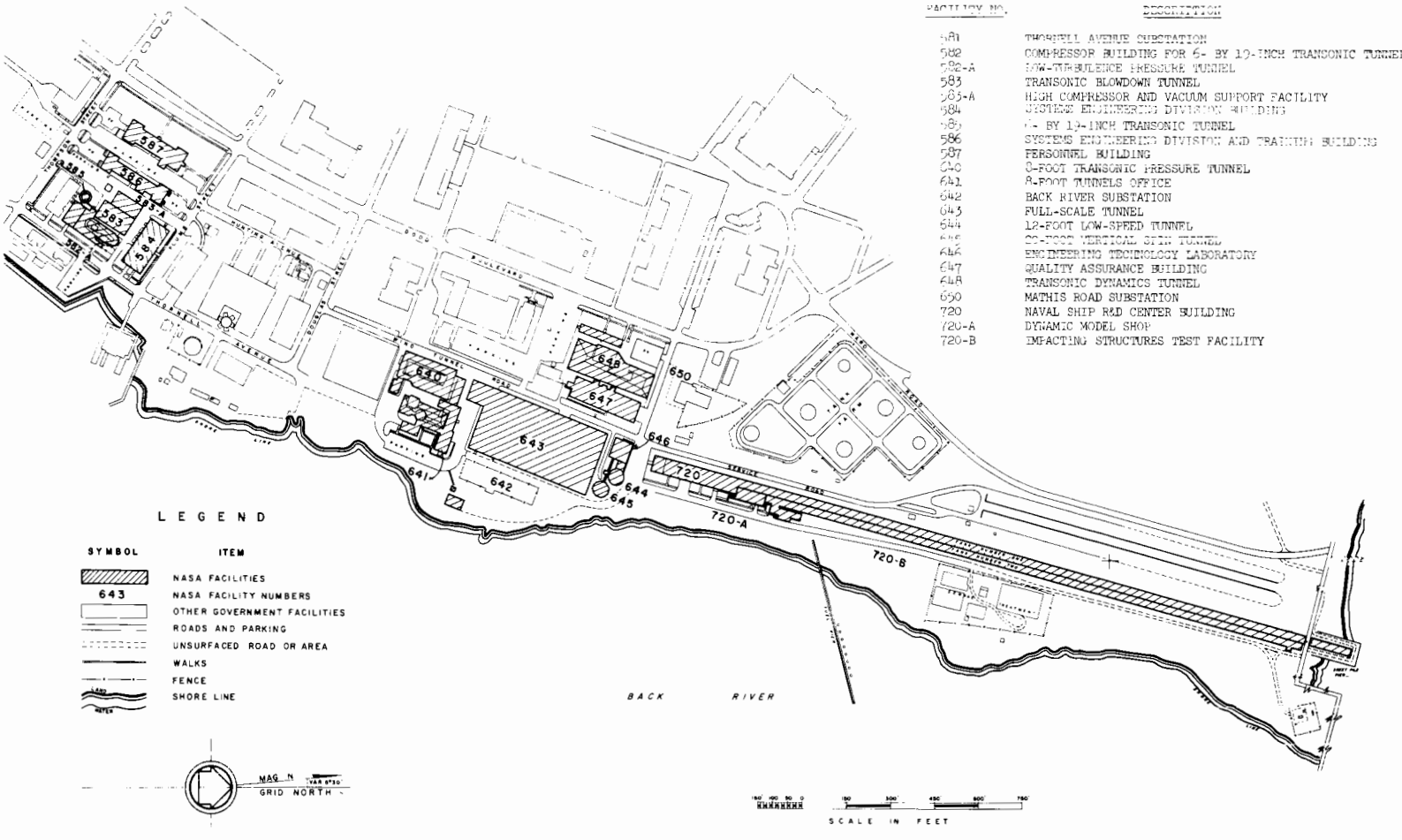
FACILITIES AUTHORIZED AND/OR UNDER CONSTRUCTION

A LIFE SUPPORT TECHNOLOGY LABORATORY
B V/STOL TRANSITION RESEARCH WIND TUNNEL
C AIRCRAFT NOISE REDUCTION LABORATORY

411-084 (1) - 71 (Follows RPM 2-66) No. 3

LANGLEY RESEARCH CENTER
FISCAL YEAR 1972 ESTIMATES

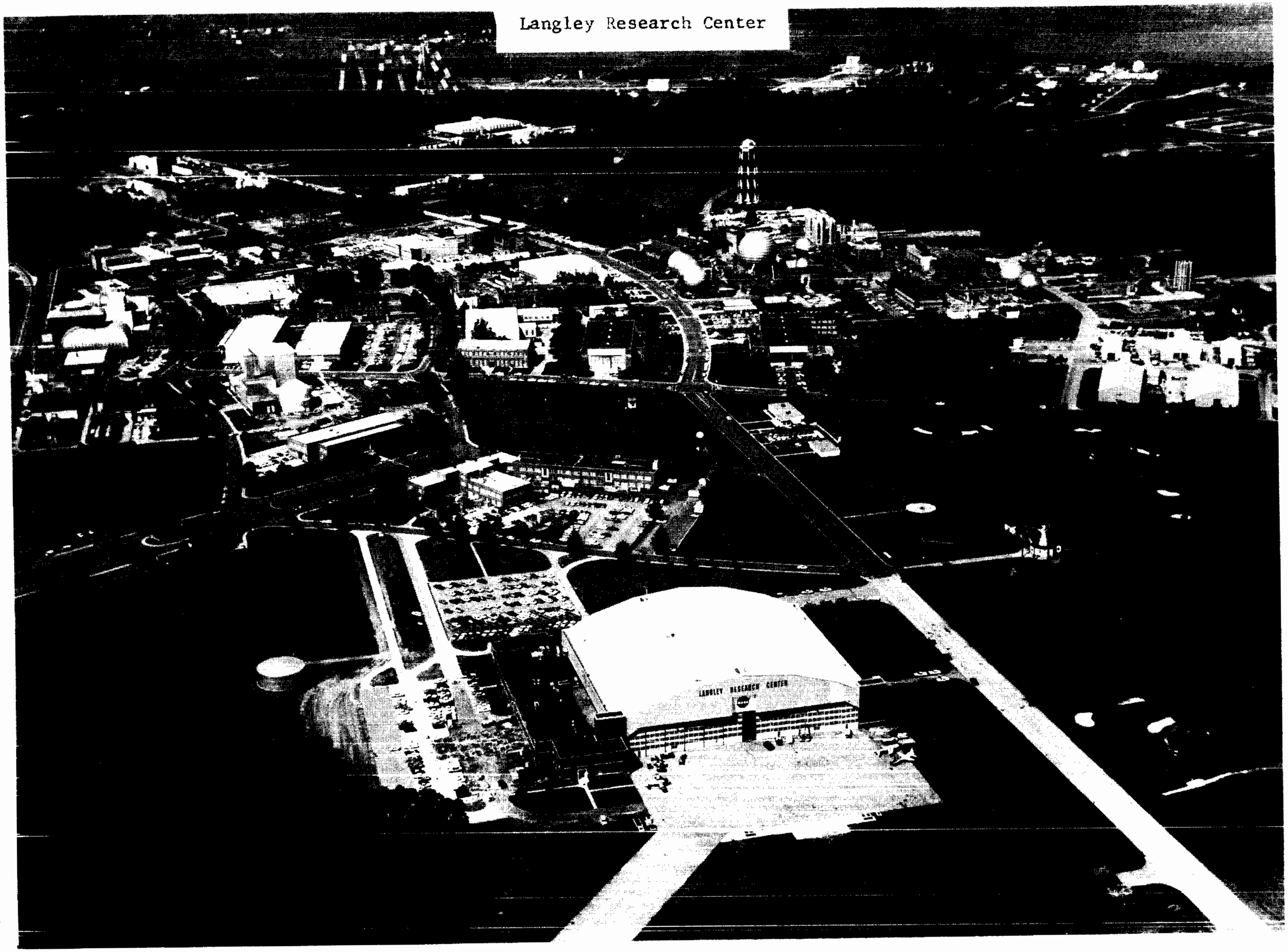
Location Plan



EAST AREA


Langley Research Center

Langley Research Center



RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 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 research effort at this Center. Research by commercial and university laboratories is also conducted under contracts directed by Lewis Research Center personnel.

The Lewis Center is responsible for the Centaur booster project and for the SERT (Space Electric Rocket Test) project. Large contracts are directed on the Quiet Engine (for aircraft) and the Brayton Cycle Nuclear Electric Generating System for spacecraft. There is also considerable supporting in-house research effort on these projects.

Some examples of major research and technology activities are discussed in the following paragraphs:

Aircraft engines for future subsonic and supersonic aircraft will incorporate high compressor pressure ratios and high turbine inlet temperatures. A large part of the aeronautics research effort at Lewis is directed toward solving the problems imposed by these two factors. Among these research efforts are: slotted compressor blades to increase the pressure rise per blade row, cooled turbine blades, high-speed bearings and seals for operation at high temperature, engine inlets, engine exhaust nozzles, combustor configurations, and high energy fuels. 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. These flight tests complement wind tunnel tests which have limited capability in predicting the engine-airframe interactions at transonic speeds.

Lewis is supporting a series of advanced research and technology projects on subsonic aircraft. These projects are: the Advanced Technology

Experimental Transport (ATET), the lift-fan transport for VTOL applications, and the externally-blown airplane flaps for STOL applications. The engine technology for these applications requires new engine configurations for which the technology has not yet been established. One element of the in-house program is, for instance, to determine the effects of cross flow on high-pressure ratio lift fans for V/STOL aircraft in experiments being conducted in the low-speed return passage of the 8- by-6 Foot Supersonic Wind Tunnel.

High performance engines are presenting an increased requirement for finding means to reduce engine noise. Lewis is conducting in-house research to provide the technology required and to develop prototype noise reducing components. A quiet engine development contract is being managed by Lewis to provide a turbo-fan engine that will incorporate the technology being developed both at Lewis and under contract programs.

The problems of high flight Mach number aircraft engines are also being investigated. This research spans the problems of inlets, combustion, nozzles, and engine systems. A new facility nearing completion at Plum Brook will extend the capability to allow experiments on engines of practical size.

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, nozzle insulating coatings, and spacecraft surface degradation due to rocket jet impingement.

For future deep space missions a number of potentially attractive propulsion systems are receiving serious consideration; however, insufficient data exists upon which to base a selection. One of the systems under consideration utilizes space storable propellants. Lewis has undertaken a program to provide the necessary engine performance data. The program will demonstrate various propellant combinations with flight-type systems to provide the base of technology and hardware that is required to reduce the cost of later flight hardware development.

A full-scale Centaur vehicle was installed and operated in the Spacecraft Propulsion Research Facility. This vehicle was equipped with a prototype tank pressurizing system replacing the current pump system for feeding the propellants to the engine. Work will continue during the coming year on the development of this pressurizing system.

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 environments 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 will require intensive research and development. 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 to reduce weight produce requirements for new designs of compressors, turbines, bearings and electric generators. The heat source will probably be a nuclear reactor.

Various problems in connection with the development of nuclear power systems and nuclear rockets are conducted at the Plum Brook Station. 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. A new facility for conducting research on plasma turbulence, diffusion and heating is under construction. Known as the "Bumpy Torus" it will utilize twelve superconducting magnets to compress a stream of deuterium plasma and force it to flow in a roughly circular path, thus avoiding the large entering and leaving losses encountered with existing open-end facilities. Data obtained with this facility may aid in the ultimate development of a controlled fusion reaction device.

The performance of propulsion and power generation systems, launch vehicles, spacecraft, and practically all hardware is paced by physical limitations of available materials. The Center has maintained a substantial materials research effort aimed at raising these limitations and improving component and system performance. 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. Materials 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 concepts being investigated.

The NASA Aerospace Safety Institute is located at the Lewis Center. The Institute's staff of specialists surveys the research needs and directs research efforts in this field. A data bank of research information is being compiled and cataloged for ready access. A computer system and data retrieval methods are being established to provide the safety information to requestors.

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-Hopkins International 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 fifty miles west of Cleveland, on land formerly occupied by the Plum Brook Ordnance Works. Known as the Plum Brook Station, it occupies 7,837 acres of which 7,787 are owned by the Government and fifty are in easements.

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 and a Fluorine Pump Laboratory. The latest major research facilities to be completed are the Spacecraft Propulsion Research Facility to test the ignition and operation of full-scale rocket engines after a prolonged shut-down period in a space environment, and the Space Power Facility 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, 1970, was $398,051,000, of which $115,315,000 represents facilities located at the Plum Brook Station.

SUMMARY OF RESOURCES REQUIREMENTS:

FUNDS

Functions	1970	1971	1972
Personnel.....	$64,982,000	$68,636,000	$69,575,000
Travel.....	941,000	1,075,000	1,017,000
Facilities services.....	6,805,000	6,412,000	6,297,000
Technical services.....	230,000	72,000	72,000
Administrative support.....	937,000	899,000	905,000
Total, fund requirements.....	$73,895,000	$77,094,000	$77,866,000

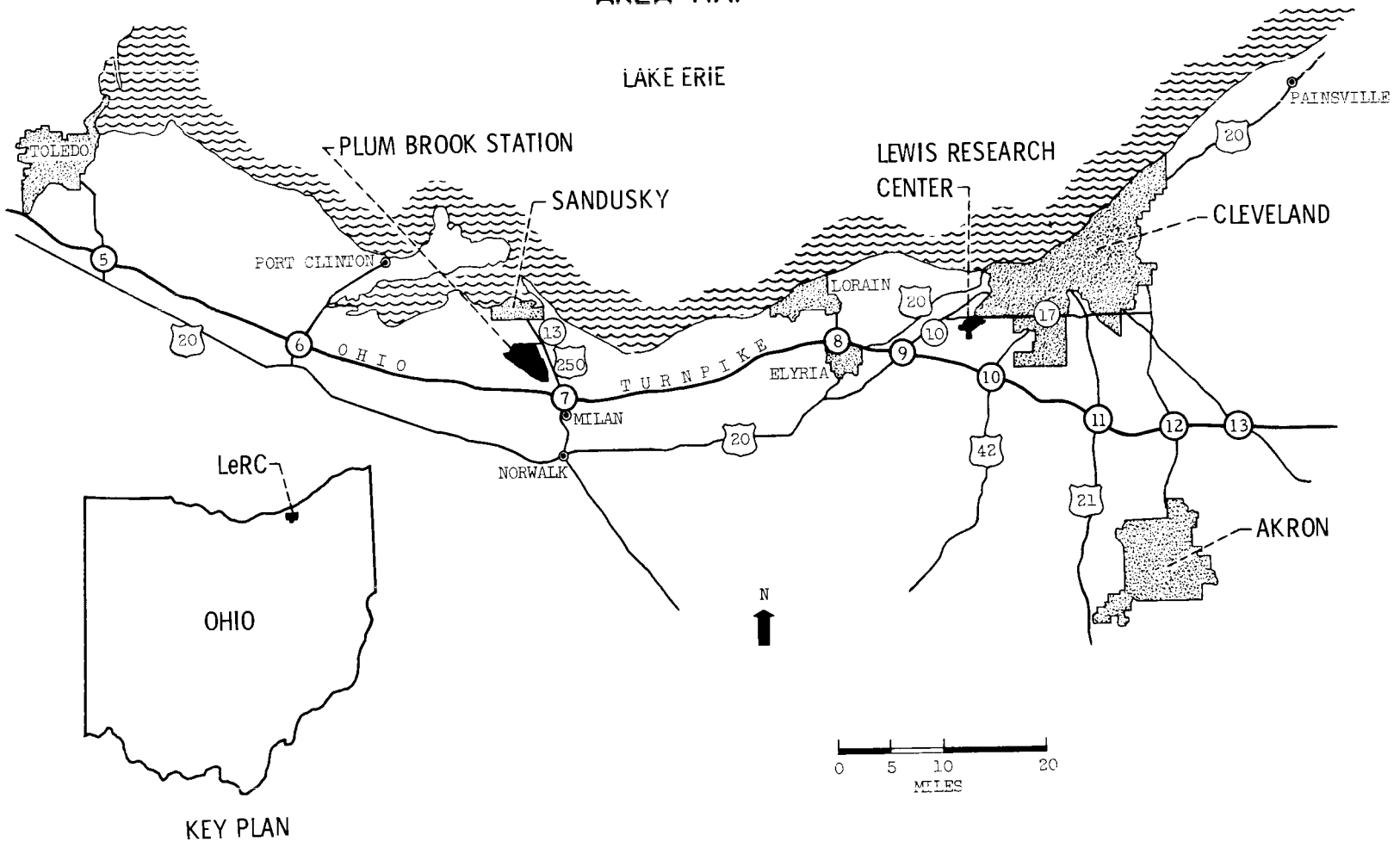
PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Space Science and Applications			
Space applications.....	23	37	36
Launch vehicle procurement.....	301	299	286

	1970	1971	1972
Advanced Research and Technology			
Aeronautical research and technology	1,302	1,294	1,336
Space research and technology.....	1,105	1,037	920
Nuclear power and propulsion.....	287	282	215
Technology Utilization.....	7	7	6
Subtotal, positions by program.....	3,025	2,956	2,799
2. Indirect Positions:			
Director and staff.....	16	16	15
Administrative support.....	408	388	370
Research and development support.....	752	727	695
Subtotal, indirect positions.....	1,176	1,131	1,080
Total, permanent positions.....	4,201	4,087	3,879

LEWIS RESEARCH CENTER
FISCAL YEAR 1972 ESTIMATES

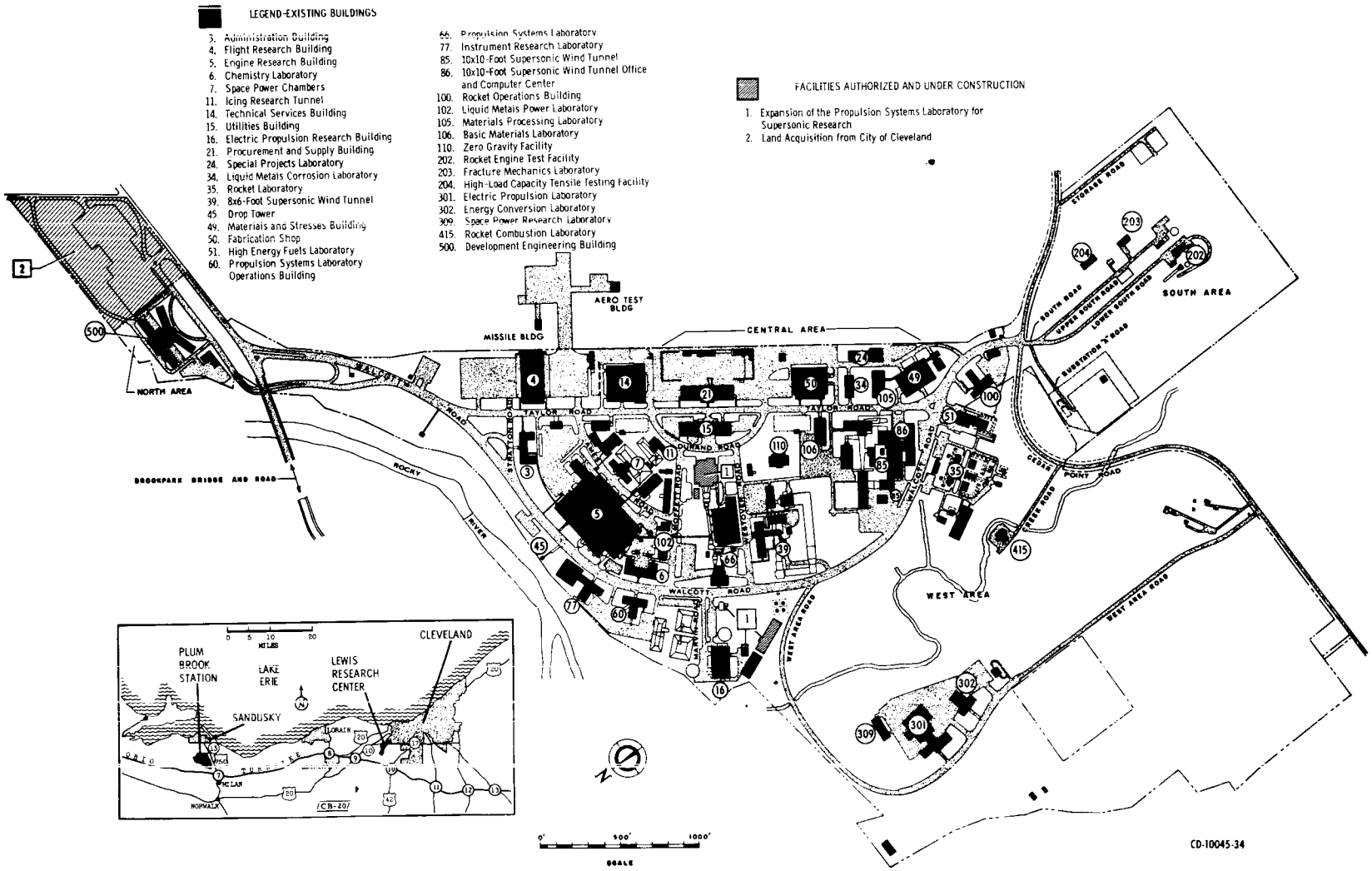
AREA MAP



RPM 2-77

LEWIS RESEARCH CENTER
FISCAL YEAR 1972 ESTIMATES

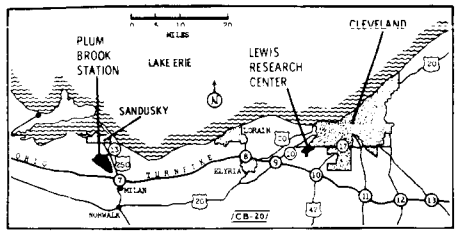
LOCATION PLAN

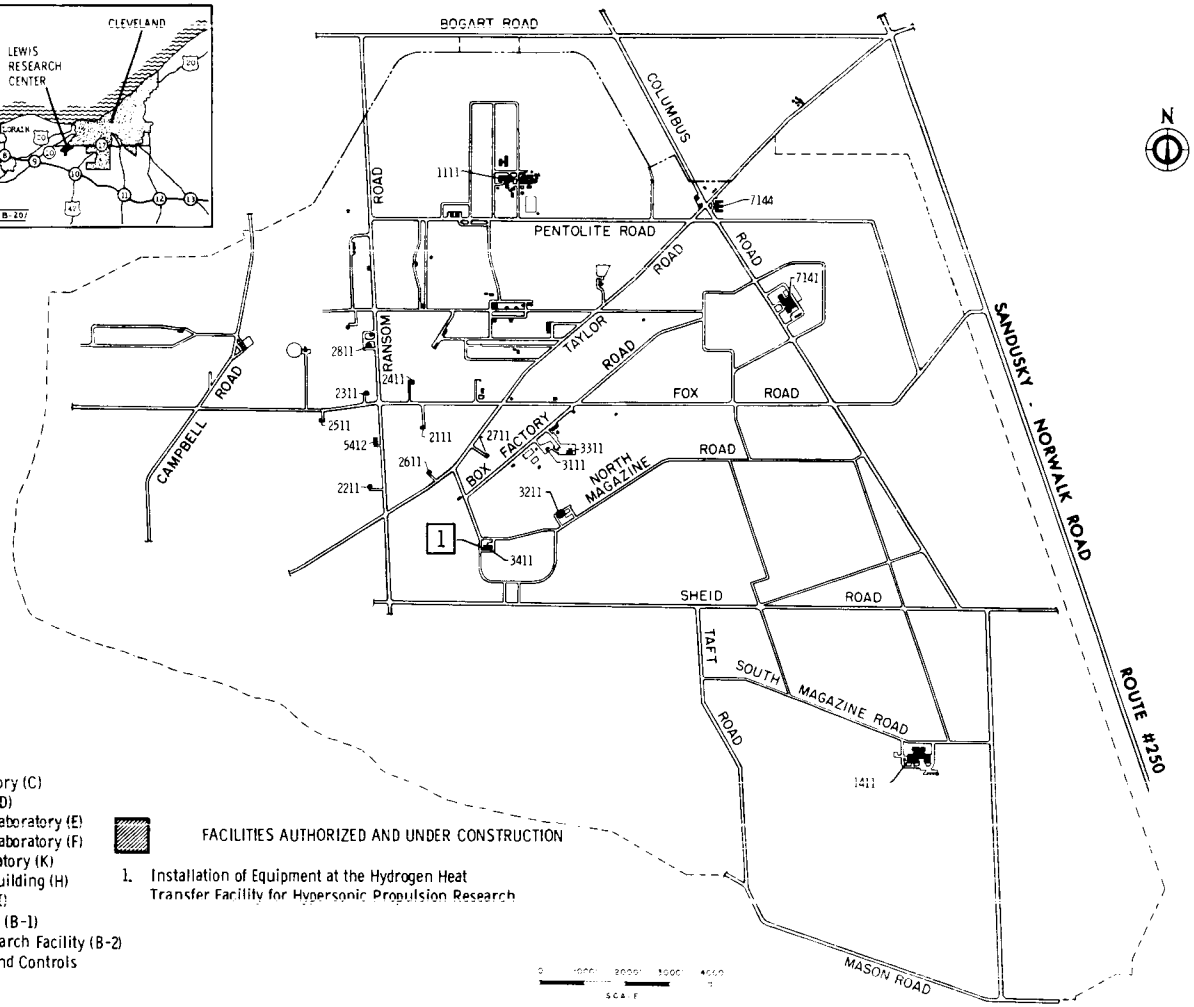


RTM 2-78

LEWIS RESEARCH CENTER
PLUM BROOK STATION
FISCAL YEAR 1972 ESTIMATES

LOCATION PLAN





LEGEND

EXISTING FACILITIES

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

FACILITIES AUTHORIZED AND UNDER CONSTRUCTION

1. Installation of Equipment at the Hydrogen Heat Transfer Facility for Hypersonic Propulsion Research

CD-10048-34

LEWIS RESEARCH CENTER
FISCAL YEAR 1972 ESTIMATES

CLEVELAND FACILITIES

C-69628

LEWIS RESEARCH CENTER
FISCAL YEAR 1972 ESTIMATES

PLUM BROOK FACILITIES

C-55682

RPM 2-81

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

SPACE NUCLEAR SYSTEMS OFFICE

MISSION:

The joint AEC-NASA Space Nuclear Systems Office is responsible for planning and directing programs to establish the technology and development of flight qualified nuclear propulsion and nuclear electric power systems for use in space.

Important aspects of these functions include: (1) the development of the 75,000 pound thrust NERVA engine, (2) the planning and management of the program to develop a reusable nuclear stage, (3) planning and management of various programs to advance nuclear propulsion technology, (4) the development of nuclear electric power systems, and (5) the planning and management of programs to advance the technology of nuclear electric power systems.

DESCRIPTION:

The Space Nuclear Systems Office is a joint AEC-NASA office and was established under Interagency Agreement to manage all aspects of the space nuclear power and space nuclear propulsion programs.

The office consists of a Headquarters group located at AEC Headquarters, Germantown, Maryland and three extensions, located in Ohio, New Mexico and Nevada.

The Space Nuclear Systems Office is charged with the responsibility for the management of the Nuclear Rocket Development Station (NRDS). The Nuclear Rocket Development Station is located on a 78,000 acre site adjacent to the AEC's Nevada Test Site approximately 90 miles northwest of Las Vegas in southern Nevada, and is the national site for the static ground testing of reactors, engines and eventually of vehicles associated with nuclear rocket development.

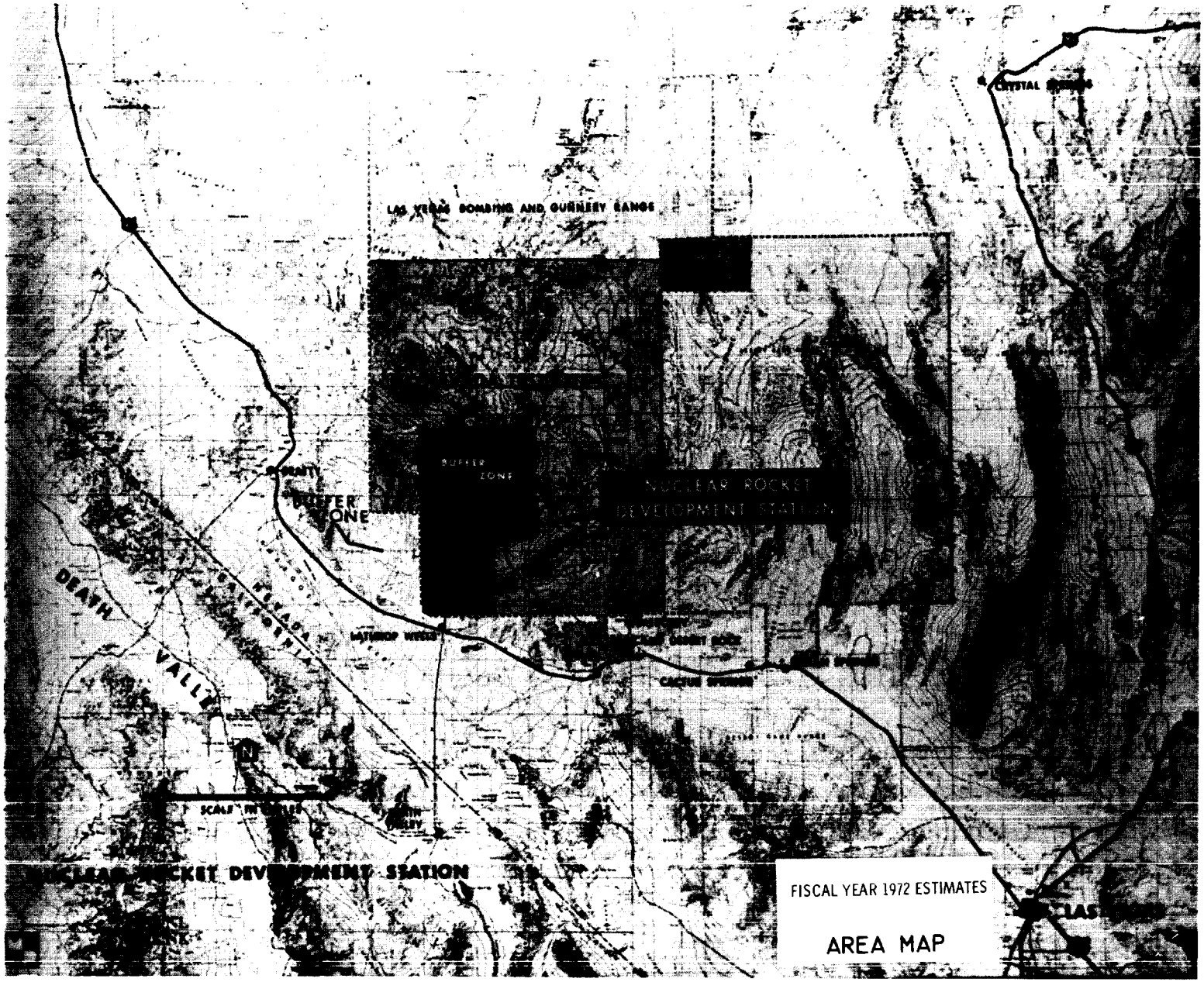
The total capital investment of NASA-funded facilities, including fixed assets in progress and contractor-held facilities at various locations as of June 30, 1970, was $53,172,000.

FUNDS

Functions	1970	1971	1972
Personnel	$2,093,000	$2,319,000	$2,391,000
Travel	185,000	199,000	196,000
Facilities services	4,000	---	---
Administrative support	---	1,000	1,000
Total, fund requirements	$2,282,000	$2,519,000	$2,588,000

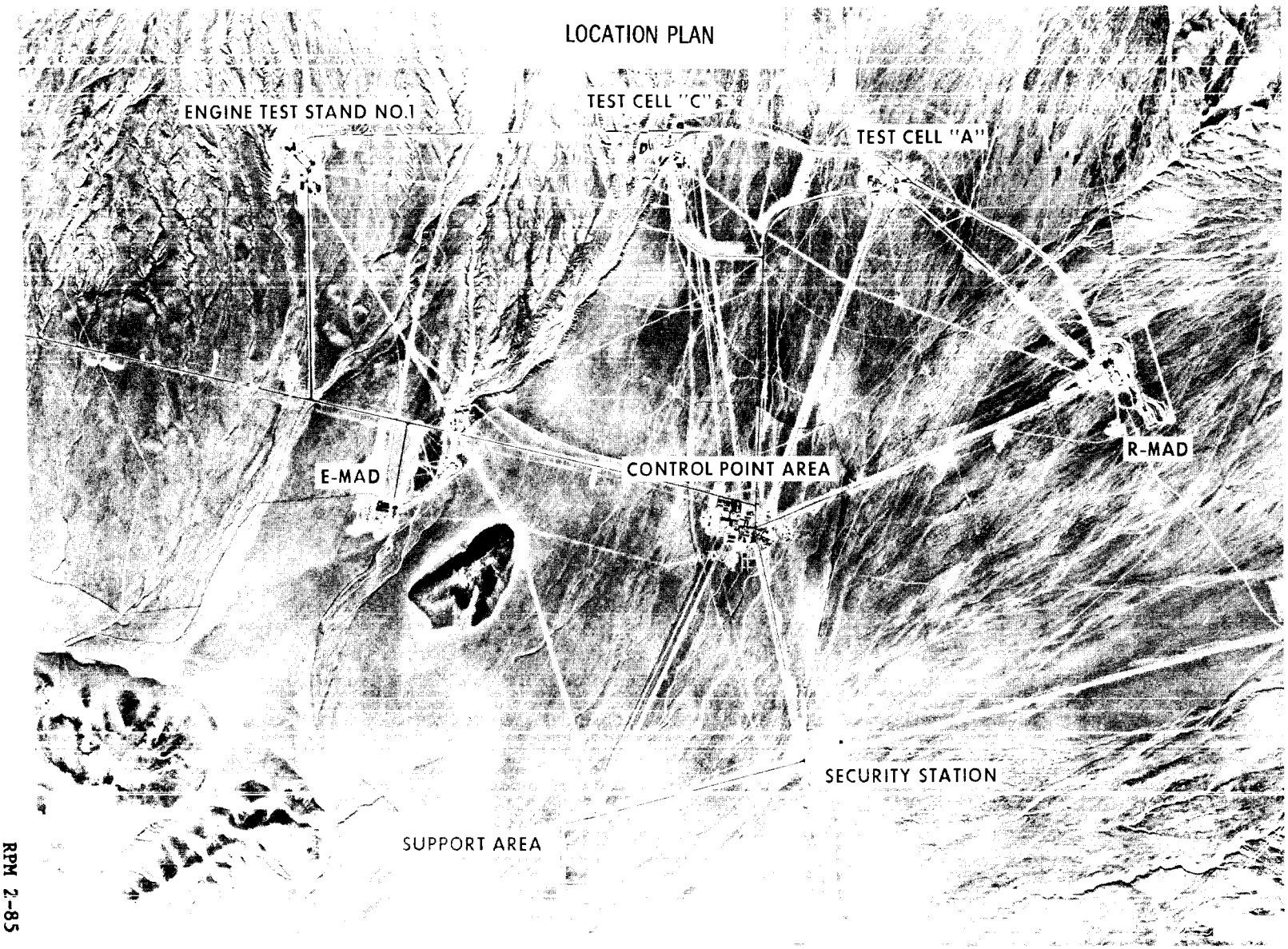
PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Advanced Research and Technology			
Nuclear power and propulsion	109	109	103
Technology Utilization	1	1	1
Subtotal, positions by program	110	110	104
2. Indirect Positions:			
Director and staff	3	3	3
Administrative support	1	1	1
Subtotal, indirect positions	4	4	4
Total, permanent positions	114	114	108

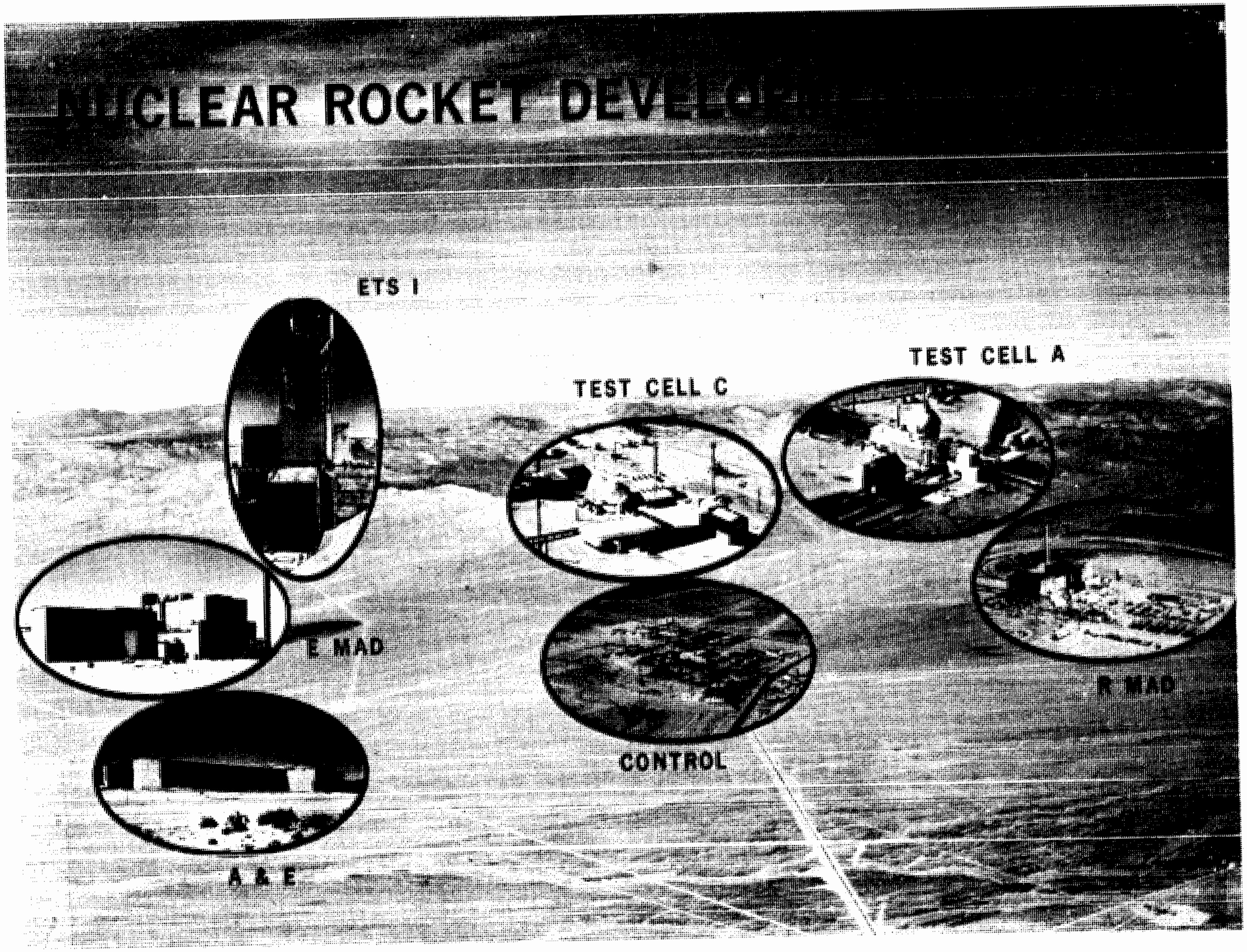

LAS VEGAS BOMBING AND GUNNERY RANGE
BUFFER ZONE
NUCLEAR ROCKET DEVELOPMENT STATION
DEATH VALLEY
CALIFORNIA
NEVADA
SCALE IN MILES
FISCAL YEAR 1972 ESTIMATES
AREA MAP

NUCLEAR ROCKET DEVELOPMENT STATION

FISCAL YEAR 1972 ESTIMATES



RPM 2-85


CLEAR ROCKET DEVEL
ETS I
TEST CELL A
TEST CELL C
E MAD
R MAD
CONTROL
A & E

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 ESTIMATES

NASA HEADQUARTERS

MISSION:

The mission of the National Aeronautics and Space Administration Headquarters is to plan and provide executive direction for the programs authorized by the Congress, and to implement the national objectives stated in the National Aeronautics and Space Act of 1958, as amended. The principal statutory functions are:

1. To conduct research into, and for the solution of, problems of flight within and outside the earth's atmosphere and to develop, construct, test, and operate aeronautical and space vehicles for research purposes.

2. To conduct activities required for the exploration of space with manned and unmanned vehicles.

3. To arrange for participation by the scientific community in planning scientific measurements and observations to be made through use of aeronautical and space vehicles, and conduct or arrange for the conduct of such measurements and observations.

4. To provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof.

The following offices at Headquarters assist management in carrying out the technical aspects of this mission:

Office of Manned Space Flight - Responsible for all NASA activities directly involving manned space flight missions. Programs include:

Apollo - Based on the demonstrated national capability for manned space exploration, to conduct scientific exploration of the moon through lunar orbital and lunar surface operations.

Space Flight Operations - To expand capabilities to conduct scientific, technological and applied operations in space through flights of increasing duration and complexity, initially using Apollo hardware or derivatives of Apollo hardware; development of a fully reusable space transportation system; and progressing to an orbital space station.

Advanced Missions - To plan a broad program of explorations which will achieve and maintain a balanced program of space operations and exploration 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 the scientific training of astronauts; 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 over-all 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 Systems Office.

Office of Tracking and Data Acquisition - Responsible for the development, implementation, and operation of tracking, data acquisition, command, communications, and data processing facilities, systems and services required for NASA flight missions. This office is also responsible for agency-wide coordination of the management of automatic data processing systems and services. In addition, this office provides for centralized planning and systems management for the administrative communications at NASA installations.

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, communications, 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	1970	1971	1972
Personnel	$43,007,000	$43,580,000	$41,104,000
Travel	2,869,000	3,226,000	3,041,000
Facilities services	380,000	878,000	337,000
Technical services	11,351,000	11,195,000	9,923,000
Administrative support	5,551,000	5,684,000	5,276,000
Total, fund requirements	$63,158,000	$64,563,000	$59,681,000

PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	143	99	94
Space flight operations	189	165	165
Advanced missions	40	40	38
Space Science and Applications			
Physics and astronomy	58	52	49
Lunar and planetary exploration	58	52	63
Bioscience	29	24	---
Space applications	56	56	54
Launch vehicle procurement	28	25	24
Advanced Research and Technology			
Aeronautical research and technology	95	86	83
Space research and technology	102	94	89
Nuclear power and propulsion	8	---	---
University Affairs			
Sustaining university program	12	9	6
Tracking and Data Acquisition	55	53	50
Technology Utilization	19	17	16
Subtotal, positions by program	892	772	731
2. Indirect Positions:			
Director and staff	446	418	397
Administrative support	242	217	205
Research and development support	546	490	467
Subtotal, indirect positions	1,234	1,125	1,069
Total, permanent positions	2,126	1,897	1,800

RESEARCH AND PROGRAM MANAGEMENT

FISCAL YEAR 1972 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 or purchase 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 purpose of comparison 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 back-up 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. Five of these spacecraft have been successfully launched since 1962--two to Venus and three to Mars--providing a wealth of scientific information on these planets. The program revealed the unsuspected existence of craters on Mars (Mariner IV). Two more missions to the planets are planned for 1971 (Mars) and 1973 (Venus and Mercury).

In 1975, the Viking mission consisting of two launches to Mars is planned. Each spacecraft will consist of an orbiter and a lander. The

Langley Research Center has responsibility for the over-all Viking project management and development of the lander, while JPL has responsibility for development of the orbiter, spacecraft navigation, and tracking and data acquisition. The spacecraft will orbit Mars, separate a lander capsule which will enter the Martian atmosphere and soft land on the surface of the planet. Orbital, entry, and landed science data will be collected and transmitted to earth. The primary functions of the orbiter is to provide site surveillance data for use in selecting the exact landing site for the lander capsule, and to serve as a relay station to record and transmit to earth data received from the lander. At other times, the orbiter will conduct its own science experiments, including the transmission of pictures of the Martian surface back to earth, infrared radiometry to determine surface temperatures, infrared spectrometry to detect water vapor, and radio experiments to obtain data to improve planetary navigation capabilities and provide measurements of radio propagation properties and Mars atmospheric data.

The Jet Propulsion Laboratory will have management responsibility for the Outer Planets Missions--a proposed new start in the FY 1972 Research and Development budget--which will send automated spacecraft to the farthest boundary of our solar system to gather scientific data on Jupiter, Saturn, Uranus, Neptune and Pluto. The 1970's presents rare opportunities for the exploration of these planets by the gravity assist swing-by method. This method exploits the unusual alignment of these planets during this period--an alignment that will not be repeated for 179 years--by capitalizing on the gravitational pull of each planet to propel the spacecraft toward succeeding planets, thereby permitting the exploration of several of these planets by each spacecraft. The economic advantages of this method are readily apparent.

The development of the Outer Planets spacecraft requires stretching the state of the art in several areas of technology, including radioisotope thermoelectric power; built-in self testing, repair and adaptive capability which will assure reliable performance of the spacecraft for ten years; higher navigational accuracy, and greater platform stability. Development of the technology necessary for the success of these missions commenced in 1969 and has progressed to the point where the feasibility of the spacecraft design concept is proven. Launches are planned during both the 1976-1977 and 1979 opportunities.

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 NASA's worldwide Deep Space Network. The Deep Space Network is comprised of the Space Flight Operations Facility in Pasadena--the nerve center of the network--and tracking and data acquisition stations located in California, Spain, South Africa and Australia. The Deep Space Network provides support to Jet Propulsion Laboratory managed flight missions, to all manned Lunar Missions, and to projects such as Pioneer and Helios which are managed by other NASA 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 175.5 acres of land of which 145.9 acres are owned by NASA and 29.6 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, fixed assets in progress and contractor-held facilities, as of June 30, 1970, was $231,468,000.

SUMMARY OF RESOURCES REQUIREMENTS:

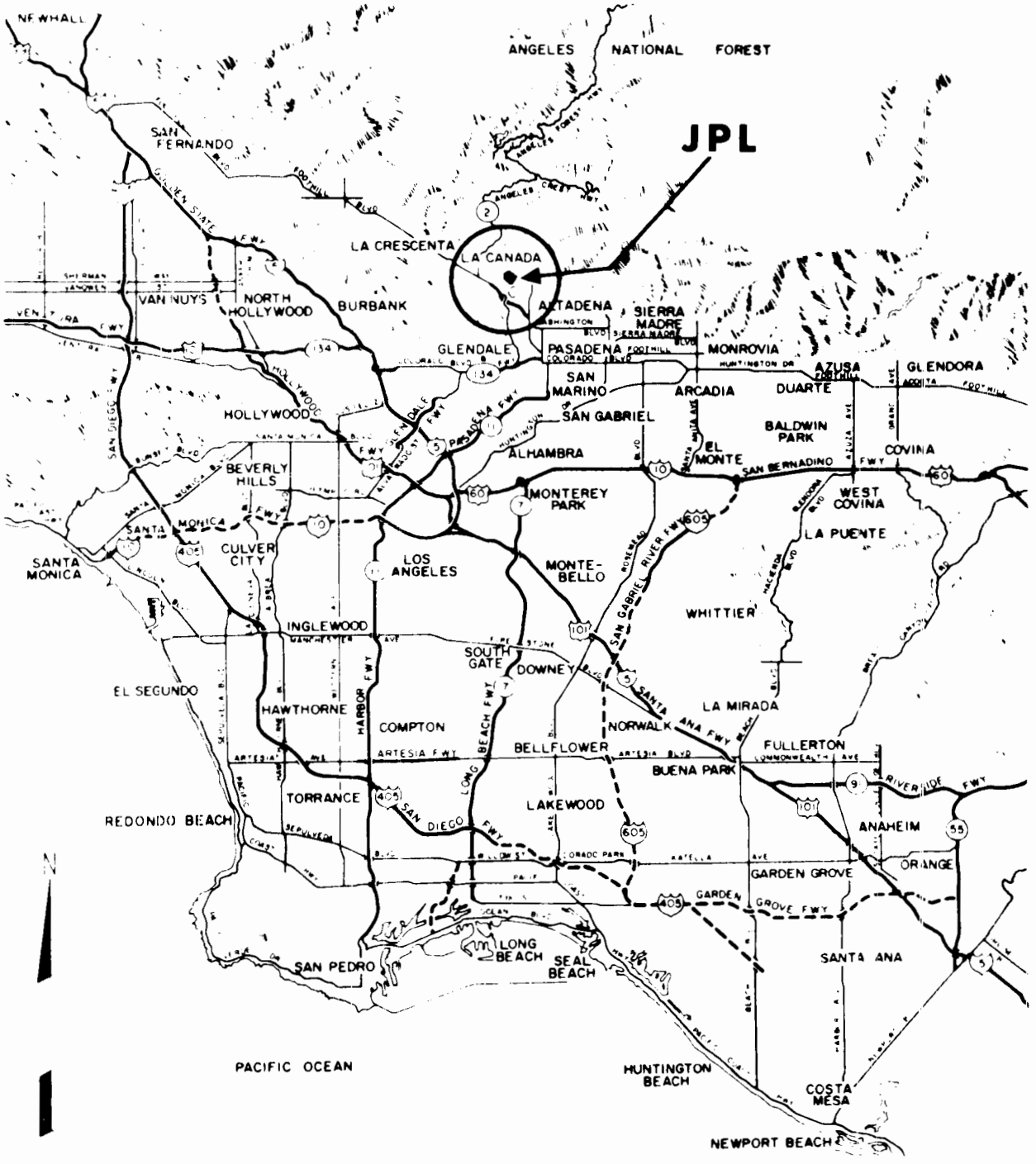
FUNDS

Functions	1970	1971	1972
Personnel	$67,036,000	$71,056,000	$75,013,000
Travel	2,368,000	2,373,000	2,367,000
Facilities services	6,430,000	6,660,000	6,977,000
Technical services	9,026,000	11,932,000	3,720,000
Administrative support	2,740,000	2,799,000	2,980,000
Total, fund requirements	$87,600,000	$94,820,000	$91,057,000

PERSONNEL

	1970	1971	1972
1. Permanent Positions by Program:			
Manned Space Flight			
Apollo	47	37	13
Space Science and Applications			
Physics and astronomy	15	15	23
Lunar and planetary exploration	955	946	1,056
Bioscience	29	25	---
Space applications	54	41	36
Launch vehicle procurement	6	8	7
Advanced Research and Technology			
Aeronautical research and technology	15	10	9
Space research and technology	310	313	254
Nuclear power and propulsion	53	49	40
Tracking and Data Acquisition	483	499	460
Subtotal, positions by program	1,967	1,943	1,898
Direct Support	869	893	795
2. Indirect Positions	1,364	1,364	1,297
Total, permanent positions	4,200	4,200	3,990

VICINITY MAP



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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
25	SHOP TEST CELL Nº 32 (LIQUID)	4-E
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	3-B
41	HI TEMP LAB	5-F
42	TEST CELL (LIQUID)	5-E
44	CREDIT UNION	5-F
45	IMPACT LABORATORY	5-F
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)	4-E
57	TEST CELL (AIR FUEL)	4-D
58	COMPRESSOR BUILDING	4-D
59	CHEM LAB	5-E
60	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)	4-E
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-F
90	SHOP TEST CELL Nº 31	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	26 FOOT SPACE SIMULATOR	4-F
152	HAZARDOUS CHEMICAL STORAGE	5-E
156	COMPUTER PROGRAM OFFICE	5-C
157	ENGINEERING & MECHANICS BLDG	5-D
158	MATL SCIENCES LAB ANNEX	5-D
159	PUMP HOUSE (WATER)	4-F
160	SEWAGE LIFT STATION	5-D
161	TELECOMMUNICATIONS LAB	5-C
165	COOLING TOWER	5-E
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	3-F
176	FIRE HOUSE	5-F
177	HEAVY EQUIP SERVICING SHED	5-E
178	BAILEY BRIDGE	4-F
179	SPALLSHAFT ASSY FACILITY	7-C
180	CENTRAL ENGR BLDG	6-B
182	BUS STOP SHELTER	4-F
183	PHYSICAL SCIENCE LAB	5-D
184	ELECTRONIC STORES	5-D
185	PROGRAMMING OFFICE	5-C
186	SPACE SCIENCES DIVISION BLDG	7-B
187	CHEMICAL STORAGE	6-E
188	ENGINEERING FACILITIES BLDG	4-C
189	ELECTRONICS LAB ANNEX	5-D
190	PROCUREMENT OFFICES	8-C
191	HAZARDOUS TEST BAY	3-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 "F" EQUIP BLDG	5-E
212	ANTENNA LABORATORY	2-D
213	COOLING TOWERS A, B & C	5-B
215	COOLING TOWER	6-D
219	SECRETARIAL CENTER	7-C
220	CRS TERMINAL BUILDING	4-D
224	SEWER LIFT STATION	8-C
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-C
233	SPACECRAFT DEVELOPMENT BLDG	7-C
234	LUMBER STORAGE BLDG	8-C
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-G
245	SPECTROSCOPY LAB	4-B
246	SOILS TEST LAB	4-D
247	DYNAMITRON (TEMPORARY)	6-C
248	VAN DE GRAFF SOLID ACCEL	4-C
249	VISITORS RECEPTION BLDG	4-B
250	GUARD SHELTER	6-B
251	ASTRO 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

JPL FACILITIES - PASADENA

CALIFORNIA INSTITUTE OF TECHNOLOGY
JET PROPULSION LABORATORY
PLANT ENGINEERING
SITE PLAN
BUILDING LOCATIONS
SP 01

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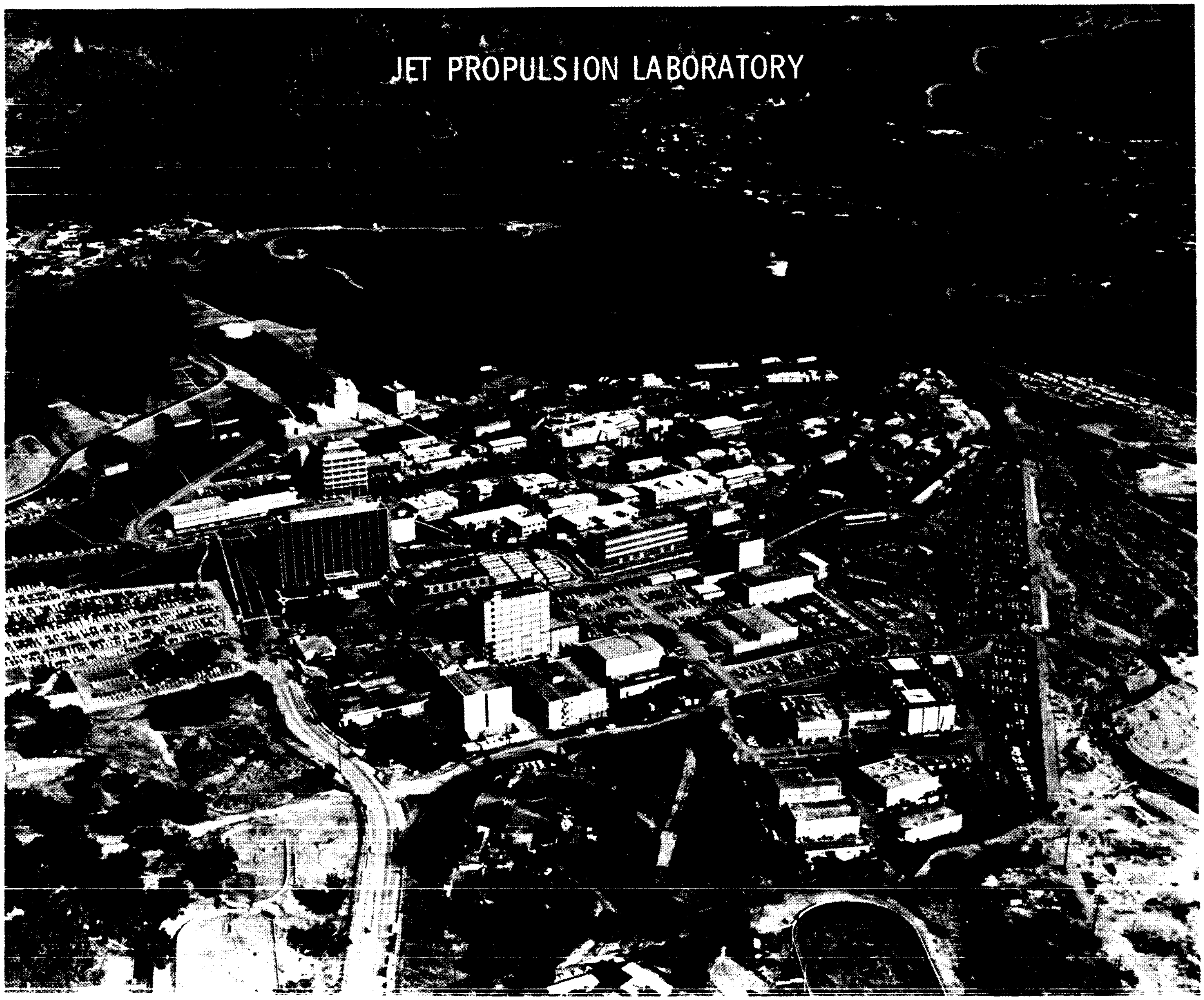
RPM 2-96



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