National Aeronautics and Space Administration

BUDGET ESTIMATES

FISCAL YEAR 1965

Volume I

SUMMARY DATA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

SUMMARY DATA

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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GENERAL STATEMENT

The National Aeronautics and Space Administration was established October 1, 1958, pursuant to Public Law 85-568 (72 Stat. 426; 42 U.S.C. 2451) approved July 29, 1958, for the conduct of the non-military space programs of the United States, including the exploration of space and its utilization for peaceful purposes, and to conduct and support advanced research and development related to space and aeronautics in support of both civilian and military requirements.

A total of $5,304,000,000 is requested to carry out the missions and programs of the agency which are designed to maintain American supremacy in space and aeronautics.

The major portion of the research and development effort is performed by industrial contractors under the guidance of NASA installations. A smaller, but highly significant portion of the work is conducted by the NASA installations and by universities and other research contractors.

The activities of NASA may be categorized into the following major areas:

1. Manned space exploration involving the Gemini and Apollo programs and investigation of possible future advanced missions.

2. A comprehensive program of unmanned investigations of earth, moon, sun and planets employing sounding rockets, orbiting spacecraft and interplanetary probes.

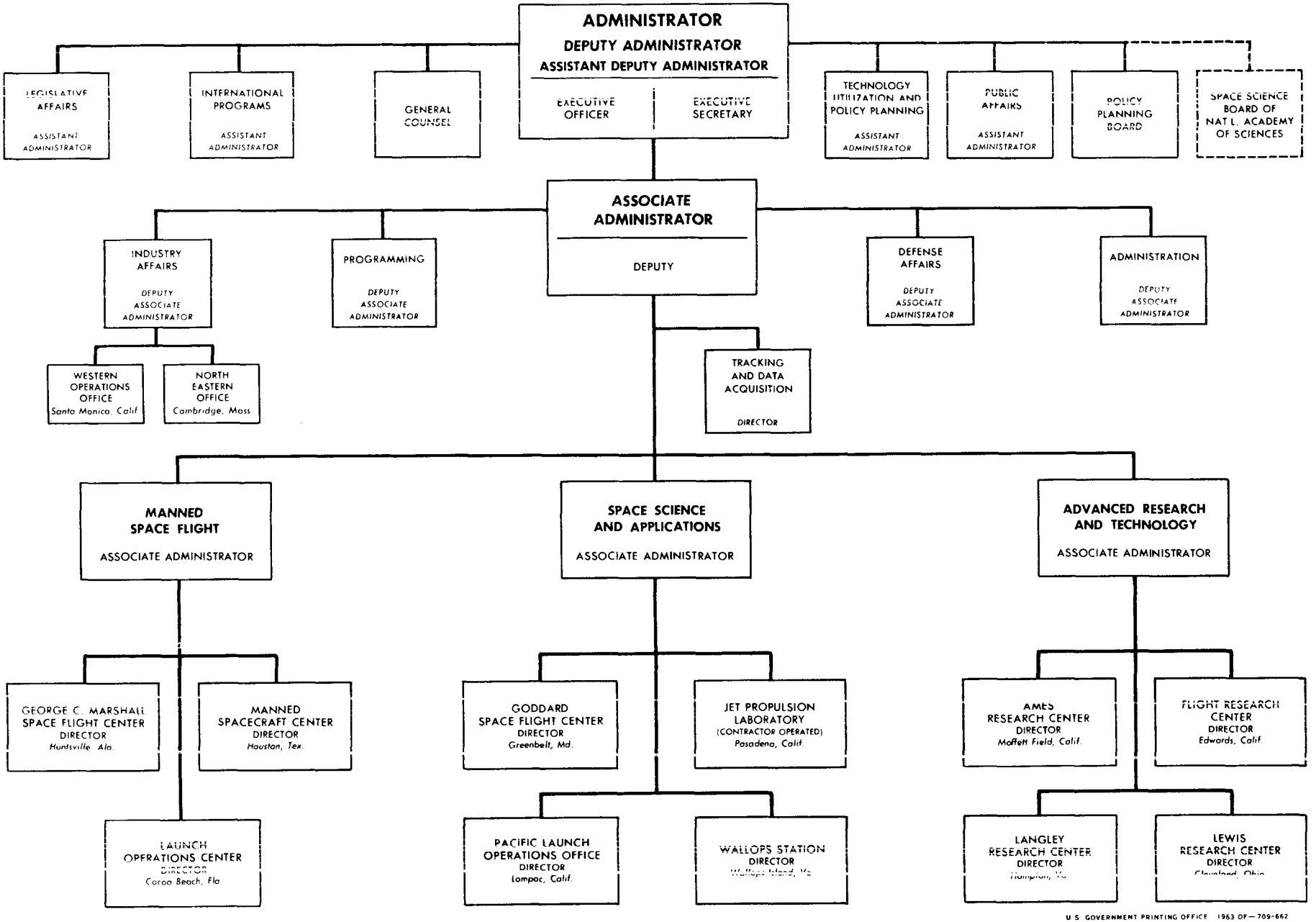
3. Development of meteorological and communications satellite systems.

4. Advanced research and technological development to support our aeronautical and space programs.

Detailed justification of the fiscal year 1965 estimate by appropriation may be found in each of the following volumes:

Volume		Amount
II	Research and development	$4,382,000,000
III	Construction of facilities	281,000,000
IV	Administrative operations	641,000,000
	Total	$5,304,000,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION



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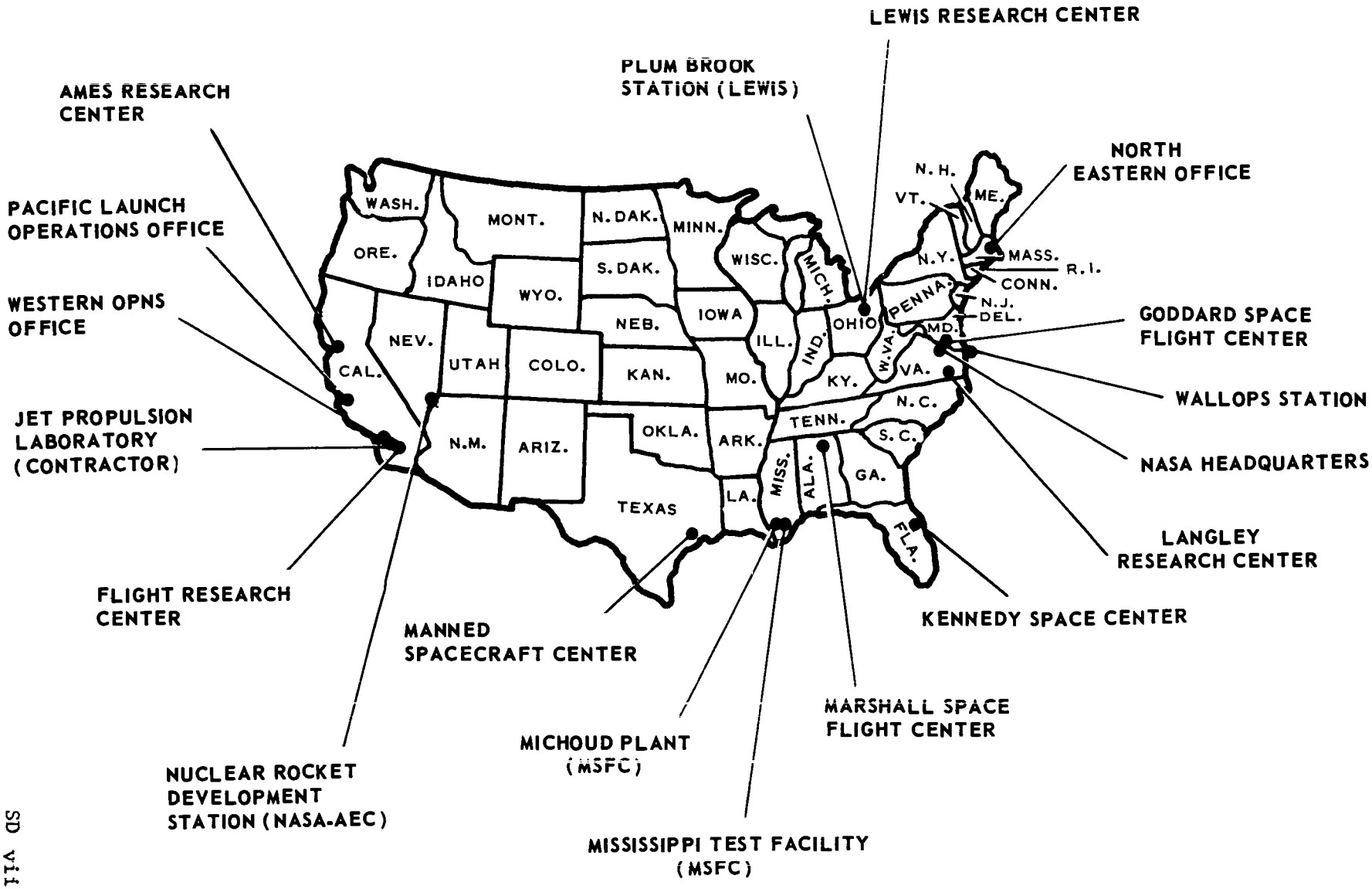
NASA INSTALLATIONS



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED AUTHORIZATION BILL

To authorize appropriations to the National Aeronautics and Space Administration for research and development, construction of facilities, and administrative operations; and for other purposes.

1 Be it enacted by the Senate and House of Representatives
2 of the United States of America in Congress assembled, That
3 there is hereby authorized to be appropriated to the National
4 Aeronautics and Space Administration the sum of $5,304,000,000,
5 as follows:
6 (a) For "Research and development, " $4,382,000,000
7 for the following programs:
8 (1) Gemini, $308,400,000;
9 (2) Apollo, $2,677,500,000;
10 (3) Advanced missions, $26,000,000;
11 (4) Geophysics and astronomy, $190,200,000;
12 (5) Lunar and planetary exploration, $300,400,000;
13 (6) Sustaining university program, $46,000,000;
14 (7) Launch vehicle development, $128,200,000;
15 (8) Bioscience, $31,000,000;

1 (9) Meteorological satellites, $37,500,000;

2 (10) Communication satellites, $12,600,000;

3 (11) Advanced technological satellites,

4 $31,000,000;

5 (12) Basic research, $21,000,000;

6 (13) Space vehicles systems, $38,800,000;

7 (14) Electronic systems, $28,400,000;

8 (15) Human factor systems, $16,200,000;

9 (16) Nuclear-electric systems, $48,100,000;

10 (17) Nuclear rockets, $58,000,000;

11 (18) Chemical propulsion, $59,800,000;

12 (19) Space power, $13,000,000;

13 (20) Aeronautics, $37,000,000;

14 (21) Tracking and data acquisition, $267,900,000;

15 (22) Technology utilization, $5,000,000.

16 (b) For "Construction of facilities," including land

17 acquisitions, $281,000,000 as follows:

18 (1) Ames Research Center, Moffett Field,

19 California, $6,081,000;

1 (2) Electronics Research Center, (location to
2 be inserted) $10,000,000;
3 (3) Goddard Space Flight Center, Greenbelt,
4 Maryland, $1,300,000;
5 (4) Jet Propulsion Laboratory, Pasadena and Edwards,
6 California, $3,714,000;
7 (5) John F. Kennedy Space Center, NASA, Cocoa Beach,
8 Florida, $91,261,000;
9 (6) Langley Research Center, Hampton, Virginia,
10 $4,454,000;
11 (7) Lewis Research Center, Cleveland and Sandusky,
12 Ohio, $810,000;
13 (8) Manned Spacecraft Center, Houston, Texas,
14 $25,166,000;
15 (9) George C. Marshall Space Flight Center,
16 Huntsville, Alabama, $15,288,000;
17 (10) Michoud Plant, New Orleans and Slidell,
18 Louisiana, $6,534,000;

1 (11) Mississippi Test Facility, Mississippi,
2 $61,991,000;
3 (12) Wallops Station, Wallops Island, Virginia,
4 $1,804,000;
5 (13) Various locations, $37,597,000;
6 (14) Facility planning and design not otherwise
7 provided for, $15,000,000.
8 (c) For "Administrative operations", $641,000,000.
9 (d) Appropriations for "Research and development" may be
10 used (1) for any items of a capital nature (other than
11 acquisition of land) which may be required for the perform-
12 ance of research and development contracts and (2) for grants
13 to nonprofit institutions of higher education, or to non-
14 profit organizations whose primary purpose is the conduct of
15 scientific research, for purchase or construction of
16 additional research facilities; and title to such facilities
17 shall be vested in the United States unless the Administrator
18 determines that the national program of aeronautical and
19 space activities will best be served by vesting title in any

1 such grantee institution or organization. Each such grant
2 shall be made under such conditions as the Administrator
3 shall determine to be required to insure that the United
4 States will receive therefrom benefit adequate to justify
5 the making of that grant. None of the funds appropriated
6 for "Research and development" pursuant to this Act may be
7 used for construction of any major facility, the estimated
8 cost of which, including nonseverable equipment, exceeds
9 $250,000, unless the Administrator or his designee has
10 notified the Committee on Science and Astronautics of the
11 House of Representatives and the Committee on Aeronautical
12 and Space Sciences of the Senate of the nature, location,
13 and estimated cost of such facility. The provisions of
14 paragraph (g) hereof shall not apply to the use of R&D funds
15 authorized under this paragraph.
16 (e) When so specified in an appropriation Act, any
17 amount appropriated for "Research and development" or for
18 "Construction of facilities" may remain available without
19 fiscal year limitation.

1 (f) Appropriations made pursuant to subsection 1(c)
2 may be used, but not to exceed $35,000, for scientific
3 consultations or extraordinary expenses upon the approval
4 or authority of the Administrator and his determination
5 shall be final and conclusive upon the accounting officers
6 of the Government.
7 (g) No part of the funds appropriated pursuant to
8 subsections 1(a) and (c) for maintenance, repairs,
9 alterations, and minor construction shall be used for the
10 construction of any new facility the estimated cost of which,
11 including nonseverable equipment, exceeds $100,000.
12 Sec. 2. Authorization is hereby granted whereby any
13 of the amounts prescribed in paragraphs (1), (2), (3), (4),
14 (5), (6), (7), (8), (9), (10), (11), (12), and (13), of
15 subsection 1(b) may in the discretion of the Administrator
16 of the National Aeronautics and Space Administration, be
17 varied upward 5 per centum to meet unusual cost variations,
18 but the total cost of all work authorized under such para-
19 graphs shall not exceed a total of $266,000,000.

1 Sec. 3. Not to exceed 2 per centum of the funds appro-
2 priated pursuant to subsection 1(a) hereof may be trans-
3 ferred to the "Construction of facilities" appropriation,
4 and, when so transferred, together with $30,000,000 of the
5 funds appropriated pursuant to subsection 1(b) hereof (other
6 than funds appropriated pursuant to paragraph (14) of such
7 subsection) shall be available for expenditure to construct,
8 expand, or modify laboratories and other installations at
9 any location (including locations specified in subsection
10 1(b)), if (1) the Administrator determines such action to
11 be necessary because of changes in the national program of
12 aeronautical and space activities or new scientific or
13 engineering developments, and (2) he determines that deferral
14 of such action until the enactment of the next authorization
15 Act would be inconsistent with the interest of the Nation
16 in aeronautical and space activities. The funds so made
17 available may be expended to acquire, construct, convert,
18 rehabilitate, or install permanent or temporary public works,
19 including land acquisition, site preparation, appurtenances,

1 utilities, and equipment. No portion of such sums may be
2 obligated for expenditure or expended to construct, expand,
3 or modify laboratories and other installations unless (A)
4 a period of thirty days has passed after the Administrator
5 or his designee has transmitted to the Committee on Science
6 and Astronautics of the House of Representatives and to the
7 Committee on Aeronautical and Space Sciences of the Senate
8 a written report containing a full and complete statement
9 concerning (1) the nature of such construction, expansion,
10 or modification, (2) the cost thereof including the cost of
11 any real estate action pertaining thereto, and (3) the reason
12 why such construction, expansion, or modification is
13 necessary in the national interest, or (B) each such com-
14 mittee before the expiration of such period has transmitted
15 to the Administrator written notice to the effect that such
16 committee has no objection to the proposed action.
17 Sec. 4. Notwithstanding any other provision of this
18 Act--
19 (1) no amount appropriated pursuant to this Act may be

1 used for any program deleted by the Congress from
2 requests as originally made to either the House Committee
3 on Science and Astronautics or the Senate Committee on
4 Aeronautical and Space Sciences,
5 (2) no amount appropriated pursuant to this Act may
6 be used for any program in excess of the amount actually
7 authorized for that particular program by sections 1(a)
8 and 1(c), and
9 (3) no amount appropriated pursuant to this Act may be
10 used for any program which has not been presented to or
11 requested of either such committee,
12 unless (A) a period of thirty days has passed after the
13 receipt by each such committee of notice given by the
14 Administrator or his designee containing a full and complete
15 statement of the action proposed to be taken and the facts
16 and circumstances relied upon in support of such proposed
17 action, or (B) each such committee before the expiration of
18 such period has transmitted to the Administrator written
19 notice to the effect that such committee has no objection

1 to the proposed action.

2 Sec. 5. The Administrator is hereby authorized to
3 transfer, with the approval of the Bureau of the Budget,
4 funds appropriated pursuant to this Act (other than funds
5 appropriated pursuant to paragraph (14) of subsection 1(b)),
6 to any other agency of the Government whenever the
7 Administrator determines such transfer necessary for the
8 efficient accomplishment of the objectives for which the
9 funds have been appropriated. Not more than $20,000,000 of
10 the funds authorized by this Act may be transferred by the
11 Administrator under this section, and no transfer in excess
12 of $250,000 shall be made under this section unless the
13 Administrator has transmitted to the Committee on Aeronautical
14 and Space Sciences of the Senate and to the Committee on
15 Science and Astronautics of the House of Representatives a
16 written statement concerning the amount and purpose of, and
17 the reason for, such transfer, and (1) each such committee
18 has transmitted to the Administrator written notice to the
19 effect that such committee has no objection to that transfer,

1 or (2) thirty days have passed after the transmittal by

2 the Administrator of such statement to those committees.

3 Sec. 6. This Act may be cited as the "National

4 Aeronautics and Space Administration Authorization Act,

5 1965."

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

SUMMARY OF NEW OBLIGATIONAL AUTHORITY

(In thousands of dollars)

Appropriation	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1964 Supplemental	Fiscal Year 1965
Research, Development, and Operations.....	$2,897,878	---	---	---
Research and Development.....	(2,459,203)[a]	$3,926,000	$141,000	$4,382,000
Construction of Facilities.....	776,237	680,000	---	281,000
Administrative Operations.....	(438,675)[a]	494,000	---	641,000
TOTAL.....	$3,674,115	$5,100,000	$141,000	$5,304,000

a/ The "Research and Development" and "Administrative Operations" portions of "Research, Development, and Operations" are shown parenthetically for comparability.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

APPROPRIATION SUMMARY

(Thousands of dollars)

	Total	Research, Development, and Operation	Research and Development	Construction of Facilities	Administrative Operations
FISCAL YEAR 1963					
Independent Offices, Appropriation Act, 1963 (76 Stat. 730-1)..	$3,674,115	$2,897,878	---	$776,237	---
NASA Appropriation Transfers (76 Stat. 731).....	---	+32,603	---	-32,603	---
Transfer to General Services Administration (76 Stat. 728).....	-1,074	-1,074	---	---	---
Appropriation (adjusted).....	$3,673,041	$2,929,407	---	$743,634	---

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

APPROPRIATION SUMMARY

(Thousands of dollars)

	Total	Research, Development, and Operation	Research and Development	Construction of Facilities	Administrative Operations
FISCAL YEAR 1964					
Independent Offices, Appropriation Act, 1964 (77 Stat. 439)....	$5,100,000	---	$3,926,000	$680,000	$494,000
NASA Appropriation Transfers (77 Stat. 439).....	---	---	-16,385	-6,500	+22,885
Transfer to General Services Administration (77 Stat. 436).....	-34	---	---	---	-34
Appropriation (adjusted).....	$5,099,966	---	$3,909,615	$673,500	$516,851
Proposed Supplemental....	141,000	---	141,000	---	---
Total (including supplemantal).....	$5,240,966	---	$4,050,615	$673,500	$516,851
FISCAL YEAR 1965					
Appropriation request....	$5,304,000	---	$4,382,000	$281,000	$641,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

BUDGET PLAN SUMMARY BY BUDGET ACTIVITY BY APPROPRIATION
(Thousands of Dollars)

Appropriation Title	Total	Manned Space Flight	Space Applications	Unmanned Investigations in Space	Space Research and Technology	Aircraft Technology	Supporting Operations
Fiscal Year 1963.....	$3,695,888	$2,244,798	$106,714	$588,293	$492,151	$47,038	$216,894
Research, development and operation.....	$2,953,469	$1,700,989	$106,520	$541,031	$385,302	$45,341	$174,286
Research and development..A/	(2,514,794)	(1,503,583)	(96,958)	(489,951)	(255,962)	(15,598)	(152,742)
Administrative operations.A/	(438,675)	(197,406)	(9,562)	(51,080)	(129,340)	(29,743)	(21,544)
Construction of facilities..	742,419	543,809	194	47,262	106,849	1,697	42,608
Fiscal Year 1964.....	$5,257,351	$3,535,030	$116,633	$687,574	$491,633	$51,500	$374,981
Research and development....	3,926,000	2,649,800	103,300	602,700	298,100	22,100	250,000
Supplemental.....	141,000	141,000	---	---	---	---	---
Construction of facilities..	673,500	495,179	3,933	18,574	56,833	100	98,881
Administrative operations...	516,851	249,051	9,400	66,300	136,700	29,300	26,100
Fiscal Year 1965.....	$5,304,000	$3,576,630	$98,000	$732,518	$461,620	$73,201	$362,031
Research and development....	4,382,000	3,011,900	86,100	649,800	283,300	37,000	313,900
Construction of facilities..	281,000	234,330	-	7,018	26,620	4,001	9,031
Administrative operations...	641,000	330,400	11,900	75,700	151,700	32,200	39,100

A/ The "Research and Development" and "Administrative Operations" portions of the "Research, Development, and Operation" appropriation are shown parenthetetically for comparability.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

PERSONNEL SUMMARY AND COSTS

	1963	1964	1965
Personnel Data			
End year employment:			
Permanent positions	27,904	32,000	33,200
Other positions	2,030	600	600
Total	29,934	32,600	33,800
NASA funded	29,837	32,580	33,780
Reimbursable	97	20	20
Average number of all employees	26,044	30,446	33,340
Average GS grade	10.0	10.0	10.0
Average GS salary	$8,943	$9,487	$9,576
Average salary, grades established by the Administrator (Wage Board)	$6,754	$6,934	$6,979
Average salary of ungraded positions (Excepted)	$18,361	$18,474	$18,474
Costs	(Thousands of Dollars)		
Personnel compensation:			
Net salary, permanent positions	$208,029	$261,417	$299,692
Other positions	4,473	3,848	3,297
Other compensation	18,724	24,545	23,994
Total compensation	231,226	289,810	326,983
NASA funded	230,575	289,383	326,782
Reimbursable	651	427	201
Personnel benefits:			
Retirement	13,445	17,047	19,248
Health benefits	1,537	1,795	1,956
Life insurance	667	822	914
All other (Incentive awards, uniforms, etc.)	388	483	616
Total benefits	16,037	20,147	22,734

	1963	1964	1965
Total benefits.....	$16,037	$20,147	$22,734
NASA funded.....	15,988	20,117	22,718
Reimbursable.....	49	30	16
Total personnel costs.....	$247,263	$309,957	$349,717
NASA funded.....	246,563	309,500	349,500
Reimbursable.....	700	457	217

Manpower Requirements

NASA requires 33,200 permanent positions at the end of fiscal year 1965 to carry out the program goals and responsibilities during fiscal year 1965. This employment level represents an increase of 1,200 permanent positions over the comparable figure for the fiscal year 1964. The personnel filling these additional positions will be utilized for projects related to the manned space flight and electronics research efforts. This increase will provide for requirements for the continuation of the operational phase of the Gemini Project, for initiation of the operational phase of Apollo, for extensive testing of the Saturn class launch vehicles, and for increased emphasis on electronics research.

A project by project analysis of the fiscal year 1965 estimates was conducted to determine the actual requirements for personnel. In fiscal year 1965, the ratio of supporting personnel and personnel in supporting research and technology programs, other than electronics, to total personnel has generally been held at or below the ratio for fiscal year 1964. Other programs have been maintained as close as possible to the fiscal year 1964 level to permit maximum effort on the Manned Space Flight Program.

Components of increases in personnel costs for fiscal year 1965

(Thousands of Dollars)

	Personnel Salaries	Personnel Benefits
Additional costs of pay raises in fiscal year 1965.....	$6,065	$422
Increased costs for within- grade and grade-to-grade promotions.....	2,108	147
Cost of increased man-years in fiscal year 1965 over fiscal year 1964.....	29,226	2,032
Total increase in NASA funded personnel costs.....	$37,399	$2,601

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Analysis of increases in personnel costs for fiscal year 1965

Personnel costs for fiscal year 1965 and fiscal year 1964 are based on net permanent salaries, reflecting deductions for savings to be realized from delays in filling vacancies, lag in recruitment for new positions, leave without pay, etc.

The net compensation of the fiscal year 1964 NASA funded permanent positions included a 2.6 per cent pay increase for classified personnel effective for the last half of the fiscal year. Therefore, an additional $6.1 million, or 2.6 per cent, is required to cover the cost of the salary increases for a full year in fiscal year 1965.

Increased cost of $2.1 million, or less than 1 per cent is included to cover costs of whthin-grade and grade-to-grade promotions under civil service job performance standards.

Fiscal year 1965 requirements reflect an amount of $29.2 million to finance the increase of 2,916 NASA-funded man-years. Included in this number are 900 man-years that are attributable to the 1,200 new positions requested for 1965. The remaining increase of 2,016 man-years results from part year employment in fiscal year 1964, which will require funding for a full year during 1965.

Related personnel benefits for the Government's contribution for employee retirement, social security and insurance programs, etc., for the above salary increases will cost 6.9 per cent or $2.6 million.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION BILL

RESEARCH AND DEVELOPMENT

For necessary expenses, not otherwise provided for, including research, development, operations, [technical] services, *minor construction*, supplies, materials, [and] equipment*; maintenance, repair, and alteration of real and personal property;* [(including the purchase of aircraft for experimental purposes)] *and purchase, hire, maintenance and operation of other than administrative aircraft* necessary for the conduct and support of aeronautical and space research and development activities [,] of the National Aeronautics and Space Administration; [$3,926,000,000] *$4,382,000,000,* to remain available until expended. *(42 U.S.C. 2451, et seq., 50 U.S.C. 151–160, 511–515; Independent Offices Appropriation Act, 1964; additional authorizing legislation to be proposed.)*

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

RESEARCH AND DEVELOPMENT

Program and Financing (in thousands of dollars)

	Budget Plan			Obligations		
	1963	1964	1965	1963	1964	1965
Program by activities:						
Direct:						
1. Manned space flight:						
(a) Spacecraft development and operations.....	$722,089	$1,283,900	$1,333,900	$708,513	$1,226,624	$1,332,395
(b) Launch vehicle development	721,785	1,192,900	1,389,500	704,608	1,165,732	1,383,470
(c) Supporting programs.....	59,709	173,000	288,500	62,177	167,279	282,725
2. Space applications:						
(a) Meteorology.....	54,051	67,800	37,500	55,473	66,392	39,015
(b) Communications.....	32,075	13,500	12,600	32,323	18,484	12,693
(c) Other applications.....	10,832	22,000	36,000	7,404	24,618	35,252
3. Unmanned investigations in space:						
(a) Spacecraft development and operations.....	384,222	477,600	521,600	381,867	466,690	519,400
(b) Launch vehicle development	105,729	125,100	128,200	107,215	119,976	128,045
4. Space research and technology:						
(a) Launch vehicles and spacecraft.....	88,547	111,900	104,400	82,097	112,100	104,755
(b) Propulsion and space power	167,415	186,200	178,900	163,057	181,958	179,290
5. Aircraft technology.....	15,598	22,100	37,000	16,724	21,673	36,255
6. Supporting operations:						
(a) Tracking and data acquisition.....	122,142	210,000	267,900	108,025	219,323	261,205
(b) Facility, training, and research grants.....	30,600	40,000	46,000	24,685	43,951	45,700
Total direct.....	2,514,794	3,926,000	4,382,000	2,454,168	3,834,800	4,360,200

Program and Financing (in thousands of dollars)--Continued

	Budget plan			Obligations		
	1963	1964	1965	1963	1964	1965
Program by activities--Continued						
Reimbursable:						
1. Manned space flight:						
(a) Spacecraft development and operations.....	.....	$1,600	$1,900	.....	$1,600	$1,900
2. Space applications:						
(a) Meteorology.....	$526	17,745	24,000	$8,589	38,397	24,000
(b) Communications.....	11,280	3,153	5,000	8,057	14,776	5,000
3. Unmanned investigations in space:						
(a) Spacecraft development and operations.....	80	38	.....	601	62	.....
(b) Launch vehicle development.....	500	.....	.....	3,540	564	.....
4. Space research and technology:						
(a) Launch vehicles and spacecraft.....	35	.....	.....	35	.....	.....
(b) Propulsion and space power.....	40,205	50,035	45,000	40,065	50,200	45,000
5. Aircraft technology.....	.....	.....	.....	284	6	.....
6. Supporting operations:						
(a) Tracking and data acquisition.....	45	17	.....	45	17	.....
Total reimbursable..	52,671	72,588	75,900	61,216	105,622	75,900
Total.....	2,567,465	3,998,588	4,457,900	2,515,384	3,940,422	4,436,100

Program and Financing (in thousands of dollars)--Continued

	Budget plan			Obligations		
	1963	1964	1965	1963	1964	1965
Financing:						
Comparative transfer to other accounts.....	$443,241	.....	.....	$427,932	$14,199	.....
Unobligated balance brought forward:						
For completion of prior year budget plans.....	.....	.....	.....	-113,007	-150,054	$-196,261
Available to finance new budget plans.....	-25,732	$-1,670	.....	-25,732	-1,670	.....
Unobligated balance transferred to or from "Construction of facilities" (75 Stat. 355 and 76 Stat. 731).....	.....	-14,715	.....	30,343	-14,715	.....
Unobligated accepted reimbursable order transferred to other accounts.....	.....	.....	.....	.....	-2,240	.....
Advances and reimbursements from other accounts.....	-57,237	-72,588	$-75,900	-57,237	-72,588	-75,900
Unobligated balance carried forward:						
For completion of prior year budget plans.....	.....	.....	.....	150,054	196,261	218,061
Available to finance new budget plans.....	1,670	.....	.....	1,670	.....	.....
New obligational authority	2,929,407	3,909,615	4,382,000	2,929,407	3,909,615	4,382,000

Program and Financing (in thousands of dollars)--Continued

	Budget plan			Obligations		
	1963	1964	1965	1963	1964	1965
New obligational authority:						
Appropriation.....	$2,897,878	$3,926,000	$4,382,000	$2,897,878	$3,926,000	$4,382,000
Transferred from "Construction of facilities" (76 Stat. 731).....	32,603	.....	.....	32,603	.....	.....
Transferred to:						
"Administrative operations" (77 Stat. 439).....	.....	-16,385	.....	.....	-16,385	.....
"Operating expenses, Public Buildings Service," General Services Administration (76 Stat. 728).....	-1,074	.....	.....	-1,074	.....	.....
Appropriation (adjusted)	2,929,407	3,909,615	4,382,000	2,929,407	3,909,615	4,382,000

	1963 actual	1964 estimate	1965 estimate
Note.—Reconciliation of budget plan to obligations:			
Total budget plan.....	$2,567,465	$3,998,588	$4,457,900
Deduct portion of budget plan to be obligated in subsequent years.....	102,108	196,261	218,061
Add obligations of prior year budget plans.....	50,027	138,095	196,261
Total obligations.....	2,515,384	3,940,422	4,436,100

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

RESEARCH AND DEVELOPMENT
SUMMARY BY BUDGET ACTIVITY

(In thousands of dollars)

Budget Activities and Programs	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1964 Supplemental	Fiscal Year 1965
MANNED SPACE FLIGHT	$1,503,583	$2,649,800	$141,000	$3,011,900
Gemini	288,090	383,800	---	308,400
Apollo	1,183,965	2,243,900	141,000	2,677,500
Advanced missions	11,391	22,100	---	26,000
Completed missions	20,137	---	---	---
SPACE APPLICATIONS	$96,958	$103,300	---	$86,100
Meteorology	54,051	67,800	---	37,500
Communications	32,075	13,500	---	12,600
Other applications	10,832	22,000	---	36,000
UNMANNED INVESTIGATIONS IN SPACE	$489,951	$602,700	---	$649,800
Spacecraft development and operations	384,222	477,600	---	521,600
Launch vehicle development	105,729	125,100	---	128,200
SPACE RESEARCH AND TECHNOLOGY	$255,962	$298,100	---	$283,300
Launch vehicles and spacecraft	88,547	111,900	---	104,400
Propulsion and space power	167,415	186,200	---	178,900
AIRCRAFT TECHNOLOGY	$15,598	$22,100	---	$37,000
SUPPORTING OPERATIONS	$152,742	$250,000	---	$313,900
Tracking and data acquisition	122,142	210,000	---	267,900
Facility training, and research grants	30,600	40,000	---	46,000
TOTAL PLAN	$2,514,794	$3,926,000	$141,000	$4,382,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

SUMMARY OF RESEARCH AND DEVELOPMENT BUDGET PLAN BY PROGRAM

(In thousands of dollars)

	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1964 Supplemental	Fiscal Year 1965
MANNED SPACE FLIGHT	$1,503,583	$2,649,800	$141,000	$3,011,900
Gemini	288,090	383,800	---	308,400
Apollo	1,183,965	2,243,900	141,000	2,677,500
Advanced missions	11,391	22,100	---	26,000
Completed missions	20,137	---	---	---
SPACE SCIENCE AND APPLICATIONS	$615,345	$742,500	---	$776,900
Geophysics and astronomy	147,689	186,200	---	190,200
Lunar and planetary exploration	222,802	270,800	---	300,400
Sustaining university program	30,600	40,000	---	46,000
Launch vehicle development	105,729	125,100	---	128,200
Bioscience	13,731	20,600	---	31,000
Meteorological satellites	54,051	67,800	---	37,500
Communication satellites	32,075	13,500	---	12,600
Advanced technological satellites	8,668	18,500	---	31,000
ADVANCED RESEARCH AND TECHNOLOGY	$271,560	$320,200	---	$320,300
Basic research	17,696	21,000	---	21,000
Space vehicle systems	43,990	49,000	---	38,800
Electronic systems	17,071	28,700	---	28,400
Human factor systems	9,790	13,200	---	16,200
Nuclear-electric systems	39,893	44,700	---	48,100
Nuclear rockets	69,465	82,700	---	58,000
Chemical propulsion	49,722	45,800	---	59,800
Space power	8,335	13,000	---	13,000
Aeronautics	15,598	22,100	---	37,000
TRACKING AND DATA ACQUISITION	$122,142	$210,000	---	$267,900
TECHNOLOGY UTILIZATION	$2,164	$3,500	---	$5,000
TOTAL PLAN	$2,514,794	$3,926,000	$141,000	$4,382,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

NEW RESEARCH AND DEVELOPMENT PROGRAMS AND PROJECTS

The fiscal year 1965 budget contains $67,700,000 for the following new research and development programs and projects:

	Fiscal Year 1964	Fiscal Year 1965
Communications Satellites Program		
Early gravity gradient experiment	-0-	$5,000,000

The purpose of this project is to research, develop and test gravity gradient stabilized spacecraft in support of the Department of Defense communications satellite program. Stabilization components will be designed for orbital test in a 6,500 mile circular orbit. The fiscal year 1965 funding estimate covers the design and development of spacecraft with launch vehicle and ground support services being furnished by the Department of Defense.

Meteorological Satellite Program		
Synchronous meteorological satellite experiment	-0-	3,200,000

This project has been designed to develop suitable experiments for a synchronous equatorial meteorological satellite which would continuously monitor short-lived storms. Several experiments will be flight tested to verify new optical and camera systems and to assess the effect of sensor motion on the spacecraft stabilization. Studies and hardware development of experiments are programmed for fiscal year 1965 in preparation for flights aboard spacecraft in calendar year 1966.

Advanced Technological Satellites Program		
Supporting research and technology	$2,100,000	1,100,000
Advanced technological satellites	16,400,000	29,900,000

These two projects were initiated in fiscal year 1964 to insure availability of spacecraft technology (particularly in the areas of stabilization, orientation and station keeping in the 24-hour orbit) and to provide the capability for experimental testing of the techniques and devices from various engineering and technological disciplines in the space environment. The most significant areas of supporting research and technology are in those of spacecraft components and materials; of passively

	Fiscal Year 1964	Fiscal Year 1965

damped gravity gradient and active attitude control systems; and of millimeter-wave propagation studies and investigations.

Five orbital launches are planned on the Atlas-Agena launch vehicle - one of a gravity gradient technology satellite in a 6,500 mile orbit and four in stationary orbits, two of which are spin stabilized and two of which are earth oriented.

The fiscal year 1965 funds will provide for continued work on the design and development of spacecraft, ground station equipment procurement, and incremental funding of the launch vehicles.

The program includes much of the spacecraft development work previously planned under the "Advanced Synchronous Communications Satellite" project authorized in the fiscal year 1964 budget.

Lunar and Planetary Exploration Program

Manned space science	$4,200,000	$11,000,000

The scientific mission planning and development of instruments for scientific experiments on manned space flight missions is now budgeted as a separate item. In fiscal year 1964, $4,200,000 was financed under several supporting research and technology projects.

The fiscal year 1965 estimate provides for funds to train the astronauts as scientific observers and participators in specific experiments, to develop equipment for scientific investigations on manned Gemini and Apollo missions, and to study the potential scientific uses of proposed future manned spacecraft systems. This project will help assure that the distinct advantages of manned over unmanned scientific systems are fully exploited.

Launch Vehicle Development Program

FLOX (Flourine-Oxygen Program)	1,900,000	17,500,000

This project, initiated in fiscal year 1964, is designed to develop propellant technology and to apply the new technology to uprate the performance of existing launch vehicles as required. A new oxidizer consisting of 30 percent liquid flourine and 70 percent liquid oxygen (FLOX) will be substituted for liquid oxygen in existing propulsion systems. After engine qualification, the Atlas-Agena and Atlas-Centaur will be qualified for the new propellants. Payload increases of from 30 percent to 90 percent are expected, depending upon the missions. Among the first missions to benefit will be Surveyor, Mariner, the Lunar Orbiter, and the Advanced Technological Satellite.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF MANNED SPACE FLIGHT — GEMINI PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The Gemini program objectives are to develop an operational capability in Manned Space Flight and through this capability to conduct specific experiments and tests which support Apollo, Department of Defense programs and scientific investigations. To accomplish these objectives specific long-duration and rendezvous missions have been planned. During the long-duration missions, the astronauts will control and maneuver the spacecraft thus providing performance data (on both systems and astronaut) after long exposures to space flight. The astronauts will perform a series of experiments generated by NASA, Department of Defense and the scientific community.

The Gemini effort in fiscal year 1965 will be devoted to production and testing of spacecraft, target vehicle and launch vehicle and the conduct of one unmanned and three manned flights. The rendezvous mission will provide a test bed for various phases of the Apollo mission by developing techniques directly applicable to the lunar landing program.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Thousands of Dollars)		
	1963	1964	1965
Spacecraft	$205,045	$252,300	$168,900
Launch vehicles	79,109	110,000	111,300
Gemini support	3,936	21,500	28,200
Total costs	$288,090	$383,800	$308,400

BASIS OF FUND REQUIREMENTS:

Design and development of the Gemini spacecraft will be essentially completed by the end of fiscal year 1964. The first spacecraft was delivered to Kennedy Space Center in early October 1963; the second is scheduled for delivery in the last quarter of fiscal year 1964. In fiscal year 1965, 6 additional spacecraft, now in fabrication and assembly, will be delivered, and production of the remaining 4 will be started. Spacecraft deliveries will be completed in fiscal year 1966.

Gemini launch vehicle development and qualification are largely complete

at this time. Launch Vehicle No. 1 was delivered to Kennedy Space Center in late October 1963 and the second vehicle delivery is scheduled for the last quarter of fiscal year 1964. In fiscal year 1965, 4 additional launch vehicles will be delivered, and fabrication of several of the vehicles to be delivered in fiscal year 1966 will be in progress. The first Atlas booster and Agena Target Vehicle system will be delivered to the Kennedy Space Center in mid-fiscal year 1965 and production will be under way during that fiscal year for four additional systems to be delivered in fiscal year 1966.

Test activity in fiscal year 1965 will constitute a major portion of the program effort. Mercury experience demonstrated that successive testing of each component, subassembly, assembly, subsystem and system under carefully controlled conditions simulating actual space flight is required to assure a flight-worthy spacecraft. The Gemini requirements are even more stringent because of the launch-on-time requirement for the rendezvous missions.

Spacecraft components undergo exhaustive development tests and qualification tests prior to production. Production components must pass pre-delivery acceptance tests before shipment and pre-installation test before being installed on spacecraft. A finished spacecraft is tested for approximately four months at the factory before delivery to Kennedy Space Center and for another three months at the Cape before launch, including the final month of testing on the launch pad with the spacecraft mated to the launch vehicle. In all, the elapsed time spent in testing a completed spacecraft is nearly as long as the time required for its assembly. Test activity on the Gemini launch vehicle and on the Atlas/Agena target vehicle system is comparable in nature and scope.

The four Gemini flights, scheduled in fiscal year 1965 entail a substantial support effort. This effort involves flight and crew operations (flight control and mission planning), recovery operations, test and evaluation, crew training and training devices. The largest single budget item in this area supports the Department of Defense recovery forces. A typical mission requires 18 ships and 100 aircraft on station for one or more weeks at a time.

SCHEDULE OF LAUNCHES

Schedule of Significant Research and Development Events

Events	Quarter	Calendar Year
Launch vehicle/development ground tests	4	1963
Launch vehicle/qualification ground tests	1	1964
Target vehicle (Agena)/development ground tests	1	1964
Gemini #1 flight test	1	1964
Spacecraft/combined systems test	1	1964

Events	Quarter	Calendar Year
Spacecraft/development ground tests	2	1964
Gemini #2 flight test	3	1964
Spacecraft/qualification ground tests	3	1964
Target vehicle (Agena)/hot fire systems test	4	1964
Gemini #3 flight	4	1964
Gemini #4 flight	1	1965
Gemini #5 flight	2	1965

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF MANNED SPACE FLIGHT — APOLLO PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The ultimate goal of the Manned Space Flight program is to provide a broad national capability for manned space exploration, which will achieve and maintain a position of leadership for the United States. A specific objective in acquiring this capability is to land man on the Moon and return him safely to Earth within this decade. The Apollo program encompasses the major portion of the effort to achieve this goal.

The program will lead from one mission to the next in the most logical, safest, and most efficient manner. It consists of three flight phases: (1) unmanned suborbital and Earth-orbital flights; (2) manned Earth-orbital long-duration flights and Earth-orbital rendezvous flights; and (3) manned lunar flights. The Apollo program in fiscal years 1964 and 1965 will concentrate on extensive development and test of major systems and their components.

SUMMARY OF RESOURCES REQUIREMENTS:

(Thousands of Dollars)

Project	1963	1964	1964 Supplemental	1965
Spacecraft.....	$363,962	$870,900	$31,000	$945,800
H-1 engine.....	6,260	11,100	---	9,800
F-1 engine.....	53,703	62,300	---	64,100
J-2 engine.....	46,769	56,600	---	61,600
RL-10 engine.....	29,645	20,000	---	17,900
Saturn I.....	256,887	204,200	---	120,600
Saturn IB.....	21,271	149,900	---	260,100
Saturn V.....	343,442	689,600	110,000	988,400
Apollo support.....	62,026	179,300	---	209,200
Total costs.....	$1,183,965	$2,243,900	$141,000	$2,677,500

BASIS OF FUND REQUIREMENTS:

In fiscal year 1965, the majority of the testing on developmental spacecraft will be completed, and the manufacturing, verification and testing of production flight-configuration spacecraft will be underway. All major module subsystems will be in the final stages of reliability and qualification testing.

The ground test program will be continued in fiscal year 1965 with the delivery of 6 flight-configuration spacecraft. These spacecraft will be used for propulsion system tests, environmental proof tests, vibration and acoustic tests, complete static structural tests, thermal structural tests, and verification of earlier water impact and flotation tests.

The last 3 developmental spacecraft for flight tests will be delivered. They will be used for a high-altitude abort test, a micrometeoroid experiment, and structural qualification of the spacecraft. One will be used for a high-altitude abort test at the White Sands Missile Range.

Four production spacecraft for flight test will be completed. Two of these spacecraft will be delivered to White Sands Missile Range to qualify the critical launch escape system. The other two spacecraft will be delivered to Kennedy Space Center for launch on the Saturn IB. The delivery of the first production spacecraft initiates the "all-up" flight test concept. This concept emphasizes flight testing, at as early a date as possible, complete spacecraft systems that represent as closely as possible the spacecraft systems that will be employed on lunar missions. At the end of fiscal year 1965, 12 production flight-configuration spacecraft will be in various stages of construction.

The Saturn I, first phase, of the Apollo launch vehicle and spacecraft development program, will be completed with the launch of the SA-10. Major flight testing of Apollo spacecraft then shifts to the Saturn IB. Activity in the Saturn IB program will increase significantly in fiscal years 1964 and 1965. Fabrication of the first Saturn IB launch vehicle is underway, and by the end of fiscal year 1964, 2 vehicles will be in the fabrication stage. By the end of fiscal year 1965, the first booster and upper stages will be completed and static tested. In addition, major progress will be made in the fabrication and assembly of the next 3 flight vehicles.

The Saturn V program represents the third and final phase of the vehicle development program as it relates to Apollo. This program, which is being developed concurrently with the Saturn I and Saturn IB, will near its peak effort during fiscal year 1965. Ten ground test stages will be either completed or in the process of fabrication or assembly by the end of fiscal year 1964. In fiscal year 1965 work will be started on the first flight stages; approximately 20 ground or flight stages will be in the fabrication and assembly process or will be completed during the year. Engine development and production are keeping pace with stage activity.

SCHEDULE OF LAUNCHES

Schedule of Significant Research and Development Events

Event	Quarter	Calendar Year
Saturn I launch vehicle/SA-5 flight test	1	1964
Spacecraft/SA-6 flight test; Saturn I launch vehicle/SA-6 flight test	2	1964
J-2 engine/preliminary flight rating test	2	1964
J-2 engine/delivery of first flight engine	3	1964
F-1 engine/preliminary flight rating test	3	1964
H-1 engine/qualification	4	1964
F-1 engine/delivery of first flight engine	1	1965
Saturn I launch vehicle/SA-8 flight test (first Chrysler built booster)	2	1965
Spacecraft/airframe #009 checkout (first spacecraft qualification)	4	1965
J-2 engine/qualification	4	1965

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF MANNED SPACE FLIGHT — ADVANCED MISSIONS PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The Advanced Missions program examines the existing technology of manned space flight and analyzes concepts for future missions to provide the information and evaluation required for logical selection of new projects. The scientific and technical knowledge obtained under this program is essential for sound planning of future manned missions.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Advanced studies.....	$11,391	$22,100	$26,000

BASIS OF FUND REQUIREMENTS:

The advanced study effort during this fiscal year will be aimed at exploiting the Apollo system capability for lunar exploration and earth-orbit research, and at more advanced systems for providing a sound basis for research and development in the technology for long lead time hardware. A continuing evaluation will be made of the various methods of lunar exploration and the scientific data which can be obtained by these methods. The basic requirements and capabilities of manned earth-orbital research laboratories will be developed; studies will continue to define manned planetary missions and evaluate the most promising approaches. Growth studies of Saturn launch vehicles will be conducted and their potential will be compared to other possible post-Saturn launch systems. Finally, recoverable launch systems approaches will be developed and evaluated.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF SPACE SCIENCE AND APPLICATIONS GEOPHYSICS AND ASTRONOMY PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The fundamental objective of the Geophysics and Astronomy Program is to increase our knowledge and understanding of the space environment of the Earth, the Sun and its relationships to the Earth, the geodetic properties of the Earth, and the fundamental physical nature of the universe.

Knowledge of these areas is basic, not only to our understanding of the problems of survival and navigation in space, but also to the improvement of our ability to make technological advances in other fields. The understanding of the Earth's atmosphere is important for advancement of weather forecasting, for solution of spacecraft reentry problems and for study of the atmospheres of other planets. Ionospheric studies contribute to the advancement of radio communications. Studies of the Earth's magnetosphere and the interplanetary medium provide a link between the Earth's atmosphere and solar activity. They also provide information needed for design of spacecraft to assure man's survival in space. Studies of the Sun, when related to studies of the Earth's environment and the interplanetary medium, will give us a capability to forecast the effects based on a knowledge of their causes. Geodetic investigations provide an improved basis for maps of the Earth and for navigation in space. The immediate impact of astronomical observations is more difficult to assess, but they give us an opportunity to observe physical processes that could not possibly be reproduced in a laboratory.

In addition to the predictable practical results, there will no doubt be countless other applications of the knowledge obtained from the Geophysics and Astronomy Program. The program is planned to accumulate this knowledge in an orderly manner so that it will be available to those who will conceive of these practical applications.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology.....	$13,581	$15,100	$14,800
Solar observatories.....	10,900	18,800	22,100
Astronomical observatories.....	39,250	47,700	51,000
Geophysical observatories	39,634	53,300	55,400

	1963	1964	1965
Explorers.....	$32,811	$34,200	$31,900
Sounding rockets.....	11,513	17,100	15,000
Total costs.....	$147,689	$186,200	$190,200

BASIS OF FUND REQUIREMENTS:

Supporting Research and Technology

The supporting research and technology efforts are conducted by universities, NASA installations, and other government and non-government research organizations under the scientific and administrative coordination of the Office of Space Science and Applications. The program includes theoretical and laboratory research, ground based observations, aircraft and balloon flight experiments, and advanced work leading to the development of satellite and rocket borne instrumentation. Data which have been obtained from various flight projects and ground based observations are correlated under this program to take advantage of all available information in arriving at conclusions. The cataloging and preservation of such data are also funded under this program.

Solar Observatories

The First Orbiting Solar Observatory (OSO I) was launched in 1962. Seven similar spacecraft are scheduled for launch at about nine month intervals between now and 1968. The spacecraft points an experimental package at the Sun with an accuracy of one minute of arc to study its electromagnetic radiation in those regions of the spectrum obscured by the Earth's atmosphere. The spacecraft also carries experiments in its stablizing wheel which point at the Sun once with each revolution of the wheel. An Advanced Orbiting Solar Observatory (AOSO) is under development. It will provide the increased pointing capability, larger volume for instruments and the increased telemetry capacity which are required for the study and understanding of solar flares on the Sun.

Astronomical Observatories

The Orbiting Astronomical Observatory (OAO) is being developed to place complex astronomical instruments above the atmosphere and to point the equipment at any selected region of the sky with extreme accuracy and stability. Spacecraft component development is essentially complete and integration of the spacecraft and instruments has begun. Work is progressing on the first three observatories, and work on the fourth observatory will be initiated in fiscal year 1965.

Geophysical Observatories

Orbiting Geophysical Observatory (OGO) is being developed to provide a series of spacecraft capable of supporting a large number of diversified but

correlated scientific and technological investigations within the Earth's atmosphere, the magnetosphere, and cislunar space. The first spacecraft is scheduled for launch in mid 1964 with launchings at the rate of about two per year thereafter. As the development of the spacecraft nears completion, emphasis in funding is shifting to the cost of developing experiments and procuring spacecraft and vehicles for subsequent flights. There is also a provision for an analysis of the data from the forty experiments which will be flown on the first two observatories.

Explorers

Explorers are small satellites designed to carry a specific group of experiments into orbits especially selected for the experiments involved. They have the advantage of a comparatively short leadtime and can be launched by Delta and Scout launch vehicles. This class of satellites is also employed in international cooperative programs because their relatively simple design enables a cooperating country with little or no experience to participate in the program. The funds provide for launching about nine spacecraft per year. New types of Explorers introduced into the program in fiscal years 1964 and 1965 provide for flights in radio astronomy and geodesy. Work is continued in ionospheric and atmospheric research and in exploration of the Earth's magnetosphere and interplanetary space. Cooperative efforts with the United Kingdom, Canada, and Italy are continuing, and a cooperative program with France is being initiated.

Sounding Rockets

Sounding rockets are small vehicles which are used to make vertical profile measurement of the Earth's atmosphere, ionosphere, and magnetosphere; to conduct chemical experiments in the upper atmosphere; to recover meteorite samples for laboratory study; to make short duration observations of the Sun, stars, and planets, and to test satellite prototype instrumentation and techniques in a space environment. Sounding rocket experiments can be prepared with short leadtime. They also provide a means of exploring that part of the upper atmosphere which lies between maximum balloon altitude and minimum satellite altitudes. Their vertical profiles complement the orbital paths of satellites in completing the complex picture of the environment of the Earth. Instrumentation and techniques proved out on sounding rockets provide a test of feasibility for satellite experiments and greatly improve the chances of obtaining useful data. Fiscal year 1964 and fiscal year 1965 funds provide for a level of about 115 flights per year. This represents an increase from a level of 78 flights funded in fiscal year 1963. The increase is occasioned by the accelerated effort to study the Earth's environment during the International Year of the Quiet Sun.

SCHEDULE OF LAUNCHES

Schedule of Significant Research and Development Events

Project	Event	Quarter	Calendar Year
Solar Observatories	- Launch second OSO spacecraft (launches at nine month intervals thereafter)	2	1964
	- Launch first AOSO spacecraft	-	1968
Astronomical Observatories	- Launch first OAO (launches at one year intervals thereafter)	-	1965
Geophysical Observatories	- Launch first OGO (launches at two per year thereafter)		1964
Explorers	- Launch Beacon Explorer for ionospheric propagation and geodetic studies	1	1964
	- Launch Ionosphere Explorer for fixed frequency topside soundings	1	1964
	- Launch Air Density Explorer and Injun Explorer with one Scout vehicle	2	1964
	- Launch Canadian Alouette and Direct Measurements Explorer on one Thor-Agena vehicle for ionosphere monitoring	-	1965
	- Launch Beacon Explorer for geodetic measurements	-	1965
	- Launch first Radio Astronomy Explorer	-	1966
	- Launch integrated Canadian/US International Satellite for Ionspheric Studies (ISIS)	-	1967
Sounding Rockets	- Cosmic dust collection		1964
	- Investigation of equatorial magnetic field		1964
	- Correlated geophysical measurements		1964
	- Separating capsule ionosphere measurements		1964

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF SPACE SCIENCE AND APPLICATIONS — LUNAR AND PLANETARY EXPLORATION PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The objective of lunar and planetary exploration is to obtain significant scientific data from the moon and other bodies of the solar system and interplanetary space. Both attitude and spin stabilized spacecraft will be used. Specific mission objectives include pictures of the lunar surface with resolutions approaching three feet; soft-landing scientific instruments on the moon; broad area photoreconnaissance to assist in selecting sites for manned lunar landing; development of instruments for use by men on the lunar surface; obtaining significant scientific data about the planets, particularly the presence of life; and measuring the interplanetary environment simultaneously at widely separated points in space during all phases of the solar cycle.

Until men can travel to the moon and planets, exploration must be conducted by unmanned spacecraft. Although much can be learned about the moon and planets from the earth, many facets of their nature can be found out only by going there. These flights of exploration will yield information on the history of the moon and the origin of our planetary system.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology	$ 22,205	$ 19,000	$ 18,100
Manned space science	---	4,200	11,000
Ranger	88,816	52,200	10,800
Surveyor lander	66,386	98,600	136,000
Lunar orbiter	4	20,000	49,300
Mariner	42,777	59,100	54,100
Pioneer	2,614	17,700	21,100
Total costs	$222,802	$270,800	$300,400

BASIS OF FUND REQUIREMENTS:

Supporting Research and Technology

This program provides the capability to carry out work not specifically a part of currently approved flight missions, but which contributes to lunar and planetary science, advanced technical development, or advanced mission planning. Ground based observation and measurements of extraterrestrial bodies provide basic scientific data to be used in comparison with flight measurements, and to serve as a background for the development of flight information. This program provides early funding for promising experiments which may later be selected for flight missions. This program provides for work to advance technology as required for future missions including current work on spacecraft sterilization for the prevention of planetary contamination by terrestrial organisms. Advanced studies funded by this program lead to future mission definition and advanced spacecraft configurations.

Manned Space Science

Development of scientific instruments for experiments on manned space flight missions is budgeted as a separate item this year. The $11,000,000 requested will be used to train the astronauts as scientific observers and as participators in specific experiments, to support scientific investigations, to develop equipment for these same scientific investigations on manned Gemini and Apollo missions, and to study the potential scientific uses of proposed future manned spacecraft systems. Man has distinct advantages over unmanned systems as a scientific observer in space and on the lunar surface, and these funds are needed to assure that these advantages will be fully exploited.

Ranger

The objective of the current Ranger program of four flights in calendar year 1964 (Rangers A-D) is to obtain high resolution television pictures of lunar surface which will be of benefit both to science and the United States manned lunar program. These pictures should be at least an order of magnitude better in resolution than any available earth based photography. An extensive redesign and retest program following early Ranger failures is now complete and test results on current spacecraft have been very encouraging, indicating that the objective of increased probability of flight success has been attained. The fiscal year 1965 request will complete funding for the Ranger program.

Surveyor Lander

The objective of Surveyor is to make the first controlled landing on the moon. A series of seventeen flights is planned to measure physical and chemical properties of the lunar surface, its hardness and texture, and seismic activity, as well as to transmit to earth high resolution television pictures and information on meteoroid hazards. The Surveyor represents a

considerable advance in the state of the art in spacecraft technology by its space navigation requirements and multistage rocket descent to a soft lunar landing. To support this effort $136,000,000 is required in fiscal year 1965. These funds will pay for spacecraft development and fabrication, flight scientific hardware, procurement of the Centaur launch vehicle, and mission peculiar ground equipment and operations.

Lunar Orbiter

The lunar orbiter is a high altitude photoreconnaissance satellite designed to support the requirements of the manned lunar landing. Orbiter data will be of significant value for obtaining broad area photographic information and in correlating data acquired on the lunar surface by Surveyor lander. Analysis of its orbit will disclose much about the nature of the moon's shape, its mass distribution, and its internal structure. The Orbiter has taken advantage of the growth of the Atlas-Agena payload capability to 800 pounds for lunar missions and recent improvements in spacecraft technology. Fiscal year 1965 funds will continue the spacecraft development effort initiated in fiscal year 1964 and provide for the initial payment for procurement of the Atlas-Agena launch vehicles.

Mariner

Objectives of this program are to conduct flight missions in the vicinity of the planets Venus and Mars to obtain information about their surfaces and atmospheres. The current series of flights planned for calendar year 1964 and calendar year 1966 are directed toward exploration of Mars. The central scientific objective for Mars is to obtain information relating to the existence of life. The calendar year 1964 Mariner launched on Atlas-Agena will photograph the surface of Mars as it flies by and will search for hydrogen and oxygen required to sustain life as we know it. The calendar year 1966 missions will build on data obtained in the earlier flights by utilizing more sophisticated instrumentation made possible by the additional weight capabilities of the Atlas-Centaur launch vehicle. Fiscal year 1965 funds will complete funding of the calendar year 1964 Mars missions and provide for initiation of hardware procurement for the calendar year 1966 missions.

Pioneer

Pioneer will permit simultaneous measurements of interplanetary phenomena at widely separated points in space, and will complement interplanetary scientific experiments from Mariner missions to Mars during the International Quiet Sun Year. These measurements will lead to better understanding of the interrelation between solar and interplanetary phenomena, which must be understood before hazards to manned space flight missions become predictable. A total of seven flights are planned to assure continuous measurements as solar activity increases toward its maximum.

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SCHEDULE OF LAUNCHES

Schedule of Significant Research and Development Events

Project	Event	Quarter	Calendar Year
Ranger	Ranger A launch	1	1964
Ranger	Ranger B launch	1	1964
Ranger	Ranger C launch	2	1964
Ranger	Ranger D launch	3	1964
Mariner	Two launches to Mars	4	1964
Surveyor	Initial engineering test flight	1	1965
Pioneer	First launch	1	1965
Lunar Orbiter	Initial launches	-	1966
Surveyor	Initial operation flight	-	1966
Mariner	Two launches to Mars	-	1966

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF SPACE SCIENCE AND APPLICATIONS — SUSTAINING UNIVERSITY PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

With its establishment, the National Aeronautics and Space Administration was charged with expanding human knowledge of phenomena in the atmosphere and space and preserving the role of the United States as a leader in aeronautical and space-related science and technology. As would be expected in any undertaking of this complexity and sophistication, the need for knowledge of almost infinite variety was immediately recognized, and it soon became apparent that the existing sponsored research activities could not utilize fully the abilities of our universities. Accordingly, the Sustaining University Program was planned and initiated in fiscal year 1962 to increase university participation in aeronautical and space science and engineering endeavors and to broaden NASA's sponsored research activities.

Shortages of trained people and lack of understanding of natural phenomena are perhaps the most serious impediments to rapid and satisfactory progress in the development of a difficult new technology. Since universities are the traditional sources of both new knowledge and highly trained manpower, a carefully designed, NASA-oriented university relationship is required which can supply scientific talent and significant and relevant research activity commensurate with the demands of the national space effort and its associated activities. Thus in this program, NASA encourages research, helps advance the production of trained talent, and on occasion assists in the provision of research laboratories.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Training.....	$14,145	$20,000	$25,000
Facilities.....	10,249	12,000	10,000
Research.....	6,206	8,000	11,000
Total costs.....	$30,600	$40,000	$46,000

BASIS OF FUND REQUIREMENTS:

The rapid development of the space program continues to place increasingly severe demands on the supply of highly trained scientists and engineers. The President's Science Advisory Committee has emphasized the need for more trained manpower, particularly in the fields of engineering, mathematics and

the physical sciences, and has recommended immediate action to increase the output of Ph.D.'s to a total of 7,500 per year by 1970. By September 1964, about 2,000 scientists and engineers will be in training in the NASA program with an investment of nearly $36 million since its inception. In order to train a commensurate share of the Ph.D.'s needed, particularly those who will become involved in the space program, an additional 1,250 new students should be brought into the program in fiscal year 1965 at a cost of about $25 million.

Research and training in space-related science and technology are often impeded by inadequate or complete lack of existing laboratory space in many institutions. During the next five years a total of some 75 universities heavily engaged in NASA's programs are expected to require over three million square feet of laboratories to accommodate research and training in space-related work. Acquisitions initiated through fiscal year 1964 for this project are adding approximately 855 thousand square feet of laboratory space at a cost of nearly $29 million. A continued, orderly and deliberate acquisition rate to help fulfill part of the remaining needs requires $10 million for construction of an additional 275 thousand square feet of laboratory space during fiscal year 1965.

NASA is acutely aware of the urgent need to expend and improve the capabilities of the nation's universities to conduct research in the space sciences and technology if we are to meet the long-range goals of the space program and remain a world leader in the exploration and conquest of space. We are taking positive action to meet this need by supporting broad programs of space and aeronautical research which have been specifically tailored to the individual characteristics of each university, thus affording maximum opportunity for the adoption of new approaches, balancing and strengthening existing work, and stimulating the development and growth of new talent. In addition, by supporting quality research at selected institutions not currently participating in the space program, the number of universities involved in attacking some of the fundamental problems facing NASA is permitted to grow and thus broaden the base of the nation's total university research capability. To carry out this program, the $11 million request for fiscal year 1965 special-purpose research projects will be used to award about sixty grants to fifty-one universities in thirty-two states. Forty of these grants will be for the continuation of projects supported in fiscal year 1964, and the remainder will go to universities participating in this program for the first time.

SUMMARY

OFFICE OF SPACE SCIENCE AND APPLICATIONS — LAUNCH VEHICLE DEVELOPMENT PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The launch vehicle development program is conducted to assure reliable and economical launch systems for unmanned flight projects.

To accomplish these objectives the Launch Vehicle and Propulsion Programs Office conducts (1) a supporting research and technology program to investigate vehicle system configurations and techniques for meeting mission requirements which exceed existing capabilities; (2) the development of launch vehicles for the support of unmanned spacecraft missions; (3) procurement of launch vehicles for unmanned flight missions; and (4) modifying and improving the existing stable of vehicles and ground systems to support these projects.

SUMMARY OF RESOURCES REQUIREMENTS:

(Thousands of Dollars)

	1963	1964	1965
Supporting research and technology ...	$ 1,598	$ 1,900	$ 4,500
Scout development	3,648	---	---
Delta development	2,183	---	---
Centaur development	90,600	108,100	92,000
FLOX development	---	1,900	17,500
Operational vehicle support	7,700	13,200	14,200
Total costs	$105,729	$125,100	$128,200

BASIS OF FUND REQUIREMENTS:

Supporting Research and Technology

The launch vehicle development supporting research and technology effort consists of studies in the areas of: (1) General vehicle technology to determine applicability of that knowledge to the unmanned mission requirements; (2) Future mission requirements to determine if suitable vehicles are available, or the extent to which changes are required; (3) Design criteria; and (4) Hardware technology including the development of components, subsystems, or techniques found applicable to the needs of the unmanned missions.

These areas include fluid behavior studies, vehicle system studies, solid state component development, instrumentation and propulsion systems technology.

Scout Development

The purpose of the Scout development project was to develop a reliable, inexpensive vehicle for general space research. The vehicle's capabilities include orbital, probe, and re-entry missions.

The Scout vehicle development flight test program consisting of eight launches was completed in fiscal year 1963. Twenty-four Scouts had been launched by the end of calendar year 1963.

Delta Development

Delta is a three-stage launch vehicle which is being used to launch a variety of scientific satellites, application satellites, and space probes.

The development program was completed in fiscal year 1963 and consisted of 12 flight test vehicles. This program has achieved an outstanding record since its inception. After failure of the first launch, the vehicle has performed successfully for 21 consecutive launchings.

Centaur Development

Centaur is a 10-foot diameter, high energy upper stage powered by two Pratt and Whitney RL 10-A-3 liquid hydrogen - liquid oxygen engines of 15,000 pounds thrust each. The Atlas-Centaur combination can launch a payload of over 2,100 pounds to the moon. It will be used by NASA principally for the Surveyor series of unmanned soft lunar landings and Mariner planetary missions. The development project consists of eight flight test launches extending through 1965.

FLOX Development

A vehicle improvement project is being initiated in fiscal year 1964 to achieve a significant improvement in the performance of the Atlas vehicle by substituting 30 percent fluorine and 70 percent oxygen by weight for the present liquid oxygen oxidizer. It will result in increased payload capability, reduce the cost per pound of delivered payload, and increase mission capabilities. The resulting propellant technology will be applicable to other launch vehicles now using liquid oxygen (LOX) as an oxidizer.

The project makes use of the Atlas vehicles recovered from the Mercury program to test the propellant handling system. It includes test firing of engines modified for the more energetic propellant, and flight performance

evaluation. Preliminary studies conducted in 1963 indicate this new propellant mixture will increase payload capability of the Atlas-Centaur for the Surveyor mission approximately 30 percent. A similar increase is expected to be realized on the Atlas-Agena missions, such as the Lunar Orbiter and Advanced Technological Satellite.

Operational Vehicle Support

A continuing program is necessary to keep the Agency's operational stable of launch vehicles available and ready to meet the changing spacecraft and mission requirements with minimum expenditures of funds. The objective of this program is to provide support of launch vehicles that are operational but require modernization or modification to improve reliability and performance. This effort is accomplished through the conduct of product improvement programs, maintenance of ground support equipment peculiar to each type of launch vehicle, and a continuing engineering review of each operational vehicle system.

SCHEDULE OF LAUNCHES

Schedule of Significant Research and Development Events:

Project	Event	Quarter	Calendar Year
Scout	Improved second stage motor, (Castor) available for operational use. First flight on procurement vehicle	4	1964
Delta	First NASA thrust augumented Delta flight	2	1964
Agena	First NASA launch of Agena-D vehicle	4	1964
	Complete launch pad-12 modification for standard Atlas-Agena	1	1965
	First NASA launch of standard Atlas-Agena vehicle	2	1965
Centaur	Centaur insulation and dynamic tests completed	2	1964
	First launch for pad 36B	1	1965
	First Centaur 2 burn flight configuration	1	1965

Project	Event	Quarter	Calendar Year
Centaur	First operational Centaur launch	1	1965
	Final Centaur development flight	2	1965
FLOX	Engine component tests completed	4	1964
	Vehicle component tests completed	1	1965
	Ground support equipment development completed	1	1965
	Engine tests performed	3	1965
	First launch	1	1966

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF SPACE SCIENCE AND APPLICATIONS **BIOSCIENCE PROGRAM**

PROGRAM OBJECTIVES AND JUSTIFICATION:

The Bioscience Program has the major objectives of basic scientific research in the life sciences, biospace missions in the search for extra-terrestrial life, studying the effects of the space environment on living organisms, and basic biological research related to support of man in space.

The knowledge obtained by these investigations will provide man with greater insight into the nature, origin, and evolution of life. In addition, the biological knowledge derived from the ground-based and flight experiments will provide basic information requisite for long duration manned flight.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology.....	$11,772	$12,100	$11,800
Flight program (Biosatellite)...	1,959	8,500	19,200
Total costs.....	$13,731	$20,600	$31,000

BASIS OF FUND REQUIREMENTS:

Supporting Research and Technology

The funds for Supporting Research and Technology provide for ground-based level-of-effort support of basic biological research in areas of major interest and significance to the national space program.

The Supporting Research and Technology program provides the necessary background of theoretical and laboratory research to define the experiments to be carried out in space, to devise the techniques and instruments, and to enable the biologists to interpret the space flight data. The Supporting Research and Technology program uses the facilities of NASA centers, universities, industry and other government agencies. Of the research projects currently sponsored outside of the NASA organization about 50 percent are conducted by universities, 30 percent by industry, and 20 percent by other government agencies.

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The exobiology area involves research related to the prediction, detection, and study of extraterrestrial life. Though basic in orientation, this research has a dual nature. On the one hand, laboratory experiments are designed to obtain information concerning the origin and evolution of organic molecules and subsequent life synthesis in various extraterrestrial environments. On the other hand, both ground-based and in-flight experiments are performed to identify and study terrestrial and extraterrestrial life through the design, development, and utilization of biological sampling devices which will be flown to the moon and planets in future spacecraft.

Flight Program (Biosatellite)

The Biosatellite, which is to be launched by the Delta rocket, is a recoverable spacecraft with a life support system designed to provide flights of from three to thirty days in space for selected experiments. The objective of the project is to determine what the fundamental biological effects of the space environment are, especially weightlessness (zero gravity), radiation when combined with weightlessness, and removal of organisms from the cyclic effects of the earth's rotation. Six Biosatellite flights are planned.

The fiscal year 1964 funds provide for the initiation of design, fabrication and testing of the spacecraft, and for the initiation of research and development of flight experiments.

The fiscal year 1965 funds will provide continued funding for the various components of the spacecraft, and incremental funding of the experiments. In addition, it will provide initial funding for six Delta launch vehicles.

SCHEDULE OF LAUNCHES

Schedule of Significant Events

Project	Event	Quarter	Calendar Year
Biosatellite	Spacecraft Development Contract	1	1964
Biosatellite	First Launch	-	1965

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF SPACE SCIENCE AND APPLICATIONS METEOROLOGICAL SATELLITES PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The purpose of the meteorological satellites program is to use space science and technology to contribute to both the scientific and applications aspects of meteorology. With regard to meteorological science, NASA is providing data required for research which will contribute towards an improved understanding of the relationship between the earth's weather and events in the upper atmosphere and beyond. With regard to the applications aspects, NASA's program is structured so as to be responsive to the requirements of the operational users of meteorological satellite data, including the Weather Bureau and the Department of Defense. The NASA role in this dual effort is such that the specific objectives of the meteorological program are: (1) to develop and improve space technology, including sensors and subsystems which will provide data for use by meteorologists; (2) to carry out flight tests as required to test, calibrate, and prove the applicability of the instrumentation; (3) to fulfill special data requirements of the atmospheric sciences community which can be provided uniquely by satellite instrumentation; and (4) to participate in the operational meteorological satellite systems as required to assist the Weather Bureau in the conduct of the operational system.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology	$4,877	$6,900	$6,600
Synchronous meteorological satellite experiments	---	---	3,200
TIROS	19,176	16,800	5,800
Nimbus	28,561	41,200	18,900
Meteorological sounding rockets	1,437	2,900	3,000
Total costs	$54,051	$67,800	$37,500

BASIS OF FUND REQUIREMENTS:

Supporting Research and Technology

Supporting research and technology is the foundation on which current flight projects are built and the basis for advanced systems. The categories involved are: (1) meteorological systems research which is undertaken to determine the physical measurements required to provide the meteorological data needed by the research or operational users, the technical developments necessary to make such measurements feasible, and the data handling required prior to transmission to the user, (2) advanced meteorological sensor development which produces the sensors that make the physical measurements required to supply meteorological data, and (3) advanced meteorological system component development which provides the unique peripheral spacecraft equipment required for recording and transmitting the information from the sensors.

Synchronous Meteorological Satellite Experiments

A suitably instrumented meteorological satellite in a synchronous equatorial orbit is considered the most advantageous means of fulfilling the requirement for continuous monitoring of short lived storms. It is proposed to flight test several experiments, the results of which will contribute to the definition of the flight program. The experiments will be conducted on the advanced technological satellites being developed to conduct research on a number of satellite problems including observations from the synchronous altitude. Experiments are planned for required operating modes of the optical system (a wide angle view of the full disc of the earth and a directable narrow angle, high resolution view of a selected area), for the camera systems required by the wide range of light values to be observed, and for assessing the effect of sensor motion on the spacecraft stabilization. Studies and hardware development for experiments are proposed for fiscal year 1965 so that these experiments will be ready for flight aboard spacecraft beginning in calendar year 1966.

TIROS

The engineering and scientific feasibility of meteorological satellites has been demonstrated repeatedly by the eight successful TIROS launches. Additional TIROS spacecraft will flight test instrumentation aimed at providing a more complete spectrum of data needed to meet user requirements from advanced research and operational meteorological satellites. At the same time, these TIROS spacecraft will continue to provide operational data for use in weather analyses and forecasting prior to availability of data from fully operational systems. TIROS is planned as the basic instrument in the interim operational meteorological satellite system. The fiscal year 1965 funds are planned to complete incremental funding for spacecraft and launch vehicles for TIROS K and L. Ground Operations and Support funds are for TIROS VIII, and TIROS I and J.

Nimbus

The first Nimbus launch in early calendar year 1964 will flight test a spacecraft with new and sophisticated instrumentation. Data acquisition and operations, as well as systems data analysis and research, are expected to continue into fiscal year 1965. If required, a backup spacecraft will be available for launch in early fiscal year 1965. Funding for the Nimbus B spacecraft will provide for improvements over the Nimbus A spacecraft including redundant TV camera systems, and an advanced medium and high resolution infrared radiometer. The redundant systems are designed to lengthen significantly the operational life of the spacecraft in orbit. The increased spacecraft weight resulting from these additional sensors will be accommodated by the use of the thrust augmented version of the Thor-Agena launch vehicle. These Nimbus launches will provide the foundation for the follow-on generations of meteorological satellites. This work will, in turn, be the basis for the operational system necessary to meet fully the coordinated requirements of the operational data users. In fiscal year 1965, the funding will be completed for the second launch vehicle and the backup spacecraft, as well as providing incremental funding for the Nimbus B spacecraft, Ground Operations and Support for Nimbus A, and prelaunch modification and checkout of the ground equipment for the Nimbus B launch.

Meteorological Sounding Rockets

Two programs involving different size rockets are involved. The program using the larger rockets is to develop measurement techniques for the altitude region from forty to sixty miles. The other program is for the development of a small meteorological rocket system suitable for use in an operational sounding rocket network which would sound the region from twenty to forty miles in altitude. Fiscal year 1965 funds will provide for ground equipment for launching the large rockets and for 45 large rockets including launch and support costs. In the small sounding rocket system development program, fiscal year 1965 funds will provide for 100 rocket flights, improvement of rocket systems, and a start on the design and development of an advanced system.

SCHEDULE OF LAUNCHES

Schedule of Significant Research and Development Events

Project	Event	Quarter	Calendar Year
TIROS	Launch of TIROS VIII, the first TIROS with the automatic picture transmission system	4	1963
Nimbus	Launch of Nimbus A, first spacecraft of the Nimbus series. The Nimbus represents the second generation of meteorological satellites	1	1964

Project	Event	Quarter	Calendar Year
TIROS	Launch of TIROS I, the first "wheel" configuration TIROS	3	1964
TIROS	Launch of TIROS J in a 300 to 3,000 mile eccentric orbit to provide cloud cover data at various resolutions and altitudes	4	1964
TIROS	Launch of TIROS K, the first TIROS to reach synchronous altitude (at apogee in an eccentric orbit) providing continuous viewing for several hours of a given area of weather	2	1965
TIROS	Launch of TIROS L, the first "wheel" configuration TIROS which utilizes the automatic picture transmission system	-	1965
Nimbus	Launch of Nimbus B, providing redundant camera systems, night-time cloud cover and first test of the advanced medium resolution infrared radiometer	-	1965

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF SPACE SCIENCE AND APPLICATIONS — COMMUNICATIONS SATELLITE PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The objective of the communications satellite program is to insure that technology is developed to permit the full exploitation of communication satellite potential for operational systems and for other than common carrier utilization. In addition, the communications satellite program objectives meet National Aeronautics and Space Administration's responsibilities under the Communications Satellite Act. The expected future expansion of communications requirements necessitates the development of new, more reliable, and more economical techniques for providing greater capability than now exists. Communications satellites make it possible to establish microwave communications over long distances by providing relay stations at altitudes where they are in line of sight of many points on the earth's surface simultaneously. With their use, all types of telecommunications can be extended to the entire earth, including areas where conventional means might never be profitable. National Aeronautics and Space Administration will support the continuing improvement, development, and expansion of the possible uses of communications satellite systems through research, development, and flight tests.

Within the communications program, certain exploratory work in navigation and traffic coordination satellite systems is being carried out jointly with other government agencies to formulate the overall national effort.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology	$3,012	$1,700	$3,500
Echo II	2,299	2,600	300
Relay	13,751	2,900	1,800
Syncom	13,013	6,300	2,000
Early gravity gradient experiment	---	---	5,000
Total costs	$32,075	$13,500	$12,600

BASIS OF FUND REQUIREMENTS:

Supporting Research and Technology

The most significant areas of activity in the supporting research and technology program in fiscal years 1964 and 1965 are (1) advanced passive satellite development, (2) investigation and development of spacecraft subsystems, (3) frequency sharing criteria, and (4) studies on navigation-traffic coordination satellite systems and on satellite systems capable of linking terminals of greatly reduced size and cost making possible communications with aircraft, ships at sea, and small portable emergency land stations.

Echo II

The Echo II project consists of design, development, test (including two ballistic launches), and single orbital launch of a 135-foot diameter rigidized spherical satellite. Post-launch experimentation will consist of radar and optical observations to determine sphere characteristics and suitability for use as a reflector of radio waves. Funding through fiscal year 1964 covers all aspects of the project through orbital launch and the first six months of post-launch observations. Fiscal year 1965 funds are required to continue observations and data analysis.

Relay

The Relay project consists of the design, development, test, and two orbital launches of active communication satellites into intermediate altitude elliptical orbits and performance of communications experiments using ground stations in North and South America, Europe, and Japan. Funding through fiscal year 1964 provides for completion of all flight hardware, conduct of both launches, equipping of National Aeronautics and Space Administration ground test stations, and experimental operations throughout the life of Relay I and for the first six months of Relay II. Funds requested for fiscal year 1965 will support maintenance of National Aeronautics and Space Administration ground test stations, performance of communications experiments, operational planning and support, and analysis of results of communications and radiation experiments.

Syncom

Project Syncom consists of the design, development, test, four orbital launches of active communication satellites into synchronous orbit, and a determination of the communications system's performance employing widely separated ground stations. Funding through fiscal year 1964 includes costs for all flight hardware, launchings, and for operations through the third launch. Funds requested for fiscal year 1965 will cover flight hardware, launch support for the fourth launch and operations for the first six months of lifetime of the fourth satellite, and continuation of operations for the others. Communications ground station cost is funded by the Department of Defense.

Early Gravity Gradient Experiment

This project includes research, development, and test of a gravity gradient stabilized spacecraft which directly supports the Department of Defense communications satellite program. The spacecraft design will be compatible with the requirements provided to NASA by the Department of Defense. Stabilization components will be designed for orbital test into a 6,500 mile circular orbit. Responsibility for flight demonstration of the spacecraft will rest with the Department of Defense.

The fiscal year 1965 funding estimate covers the design and development of spacecraft, but does not include launch vehicle and ground support services as these will be provided by the Department of Defense.

SCHEDULE OF LAUNCHES

Schedule of Significant Research and Development Events

Project	Event	Quarter	Calendar Year
Syncom	Launch of Syncom II into synchronous orbit.	3	1963
Echo	Launch of Echo C (II).	1	1964
Relay	Launch of Relay II into intermediate altitude orbit.	1	1964
Syncom	Launch of Syncom III into synchronous orbit.	2	1964
Syncom	Launch of Syncom IV into synchronous orbit.	1	1965
Early gravity gradient experiment	Launch of gravity gradient spacecraft by Department of Defense.	-	1965

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RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF SPACE SCIENCE AND APPLICATIONS

ADVANCED TECHNOLOGICAL SATELLITES PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The objectives of the program are (1) to develop spacecraft technology particularly suited for space applications, (2) to provide capability for experimental testing of the techniques and devices from various engineering and technological disciplines in the space environment, particularly in the higher altitude orbits, and (3) to provide basic technological and scientific data on gravity gradient stabilization in the 6,500 mile orbit which may be extrapolated to orbits of any altitude. There is an existing and growing need in the Department of Defense and in National Aeronautics and Space Administration for improved spacecraft technology in the areas of stabilization, orientation, and station keeping in the synchronous orbit. There is a requirement for obtaining engineering data on the synchronous orbit for use in designing systems for that discrete orbit with its unique features. There is also a requirement of great importance to both the Department of Defense and National Aeronautics and Space Administration for basic information to validate theoretical concepts of gravity gradient stabilization. This information should be amenable to extrapolation to other altitudes and be convertible to engineering handbook type data for use in systems design. It is the purpose of the advanced technological satellites program to meet these requirements.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology.....	$8,668	$2,100	$1,100
Advanced technological satellites.....	---	16,400	29,900
Total costs.....	$8,668	$18,500	$31,000

Supporting Research and Technology

The most significant areas of activity in the supporting research and technology program in fiscal years 1964 and 1965 are: (1) research and development in spacecraft components and materials, (2) passively damped gravity gradient and active attitude control systems, and (3) millimeter-wave propagation studies and investigations.

Advanced Technological Satellites

This project consists of a series of launches devoted to the development of advanced technology for a number of applications. It includes research, development, test, and data analysis. Five orbital launches are planned, one of a gravity gradient technology satellite in a 6,500 mile orbit, and four in stationary orbit, two spin-stabilized and two earth-oriented. The stationary orbit satellites will carry experiments in communication, meteorology, radiation environment and damage, and stabilization and orientation techniques in addition to experiments in other technological areas. The 6,500 mile orbit launch is a technological gravity gradient experiment to obtain basic data about gravity gradient stabilization techniques in space.

Fiscal year 1964 funding includes design and development of spacecraft and initial ground station equipment procurement. Fiscal year 1965 funds will be used to continue work on the design and development of spacecraft, ground station equipment procurement, and incremental funding of the launch vehicles.

SCHEDULE OF LAUNCHES

Schedule of Significant Research and Development Events

Project	Events	Quarter	Calendar Year
Advanced technological satellites	Launch of 6,500 mile gravity gradient satellite	-	1966
Advanced technological satellites	Launch of two synchronous spin stabilized advanced technological satellites	-	1967
Advanced technological satellites	Launch of two synchronous earth-oriented advanced technological satellites	-	1968

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY — BASIC RESEARCH PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The purpose of the Basic Research program is to initiate and administer fundamental research work to obtain basic knowledge for our rapidly advancing technology. In order to improve our technological knowledge and techniques, NASA will conduct basic research in the physical and mathematical sciences.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology.....	$17,696	$21,000	$21,000
Total costs.....	$17,696	$21,000	$21,000

BASIS OF FUND REQUIREMENTS:

The Basic Research program concentrates on four major disciplines directly related to NASA's current and future missions. These disciplines are Fluid Physics, Electrophysics, Materials and Applied Mathematics. Work in the mechanisms of energy conversion in atoms will be helpful in fabricating new gaseous and solid state lasers for use in space communication and tracking; mathematical research is leading toward an improved capability of predicting the motion of a space vehicle; explorations in plasma behavior will provide information helpful to the development of space power systems and electrical engines for spacecraft propulsion; and research devoted to materials will provide techniques to develop lighter materials operating at higher temperatures for space vehicles and supersonic aircraft.

The program will be implemented through extensive efforts in the NASA field centers supplemented by grants or contracts in educational, governmental, non-profit and industrial laboratories.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY SPACE VEHICLE SYSTEMS PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The objectives of the Space Vehicle Systems program are to identify and solve critical technical problems bearing on present generation space vehicles, and to advance the state-of-the-art to enable the development of more advanced space vehicles.

The space vehicle represents a system of enormous complexity in which the major elements must be brought together and integrated in such a way as to insure reliable and efficient performance. The space vehicle research and technology program reflects the broad scope of mission and operational requirements.

Comprehensive knowledge must be obtained on atmospheric winds and turbulence, aerodynamic forces and moments, buffeting and flutter, aerodynamic heating of the vehicle during ascent, and heating of the base and afterbody due to the high-temperature exhaust. The refinement of structural design requires knowledge of the dynamic behavior of the large, highly stressed and flexible vehicles and requires further evolution and development of new and advanced structural materials and principles of structural design.

Comprehensive knowledge of the space environment is required. NASA will study: high-energy charged particle radiations and the interactions of the radiation with matter and new means of shielding; the distribution and population of hazardous particles (meteoroids), and the phenomena of hypervelocity impact and penetration, and means for protection of spacecraft from penetration; the high vacuum of space; thermal radiation from the sun; weightlessness which influences the behavior and control of propellants and other fluids; and the control of spacecraft temperatures.

Atmosphere entry and soft landing of unmanned and manned spacecraft pose continuing vehicle design problems. A broad research program in the areas of aerothermodynamics, fluid physics, structures and materials is required to produce basic understanding of high-temperature gas properties, flow fields, distribution of radiative and convective heating, stability and control, ablative materials and thermal protection systems, and high-temperature structural design.

To guide the overall program of theoretical and experimental research, continuing studies are being conducted on advanced space missions and vehicle concepts. These studies have the specific objectives of assessing

new missions or flight operations, providing ideas and innovation in space vehicle concepts, and identifying technical problems requiring long-lead-time research.

Another responsibility of the space vehicle research and technology program is application of promising new results and of the best current knowledge to the formulation of space vehicle design criteria.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology	$20,226	$26,300	$26,300
Scout reentry heating experiments	1,383	1,500	2,000
FIRE	13,912	8,000	3,000
Saturn launched meteoroid experiments	3,940	8,000	2,600
Small space vehicle flight experiments	1,724	2,800	3,000
Lifting body flight and landing tests	---	900	1,900
Scout launched meteoroid experiments (S-55)	2,805	1,500	---
Total costs	$43,990	$49,000	$38,800

BASIS OF FUND REQUIREMENTS:

Supporting Research and Technology

This program includes experimental and analytical research. The experimental research is conducted in a variety of facilities including wind tunnels, shock tubes, shock tunnels, free flight ranges, space simulators, vacuum chambers, plasma devices, electron beam apparatus, zero-gravity drop towers, arc jets and other high-temperature facilities, and specialized space vehicle materials and structures research facilities, including structural dynamics test facilities.

Scout Reentry Heating Experiments Flight Project

The remaining flights will investigate the performance of heat shield materials at velocities from 19,000 to 24,000 miles per hour, and provide data for greater confidence in high-temperature laboratory test facilities. A flight experiment spacecraft of 24,000 miles per hour reentry velocity will be launched in the fourth quarter of calendar year 1964; another flight is planned for launch in calendar year 1965. It is anticipated that the heat shield materials selected for Apollo application will be tested in these experiments.

FIRE

This flight project will investigate the heating environment of a blunt shaped Apollo-like body during reentry at speeds in excess of 26,000 miles per hour. Measurements of total radiation from the spectral content of the hot gas surrounding the spacecraft during reentry will be made. Fiscal year 1965 funds will be used to prepare the second vehicle for flight, including the incorporation of modifications deemed desirable from the results of the first flight, to launch the experiment, and to reduce, analyse, and report the results from the flight.

Saturn Launched Meteoroid Experiments

The experiments to be launched on development Saturn vehicles will permit penetration data to be obtained on metal surfaces 15 times thicker than those employed in previous experiments. The funds requested are for completion of the spacecraft, and for spacecraft launch preparation, check-out, and integration.

Small Space Vehicle Flight Experiments

This project includes ballistic trajectory flight experiments using small launch rockets to verify results obtained in ground-based facilities and to investigate problems which can only be studied under actual flight conditions. In fiscal year 1965 funds are needed to purchase solid rockets, to provide equipment and instrumentation, to provide contractual assistance in fabricating some of the experiments, and to cover launch operations costs.

Lifting-body Flight and Landing Tests

Recent research has led to a highly promising class of entry vehicles known as lifting bodies which uniquely appear to possess high maneuverability coupled with ability to cope with the heating associated with lunar return or return from missions even beyond the moon. NASA will extend and broaden the base of the flight research program dealing with approach, flare, and landing problems to include other promising lifting-body configurations and to extend the range of wing loadings to the higher values that would exist in practical vehicles. The funds requested in fiscal year 1965 will complete test vehicle construction begun with fiscal year 1964 funds, provide the required research instrumentation, and begin flight tests.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY — ELECTRONIC SYSTEMS PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The Electronic Systems program provides, through research and technology, the basis for developing reliable and efficient components, and flexible and proven techniques for ultimate use in guidance, control, communications, tracking, instrumentation and data processing systems. The spectrum of research activity ranges from laboratory and theoretical investigations which make possible new approaches to flight experiments employed to examine the feasibility, or provide environmental verification of new devices or theories.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology.....	$15,535	$24,900	$25,400
Small flight projects.....	1,536	3,800	3,000
Total costs.....	$17,071	$28,700	$28,400

BASIS OF FUND REQUIREMENTS:

The funds required for electronic systems supporting research and technology provide equipment necessary to conduct NASA in-house studies and provide for research contracts and grants to industry and universities.

Small flight projects funding provides for experiments which cannot be performed adequately on the ground. Data obtained from the small flight projects will augment and verify predictions made from ground tests.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY HUMAN FACTOR SYSTEMS PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

Future aerospace project successes depend upon the effective utilization of man, both space and ground based. The Human Factor Systems program is providing research supporting the successful consummation of these projects. Specific program objectives are (1) to obtain a better understanding of man's capabilities and limitations and to determine his utilization in advanced aerospace systems, (2) to obtain information which will be the basis of designs of systems for maintaining the high operating efficiency of crews during programmed and emergency phases of advanced aerospace missions, and (3) to determine overall human factor requirements and integrate them into the design of advanced aeronautical, astronautical and ground support systems.

The major program effort is located at Ames Research Center. In addition, other NASA centers, other government agencies, universities and industry participate. The intra-NASA and Department of Defense-NASA review procedures of life sciences tasks avoid duplication of effort and provide a better balanced national life sciences program. Intra-agency coordination of supporting research and technology taks is conducted through the Life Sciences Subpanel of the Supporting Research and Technology Panel, Aeronautics and Astronautics Coordinating Board.

Future manned space missions depend on the effective safe utilization of man for extended periods of time. Maximum reliability and safety, and minimum payload weight can be realized by utilizing man as a primary or backup component. Determination of the assignment of such tasks is dependent upon the physical condition of the crew, their performance and their ability to communicate. Throughout these missions, man will be subjected to a variety of natural and mission dependent environments such as vacuum, temperature, acceleration, weightlessness, radiation, and magnetic fields. We must know the physiological and psychological effects of each unique environmental factor, as well as the interaction of these factors to insure the effective integration of man as a part of the total system.

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SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology.....	$9,678	$13,200	$13,200
Flight program:			
Small biotechnology flight projects.....	112	---	3,000
Total costs.....	$9,790	$13,200	$16,200

BASIS OF FUND REQUIREMENTS:

Supporting research and technology funds will provide experimental equipment for research in NASA centers, and will support contracts and grants to industry, universities, and other government agencies.

Small biotechnology flight projects funds will be used to develop and check out the experiments to be flown on approved flight projects. These flight experiments will augment data evolved through supporting research and technology.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY — NUCLEAR-ELECTRIC PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

Nuclear-electric power generating systems offer the most practical sources of electric power in the kilowatt and megawatt levels for future spacecraft power. Nuclear-electric propulsion systems have the highest performance potential of any system capable of development within the predictable future.

The nuclear-electric program is intended to explore and evaluate the advantages and disadvantages, the limitations and problems of the various power and propulsion concepts and their subsystems, and develop the most promising concepts for mission use. The program covers: technology development which includes gathering basic data for component design; component fabrication for evaluation in ground and flight facilities; and, the development of selected systems.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology	$19,463	$24,600	$25,000
SNAP-8 development	15,994	15,500	18,000
Space electric rocket test (SERT)	3,188	4,000	5,100
Small nuclear-electric propulsion and power flight projects	1,248	600	---
Total costs	$39,893	$44,700	$48,100

BASIS OF FUND REQUIREMENTS:

Supporting Research and Technology

The supporting research and technology program accumulates the scientific and engineering information needed for design of advanced components, and evaluates selected advanced components in ground test facilities for both electric power generation and electric thrustor technology. Fund requirements shown are based on mission use of nuclear electric systems in 1970-1980.

SNAP-8 Development

The SNAP-8 nuclear-electric power generation system is a 35 kilowatt, 10,000 hour, maintenance-free life system for advanced space missions under development by the Atomic Energy Commission (reactor subsystem) and NASA (power conversion subsystem and integration of both subsystems). Redesigned in fiscal year 1963, test components are being fabricated in fiscal year 1964 with test data on the power conversion system first expected during the latter part of fiscal year 1964 and continuing to be accumulated during fiscal year 1965. The requirement for 10,000 hours of maintenance free life imposes a lengthy testing program (in excess of 60,000 hours) which is scheduled for completion during calendar year 1969.

Space Electric Rocket Test (SERT)

The space electric rocket test flight project is conducted in support of the power and thrustor supporting research and technology programs to obtain data that cannot be obtained in ground test facilities. The first flights are tests to determine the degree of neutralization of an ion thrustor exhaust jet in space. Later orbital flights of attitude control and station-keeping system components as well as long duration tests of power and thrustor components are under study pending the outcome of extensive ground evaluation tests planned for fiscal years 1964 and 1965.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY — NUCLEAR ROCKETS PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

This program provides the research, design and engineering data, test hardware, and general technology required to assure that nuclear rocket systems can be developed at the power levels, operating times, restart conditions and specific impulse values needed in advanced space exploration missions.

It is generally accepted that nuclear rocket propulsion will be required in advanced missions beyond Apollo, such as lunar logistics ferry, very heavy deep space instrumented probes, and manned exploration of the planets. This area of manned planetary expeditions is considered among the major applications for nuclear rockets; a nuclear rocket propelled Mars spacecraft can be 1/3 to 1/10 the weight of a chemically propelled spacecraft.

The emphasis in the Nuclear Rocket program is on laying a foundation for rapid development of nuclear rocket systems that will be required to accomplish heavy payload, high energy missions in space.

Nuclear reactor research and engineering work is of major importance since this area constitutes the major new tecnology part of the program. In addition, emphasis is placed on non-reactor components whose operating requirements tax the available technology and on the study of the fundamental heat transfer, fluid flow, stress, and nuclear phenomena involved. An essential part of this program is work on experimental ground test engine systems to develop a full understanding of the interaction of components in nuclear rocket engines and the system performance characteristics. These data form a basis for flight system development and provide information required by mission planners to incorporate nuclear capabilities in advanced missions. The effort is, therefore, directed to utlimate use in flight systems.

This program is conducted as a joint effort of the National Aeronautics and Space Administration and the Atomic Energy Commission. The Space Nuclear Propulsion Office has been established by Atomic Energy Commission and National Aeronautics and Space Administration agreement to jointly manage all aspects of the nuclear rocket propulsion effort.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology.....	$12,878	$21,200	$23,000
Kiwi.....	3,856	1,500	---
NERVA.....	41,884	52,000	34,500
RIFT.....	10,847	7,500	---
NRDS.....	---	500	500
Total costs.....	$69,465	$82,700	$58,000

BASIS OF FUND REQUIREMENTS:

Supporting Research and Technology

Supporting research and technology provides a continuing program for providing basic technology for nuclear rocket engines and vehicles. This program also includes the evaluation of the feasibility of advanced concepts and studies on the special safety problems associated with nuclear rockets.

Kiwi

No funds are requested in fiscal year 1965 since the test program will be completed and the project terminated in early fiscal year 1965.

NERVA

This project covers the formulation of technology and sufficient engine testing to permit, at some future time, the development of specific nuclear rocket propulsion systems that will be needed when heavy payload, deep space missions are specified. A continuing research and engineering program is underway to investigate the power levels, temperatures, operating times and operating cycles required by the various missions through the use of nuclear rockets.

RIFT

This project was to provide a vehicle for evaluating the operating characteristics of the NERVA engine and associated stage and engine subsystems in a space flight environment. The RIFT project was paced by the reactor development work and no major full-scale hardware commitments had been made, at the time during fiscal year 1964, when the decision was reached to terminate the project work and retain only vehicle technology effort under the supporting research and technology program. No funds are budgeted for this project in fiscal year 1965.

Nuclear Rocket Development Station

The funds under this project provide for base support of the Nuclear Rocket Development Station in Nevada which serves, by Atomic Energy Commission-National Aeronautics and Space Administration agreement, as a site for the testing of nuclear rocket reactors, engines and eventual vehicle stages. Base support consists of the services necessary for routine maintenance and operation of the facilities at the Station.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY — CHEMICAL PROPULSION PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The chemical propulsion research and technology program increases the knowledge of chemical propulsion processes, investigates new concepts and techniques, establishes a sound engineering basis for developing new ideas and approaches into useful propulsion devices, and supports the various program and project offices.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology	$14,392	$21,800	$21,800
Experimental engines	35,000	24,000	38,000
Small chemical propulsion flight projects	330	---	---
Total costs	$49,722	$45,800	$59,800

BASIS OF FUND REQUIREMENTS:

The chemical propulsion supporting research and technology program encompasses four subdivisions: (1) chemical propulsion research, which includes analytical studies, conceptual designs, combustion phenomena, fluid mechanics, gas dynamics, heat transfer, and materials applications; (2) high-impulse propellant investigation, which covers examination of the theoretical and practical problems of applying new propellants to NASA's mission; (3) liquid rocket engine technology, which involves design and improvement of engine components, subsystems or systems; and (4) solid rocket motor technology, which concerns practical problem investigations of building and using solid propellant motors.

Experimental and prototype engine developments involve engine performance and feasibility demonstrations as well as development of prototype engines for future application. Included are an engineering evaluation of the practicality of very large (260" diameter) solid motors, and a prototype development of a 1,500,000 pound thrust high performance engine (M-1) using oxygen/hydrogen propellants.

The funds requested for supporting research and technology will support activities within NASA centers as well as those conducted by industrial, university, and other organizations. Support of work at NASA centers includes procurement of laboratory equipment, engine systems and components, instrumentation, and supply and equipment items peculiar to the chemical propulsion program. The funds requested for experimental and prototype engines will be utilized to fund contracts with industrial organizations to carry out the program of design, fabrication and operation required.

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY **SPACE POWER PROGRAM**

PROGRAM OBJECTIVES AND JUSTIFICATION:

The Space Power Program provides research and technology to advance our knowledge, by providing new and improved methods of chemical and solar power generation for space exploration. The program includes all elements of complete systems such as: (1) the energy collection equipment (solar collector) or reactant supply; (2) the prime converter (i.e., solar cells, thermionic generators, thermoelectric converter, fuel cell, etc.); (3) the energy storage system (battery or thermal energy storage material); and (4) power conditioning equipment devices and switch-gear. In addition to the more basic work, part of the effort is directed at development of improved devices and demonstration of the feasibility of advanced systems.

All space vehicles use electrical energy for the operation of their equipment, such as communications, telemetry, life support, and instrumentation. Thus, this multi-disciplined program makes a direct contribution to a broad cross-section of the national space program. The energy source for space power systems may be chemical, solar, or nuclear; this program deals with methods of obtaining energy from the first two sources. Work on power generation using nuclear energy sources is covered under Nuclear Electric Systems.

The electrical power for space vehicles and the total time this power is needed varies widely. The power levels vary from a few watts to many kilowatts and durations from a few minutes for a launch vehicle to goals of several years for space vehicles. This wide range of applications requires a number of power generation techniques, each with its own capabilities and limitations.

As launch vehicle capabilities increase, making possible more complex spacecraft, it is essential that the technology in the power generation field not become a limiting factor. All system experience to date has been at rather low power levels.

Many problems also remain to be solved in the types of systems presently being used to improve reliability and life as well as to reduce weight and volume requirements. This work is needed to develop equipment and the knowledge needed to avoid failures associated with such adverse effects as the Van Allen belt, solar flare radiation, ultraviolet degradation, and high and low temperature effects.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology.....	$8,335	$13,000	$13,000
Total costs.....	$8,335	$13,000	$13,000

BASIS OF FUND REQUIREMENTS:

Supporting Research and Technology funds are required for research and test equipment at NASA centers, and for contracts and grants to industry, universities, research institutes, and other Government agencies.

The Space Power Program obtains knowledge and develops methods for new and improved power systems of high power-to-weight ratio that are simple, rugged, reliable, and long lived. This work is concerned with converting solar and chemical energy to electric power, energy storage, and power control and distribution.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY — AERONAUTICS PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The objective of the National Aeronautics and Space Administration Aeronautics program is to conduct the research necessary to generate information for the design, construction, and operation of advanced aeronautical vehicles. This research program supports current and projected civil and military requirements to maintain United States leadership in these fields.

Research is carried out in the technical disciplines of aerodynamics, loads and structures, propulsion, and operating problems.

Program research in the technical disciplines can be focused on certain aircraft types such as Supersonic Transport, Vertical and Short Take-off and Landing (V/STOL) aircraft, and the X-15A. It is the National Aeronautics and Space Administration's responsibility to provide the required research information and technical support to enable industry to build a reliable, economical, safe, and publicly acceptable supersonic transport for the United States airlines; a detailed research program is underway to accomplish this.

In the Vertical and Short Take-off and Landing (V/STOL) area the objective of the National Aeronautics and Space Administration research is to provide the required information to enable economical, reliable, all-weather vehicles to be designed and built to meet future commercial transportation and military requirements.

The X-15A continues to provide valuable research information at hypersonic speeds and continues to be a test bed for various space experiments. Studies have indicated the feasibility of utilizing the modified X-15A-2 as a reliable test vehicle for advancing the state-of-the-art of air-breathing propulsion systems and in other research areas.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology.....	$6,580	$8,900	$9,400
X-15 A.....	5,580	900	900

(Thousands of Dollars)

	1963	1964	1965
Supersonic transport.....	$2,513	$10,200	$24,700
V/STOL.....	925	2,100	2,000
Total costs.....	$15,598	$22,100	$37,000

BASIS OF FUND REQUIREMENTS:

The National Aeronautics and Space Administration Aeronautics program is directed primarily toward advanced research and technology. The funding provides National Aeronautics and Space Administration Research Centers with the necessary instrumentation, models, and supporting equipment to conduct fundamental experimental investigation and studies in techniques and disciplines of aerodynamics, loads and structures, propulsion, and operating problems.

The X-15A program is an on-going one which will continue in fiscal year 1965. The funds requested support the flight research portion of the program.

The increase in funds requested for fiscal year 1965 for supersonic transport research reflects the need for continued research on propulsion systems to provide the advanced powerplants that will be needed for future operational supersonic transports and for follow-on vehicles. In prior years, fiscal years 1962 and 1963, funds were procured by the Federal Aviation Agency for a joint Federal Aviation Agency-National Aeronautics and Space Administration-Department of Defense research program for a supersonic transport. It is the responsibility of the National Aeronautics and Space Administration to provide the research information and technology in support of the program while the Federal Aviation Agency proceeds with the prototype development.

The funding requested for V/STOL aircraft research in fiscal year 1965 reflects a level of effort essentially the same as for fiscal year 1964. The funds are required primarily for wind-tunnel models and for purchase or operation of advanced V/STOL aircraft.

SUMMARY

OFFICE OF TRACKING AND DATA ACQUISITION TRACKING AND DATA ACQUISITION PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The objective of the NASA Tracking and Data Acquisition program is to provide operational ground instrumentation support required by all NASA flight projects.

Every space flight mission undertaken, whether launch vehicle development, scientific satellite, space probe, or manned spacecraft, is undertaken to further our knowledge of the space environment by means of the acquisition and analysis of scientific information recorded during these missions. The critical element in getting such information back to the managers of the mission is the world-wide network of tracking and data acquisition stations. These stations, linked together and to the NASA mission control and data centers by a communications net, receive and record telemetered scientific data, including voice and video data; track the spacecraft in order to determine its position; and transmit signals to the spacecraft as required. Each flight mission has its own specific requirements for tracking accuracy; amount and kind of spacecraft-gathered information to be transmitted; command signals to be received; and location of ground instrumentation to perform these functions. The NASA networks, supplemented as required by other than NASA stations, are a flexible and responsive tool used to fulfill the requirements of the flight missions.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Supporting research and technology	$13,277	$12,000	$15,500
Network operations	55,943	81,500	99,800
Equipment and components	52,922	116,500	152,600
Total costs	$122,142	$210,000	$267,900

BASIS OF FUND REQUIREMENTS:

To be responsive and flexible in giving tracking and data acquisition support to varied flight projects, the NASA networks require a continuing program of component and system improvement and development, station network operations, and equipment additions and modifications.

The program for Supporting Research and Technology will be directed primarily toward the improvement of existing equipment systems and subsystems and, in addition, toward development of new equipment for ground instrumentation support. Greater capability than that which presently exists in ground instrumentation is necessary to support planned manned and unmanned flight projects.

The program for network operations reflects the increasingly complex support capability required by the NASA flight programs. To perform these functions, additional personnel, logistics and maintenance are required for operating the networks as new stations and equipment become operational.

To meet specific ground support requirements for the various types of flight projects, new equipment capability in the networks is necessary. Major equipment requirements for fiscal year 1965 are related to the observatory class satellite projects, the Apollo manned space flight missions, and the deep space flight projects. There are also increasing equipment requirements for the communications and data processing functions which are vital for an integrated tracking and data acquisition capability.

RESEARCH AND DEVELOPMENT

FISCAL YEAR 1965 ESTIMATES

SUMMARY

OFFICE OF TECHNOLOGY UTILIZATION AND POLICY PLANNING

TECHNOLOGY UTILIZATION PROGRAM

PROGRAM OBJECTIVES AND JUSTIFICATION:

The primary objective of the technology utilization program is accelerated transfer of new technology generated by NASA research and development into the civilian sector of our economy. Also included within this program are efforts to develop better methods for management of large-scale research and development programs, and to improve our understanding of the implications of the space program.

SUMMARY OF RESOURCES REQUIREMENTS: (Thousands of Dollars)

	1963	1964	1965
Research and development.....	$2,164	$3,500	$5,000

BASIS OF FUND REQUIREMENTS:

The main purpose of this program is the identification, collection and dissemination of technical information which has application within non-aerospace industry. Procedurally, innovations originating with either NASA in-house or contractor sources are initially evaluated for industrial potential at the originating NASA field center. Special reports are then prepared and transmitted to NASA Headquarters for further evaluation and eventual publication and dissemination to the industrial community.

Several pilot projects now underway in techniques of information dissemination will be expanded in fiscal year 1965. The outgrowth of these projects will be a strengthening of our national scientific resources through the more localized application of the benefits of NASA research and technology efforts.

Another integral part of the technical information aspect of the program is the preparation of extensive state-of-the-art surveys. Industrial teams, each competent in a particular technical area, search available NASA data on a specific subject item, relate technical advances to current knowledge and usage, and, finally, prepare industry-oriented reports of information so gleaned. Approximately 20 such surveys are planned during fiscal year 1965.

Also in fiscal year 1965, a number of universities will conduct research into the management of large-scale research and development programs. The

results of this research, as well as other inputs, will serve as the basis for policy planning studies on the implications of the space program. For the conduct of these planning studies, NASA in-house efforts will be augmented, as required, by contractor assistance.

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION BILL

CONSTRUCTION OF FACILITIES

For advance planning, design and construction of facilities for the National Aeronautics and Space Administration and for the acquisition or condemnation of real property, as authorized by law, [$680,000,000] *$281,000,000*, to remain available until expended. *(42 U.S.C. 2451, et seq., 50 U.S.C. 151–160, 511–515; Independent Offices Appropriation Act, 1964; additional authorizing legislation to be proposed.)*

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

CONSTRUCTION OF FACILITIES

Program and Financing (in thousands of dollars)

	Budget Plan			Obligations		
	1963	1964	1965	1963	1964	1965
Program by activities:						
Direct:						
1. Manned space flight.....	$543,809	$495,179	$234,330	$446,893	$666,249	$237,957
2. Space applications.....	194	3,933	.....	.....	4,127	.....
3. Unmanned investigations in space.....	47,262	18,574	7,018	32,755	39,954	26,371
4. Space research and technology	106,849	56,833	26,620	57,111	97,524	66,123
5. Aircraft technology.....	1,697	100	4,001	1,924	449	3,264
6. Supporting operations.....	42,608	98,881	9,031	31,118	47,697	86,285
Total direct.....	742,419	673,500	281,000	569,801	856,000	420,000
Reimbursable:						
2. Space applications.....	.....	.....	.....	3,711	384	.....
Total.....	742,419	673,500	281,000	573,512	856,384	420,000
Financing:						
Unobligated balance brought forward:						
For completion of prior year budget plans.....	.....	.....	.....	-181,843	-381,093	-195,719
Available to finance new budget plans.....	-13,500	-14,715	.....	-13,500	-14,715	.....

Program and Financing (in thousands of dollars)--Continued

	Budget plan			Obligations		
	1963	1964	1965	1963	1964	1965
Financing--Continued						
Unobligated balance transferred to or from "Research, and development, (76 Stat. 731 and 75 Stat. 355).....	.....	14,715	.....	$-30,343	$14,715	.....
Unobligated accepted reimbursable order transferred to other accounts.....	.....	.....	.....	.....	2,490	.....
Unobligated balance carried forward:						
For completion of prior year budget plans.....	.....	.....	.....	381,093	195,719	$56,719
Available to finance new budget plans.....	14,715	.....	.....	14,715	.....	.....
New obligational authority.....	743,634	673,500	281,000	743,634	673,500	281,000
New obligational authority:						
Appropriation.....	776,237	680,000	281,000	776,237	680,000	281,000
Transferred to:						
"Research, and development" (76 Stat. 731).....	-32,603	.....	.....	-32,603	.....	.....
"Administrative operations" (77 Stat. 439).....	.....	-6,500	.....	.....	-6,500	.....
Appropriation (adjusted).	743,634	673,500	281,000	743,634	673,500	281,000

Program and Financing (in thousands of dollars)--Continued

	1963 actual	1964 estimate	1965 estimate
Note.—Reconciliation of budget plan to obligations:			
Total budget plan	$742,419	$673,500	$281,000
Deduct portion of budget plan to be obligated in subsequent years	313,573	141,140	54,664
Add obligations of prior year budget plans	144,666	324,024	193,664
Total obligations	573,512	856,384	420,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

SUMMARY OF CONSTRUCTION OF FACILITIES BUDGET PLAN BY LOCATION

(In thousands of dollars)

Location	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1965
Ames Research Center (Mountain View, California)	$14,641	$11,044	$6,081
Electronic Research Center (To be determined)	-	-	10,000
Flight Research Center (Edwards, California)	1,757	1,157	-
Goddard Space Flight Center (Greenbelt, Maryland)	21,817	17,033	1,300
Jet Propulsion Laboratory (Pasadena, California)	10,208	2,998	3,714
John K. Kennedy Space Center, NASA (Cape Kennedy, Florida)	305,138	284,916	91,261
Langley Research Center (Hampton, Virginia)	10,094	8,204	4,454
Lewis Research Center (Cleveland, Ohio)	45,816	18,634	810
Manned Spacecraft Center (Houston, Texas)	25,370	35,172	25,166
Marshall Space Flight Center (Huntsville, Alabama)	41,741	28,980	15,288
Michoud Plant (New Orleans, Louisiana)	28,910	8,688	6,534
Mississippi Test Facility (Pearl River, Mississippi)	78,407	93,656	61,991
Nuclear Rocket Development Station (Nevada)	14,835	3,240	-
Various Locations	139,524	148,783	37,597
Wallops Station (Wallops Island, Virginia)	4,161	505	1,804
Facility Planning and Design 1/	-	10,490	15,000
Total	$742,419	$673,500	$281,000

1/ Amounts appropriated in fiscal year 1963 are reflected by location.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 65 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Ames Research Center	Advanced Research & Technology	Mountain View, Calif.	Santa Clara	Mountain View

INSTALLATION MISSION

Laboratory research in aerodynamics, thermodynamics, materials, structures, guidance and control, space sciences, environmental biology, life detection, life synthesis, human factors, and fundamental physics and chemistry; project management of unmanned spaceflight projects (scientific probes and satellites); development of scientific-experiment payloads for spaceflight projects managed at Ames and elsewhere.

PERSONNEL STRENGTH	FY 19 63	FY 19 64	FY 19 65
NASA PERSONNEL *(End of Year)*	2,116	2,196	2,196
CONTRACTOR & OTHER PERSONNEL	100	106	120
TOTAL ALL PERSONNEL	2,216	2,302	2,316

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	115	
LAND *(Lease or Permit)*	120	
PLANT VALUE *(as of June 30, 19 63)*		140,701
TOTAL	235	140,701

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 19 63 AND PRIOR YEARS	FY 19 64 *(Estimated)*	FY 19 65 *(Estimated)*	FUTURE YEARS *(Estimated*	TOTAL ALL YEARS *(Estimated)*
Administrative management building	OART	71	---	1,455	---	1,526
Flight simulator for advanced aircraft	OART	---	20	2,630	---	2,650
Instrument building extension	OART	---	75	1,996	---	2,071
TOTAL FOR PROJECTS IN FY 19 65	ESTIMATE			6,081		

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1965 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Electronics Research Center	OART	To be determined	NA	NA

INSTALLATION MISSION

To serve as the national focal point for knowledge and advanced technology in space electronics needed by NASA for future space systems. The Center will organize, manage, and conduct comprehensive programs in basic and applied research providing the agency with the capability to obtain inherently more reliable space electronic elements and increase the efficiency of future space electronic equipment.

PERSONNEL STRENGTH	FY 1963	FY 1964	FY 1965
NASA PERSONNEL *(End of Year)*	---	50	250
CONTRACTOR & OTHER PERSONNEL	---	---	---
TOTAL ALL PERSONNEL	---	50	250

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	---	
LAND *(Lease or Permit)*	---	
PLANT VALUE *(as of June 30, 1963)*		---
TOTAL	---	---

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Center support facilities	OART	---	---	1,950	2,950	4,900
Electronic components laboratory	OART	---	---	3,200	---	3,200
Engineering and administration building	OART	---	---	1,850	---	1,850
Qualification and standards laboratory	OART	---	---	3,000	---	3,000
TOTAL FOR PROJECTS IN FY 1965 ESTIMATE				10,000		

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1965 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Goddard Space Flight Center	Space Science & Applications	Greenbelt, Maryland	Prince Georges	Greenbelt, Maryland

INSTALLATION MISSION

The Center is responsible for complete development of unmanned sounding rockets and orbiting spacecraft experiments in basic and applied science. The work covers scientific satellites and communications and weather satellites which orbit in cislunar space (region between the earth and the moon). In addition, the Center manages NASA's Delta rocket and two world-wide tracking, data acquisition and data reduction networks.

PERSONNEL STRENGTH	FY 1963	FY 1964	FY 1965
NASA PERSONNEL *(End of Year)*	3487	3660	3660
CONTRACTOR & OTHER PERSONNEL	1230	1733	1733
TOTAL ALL PERSONNEL	4717	5393	5393

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	530	
LAND *(Lease or Permit)*	426	
PLANT VALUE *(as of June 30, 1963)*		84,300
TOTAL	956	84,300

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Earth albedo and infra-red simulation system for the space environment simulator	OSSA	---	---	500	---	500
STADAN engineering and real time station	OTDA	---	---	400	---	400
Relocation of Wallops Island training facility	OTDA	---	---	400	---	400
TOTAL FOR PROJECTS IN FY 1965 ESTIMATE				1,300		

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 65 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Jet Propulsion Laboratory	Space Science & Applications	Pasadena, California	Los Angeles	Pasadena

INSTALLATION MISSION

The Jet Propulsion Laboratory (JPL) is a government-owned research and development facility, operated for NASA by the California Institute of Technology. The Laboratory carries out research programs and unmanned lunar and planetary space projects for NASA, and conceives and executes advanced development and experimental engineering investigations to further the technology required for the nation's space program.

PERSONNEL STRENGTH	FY 1963	FY 1964	FY 1965
NASA PERSONNEL *(End of Year)*	3926	4200	4400
CONTRACTOR & OTHER PERSONNEL	235	660	160
TOTAL ALL PERSONNEL	4161	4860	4560

INVENTORY

ITEM	ACRES	COST *(Thous.)*
Land (Fee)	147	
LAND *(Lease or Permit)*	32,624	
PLANT VALUE *(as of June 30, 1963)*		72,293
TOTAL	32,771	72,293

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Addition to spacecraft development engineering building, No. 233	OSSA	595	36	564	---	1,195
25-Foot simulator modification	OSSA	4,266	150	2,350	---	6,766
Utilities installations	OSSA	2,452	420	400	1,000	4,272
Supporting services building - (Edwards Test Station)	OART	---	---	400	---	400
TOTAL FOR PROJECTS IN FY 1965	ESTIMATE			3,714		

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1965 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
John F. Kennedy Space Center, NASA	Manned Space Flight	Merritt Island, Florida	Brevard	Cocoa Beach

INSTALLATION MISSION

To conduct overall planning and supervision of the integration, test, checkout, and luanch of NASA space vehicle systems at the Atlantic Missile Range (AMR) and Merritt Island, and to provide support services for all NASA elements located in the area.

PERSONNEL STRENGTH	FY 1963	FY 1964	FY 1965
NASA PERSONNEL *(End of Year)*	1,181	1,713	2,242
CONTRACTOR & OTHER PERSONNEL	2,519	5,483	8,806
TOTAL ALL PERSONNEL	3,700	7,196	11,048

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	87,400	
LAND *(Lease or Permit)*	350	
PLANT VALUE *(as of June 30, 1963)*		122,747
TOTAL	87,750	122,747

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Addition to manned spacecraft operations and checkout building	MSF	15,816.0	4,373.0	16,316.0	---	36,505.0
Advanced Saturn launch complex No. 39	MSF	169,550.0	193,980.0	63,284.0	---	426,814.0
Extension to central supply complex	MSF	710.0	2,093.6	952.0	---	3,766.6
Manned spacecraft static test facility	MSF	5,000.0	93.0	2,780.0	---	7,873.0
Propellant systems components laboratory	MSF	---	12.0	588.0	---	600.0
Utility installations - New area	MSF	---	256.0	5,600.0	1,000.0	6,856.0
Addition to unmanned spacecraft explosive safe assembly complex	OSS	1,181.0	30.0	570.0	2,000.0	3,781.0
Modifications to Centaur launch complex No. 36	OSS	25,009.0	49.0	451.0	1,000.0	26,509.0
Modifications to launch complex No. 17	OSS	---	35.0	465.0	---	500.0
Spin balance facilities for unmanned spacecraft	OSS	---	12.0	255.0	---	267.0
TOTAL FOR PROJECTS IN FY 1965 ESTIMATE				91,261.0		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1965 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Langley Research Center	OART	Hampton, Virginia	---	Hampton

INSTALLATION MISSION Langley Research Center mission - Undertake research to provide a technical base for such missions as (1) manned and unmanned exploration of space, (2) improvement of performance and utility of airborne flight; plan, develop, and operate necessary facilities; generate new and advanced concepts; provide research advice and assistance to other branches of the Government; disseminate scientific and technical information; search for and identify potential industrial applications evolved in the course of research.

PERSONNEL STRENGTH	FY 1963	FY 1964	FY 1965
NASA PERSONNEL *(End of Year)*	4,220	4,348	4,348
CONTRACTOR & OTHER PERSONNEL	180	100	50
TOTAL ALL PERSONNEL	4,400	4,448	4,398

INVENTORY		
ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	430	
LAND *(Lease or Permit)*	342	
PLANT VALUE *(as of June 30, 1963*		242,649
TOTAL	772	242,649

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated*	TOTAL ALL YEARS *(Estimated)*
Thermal control housing and building addition for dynamics research laboratory	OART	---	60	801	---	861
Fatigue research laboratory	OART	---	70	1,221	---	1,291
Central high pressure air supply	OART	---	157	2,077	---	2,234
Utility improvements - electrical system	OART	---	---	355	---	355
TOTAL FOR PROJECTS IN FY 1965 ESTIMATE				4,454		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Lewis Research Center (Plum Brook Station)	Advanced Research and Technology	Sandusky, Ohio	Erie	Sandusky, Ohio

INSTALLATION MISSION

Under the technical direction of personnel located at the Cleveland facilities, research and development programs are conducted in the areas of advanced chemical and nuclear powered rocket engines and their accessories.

PERSONNEL STRENGTH	FY 19 63	FY 19 64	FY 1965
NASA PERSONNEL *(End of Year)*	533	578	602
CONTRACTOR & OTHER PERSONNEL	85	100	110
TOTAL ALL PERSONNEL	618	678	712

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	6031.39	
LAND *(Lease or Permit)*		
PLANT VALUE *(as of June 30, 19 63)*		49,637
TOTAL	6031.39	49,637

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 19 63 AND PRIOR YEARS	FY 19 64 *(Estimated)*	FY 19 65 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
138-34.5 KV Electrical Power Substation	OART	---	40	810	---	850
TOTAL FOR PROJECTS IN FY 19 65 ESTIMATE				810		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1965 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Manned Spacecraft Center	Manned Space Flight	Clear Lake, Texas	Harris	Houston

INSTALLATION MISSION

The Manned Spacecraft Center has as its primary mission the development of spacecraft for manned space flight programs. The Center is also responsible for manned space flight operations and conduct of astronaut training.

PERSONNEL STRENGTH	FY 1963	FY 1964	FY 1965
NASA PERSONNEL *(End of Year)*	3,345	4,340	4,811
CONTRACTOR & OTHER PERSONNEL	802	1,132	1,562
TOTAL ALL PERSONNEL	4,147	5,472	6,373

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	1,600	
LAND *(Lease or Permit)*		
PLANT VALUE *(as of June 30, 19 63)*		53,334
TOTAL	1,600	53,334

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Modification to Environmental Testing Laboratory	MSF	55.0	400.0	9,416.0	-0-	9,871.0
Electronic Systems Compatibility Facility	MSF	70.0	30.0	4,110.0	-0-	4,210.0
Lunar Mission & Space Exploration Facility	MSF	50.0	70.0	2,647.0	-0-	2,767.0
Central Data Facility Extension	MSF	-0-	70.0	2,658.0	-0-	2,728.0
Technical Services Facility	MSF	-0-	110.0	2,240.0	-0-	2,350.0
Flight Crew Operations Facility	MSF	-0-	124.0	1,764.0	-0-	1,888.0
Cafeteria	MSF	34.2	14.0	706.0	-0-	754.2
Central Heating & Cooling Plant & Warehouse Ext.	MSF	-0-	110.0	1,625.0	-0-	1,735.0
TOTAL FOR PROJECTS IN FY 1965 ESTIMATE				25,166.0		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 19 65 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Marshall Space Flight Center	Manned Space Flight	Huntsville, Alabama	Madison	Huntsville

INSTALLATION MISSION

The Marshall Space Flight Center (MSFC) has as its primary mission the development of launch vehicles, engines and vehicle systems for manned space flight programs. The Center also performs advanced studies and research in the general field of astronautics.

PERSONNEL STRENGTH	FY 1963	FY 1964	FY 1965
NASA PERSONNEL *(End of Year)*	7,332	7,658	7,658
CONTRACTOR & OTHER PERSONNEL	4,661	5,852	7,303
TOTAL ALL PERSONNEL	11,993	13,510	14,961

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	---	
LAND *(Lease or Permit)*	1,850	
PLANT VALUE *(as of June 30, 1963)*		149,030
TOTAL	1,850	149,030

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Extensions to Saturn V ground support equipment test facility	MSF	5,728.0	137.0	2,495.0	---	8,360.0
Cold flow test facility	MSF	---	136.0	2,368.0	---	2,504.0
Extension of components test facility instrumentation	MSF	7,200.0	3,765.0	1,814.0	---	12,779.0
Extension to the propulsion and vehicle engineering laboratory	MSF	1,143.5	115.0	2,230.0	---	3,488.5
Extension of utility systems	MSF	---	100.0	3,175.0	---	3,275.0
Saturn support test area	MSF	10,947.0	148.0	3,206.0	---	14,301.0
TOTAL FOR PROJECTS IN FY 19 65 ESTIMATE				15,288.0		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1965 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Michoud Plant	Manned Space Flight	New Orleans, La.	Orleans Parrish	New Orleans

INSTALLATION MISSION

The mission of Michoud Plant is the manufacturing of the booster stage for the Saturn family of launch vehicles.

PERSONNEL STRENGTH	FY 1963	FY 1964	FY 1965
NASA PERSONNEL *(End of Year)*	207	350	380
CONTRACTOR & OTHER PERSONNEL	6,577	9,779	9,284
TOTAL ALL PERSONNEL	6,784	10,129	9,664

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	838.7	
LAND *(Lease or Permit)*	---	
PLANT VALUE *(as of June 30, 19)*		$80,496
TOTAL	838.7	$80,496

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated*	TOTAL ALL YEARS *(Estimated)*
Facility additions, extensions, and alterations to support Saturn S-IB and S-IC production	MSF	---	161.0	2,735.0	---	2,896.0
Alterations to Saturn first stage production facilities	MSF	---	36.0	628.0	---	664.0
Central computer facility extensions and alterations	MSF	390.0	85.0	1,160.0	---	1,635.0
Utility extension, alteration and rehabilitation to support Saturn S-IB and S-IC production	MSF	---	80.0	2,011.0	---	2,091.0
TOTAL FOR PROJECTS IN FY 19	**ESTIMATE**			6,534.0		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1965 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Mississippi Test Facility	Manned Space Flight	Pearl River, Miss.	Hancock	Bay St. Louis, Miss.

INSTALLATION MISSION

The mission of Mississippi Test Facility is the Static Test Firing of large vehicle stages and propulsion systems.

PERSONNEL STRENGTH	FY 1963	FY 1964	FY 1965
NASA PERSONNEL *(End of Year)*	23	96	155
CONTRACTOR & OTHER PERSONNEL	21	574	2,313
TOTAL ALL PERSONNEL	44	670	2,468

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	26,624	
LAND *(Lease or Permit)*	115,326	
PLANT VALUE *(as of June 30, 1963)*		12,371
TOTAL	141,950	12,371

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Additional utility installations and support facility	MSF	4,615.9	9,431.8	9,533.0	---	23,580.7
Components service facility	MSF	130.0	150.0	5,499.0	---	5,779.0
Saturn V first stage (S-IC) static test facility	MSF	13,216.0	38,473.8	26,384.0	---	78,073.8
Saturn V second stage (S-II) static test facilities	MSF	20,353.0	16,301.9	20,575.0	---	57,229.9
TOTAL FOR PROJECTS IN FY 1965 ESTIMATE				61,991.0		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1965 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Various Locations	Various	NA	NA	NA

INSTALLATION MISSION

PERSONNEL STRENGTH	FY 19	FY 19	FY 19
NASA PERSONNEL *(End of Year)*			
CONTRACTOR & OTHER PERSONNEL			
TOTAL ALL PERSONNEL			

INVENTORY		
ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*		
LAND *(Lease or Permit)*		
PLANT VALUE *(as of June 30, 19)*		
TOTAL		

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Facilities for F-1 engine program	MSF	44,868.0	14,335.0	2,707.0	---	61,910.0
Facilities for J-2 engine program	MSF	11,250.0	7,113.0	10,971.0	---	29,334.0
Facilities for S-II stage program	MSF	536.5	---	2,024.0	---	2,560.5
Facilities for S-IVB stage program	MSF	375.0	5,553.5	10,709.0	---	16,637.5
Facilities for M-1 engine program	OART	13,166.0	10,030.0	3,970.0	33,000	60,166.0
Addition to space radiation effects laboratory for added capabilities	OART	12,382.0	105.0	1,876.0	---	14,363.0
Apollo network ground stations - New stations	OTDA	---	355.0	4,010.0	---	4,365.0
Apollo network ground stations - additions to existing stations	OTDA	---	85.0	1,330.0	---	1,415.0
TOTAL FOR PROJECTS IN FY 1965	ESTIMATE			37,597		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1965 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
Wallops Station	Space Science & Applications	Wallops Station, Va.	Accomack County, Va.	Pocomoke City, Maryland

INSTALLATION MISSION Provides facilities and personnel to conduct launch operations, data acquisition, instrumentation support, and personnel training to approved range users for projects in the following areas:

1. Component and system development
2. Sounding rocket program
3. Small scientific satellites
4. Assistance to other Agencies and Scientific groups
5. International programs
6. Cooperative satellite tracking and data readout

PERSONNEL STRENGTH	FY 1963	FY 1964	FY 1965
NASA PERSONNEL *(End of Year)*	493	530	530
CONTRACTOR & OTHER PERSONNEL	400	500	500
TOTAL ALL PERSONNEL	893	1,030	1,030

INVENTORY

ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*	9.4	
LAND *(Lease or Permit)*	6,564	
PLANT VALUE *(as of June 30, 1963)*		$38,716
TOTAL	6,573.4	$38,716

PROJECT LINE ITEM	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Launch area modification	OSSA	---	---	684	5,500	6,184
Support facilities	OSSA	---	50	1,120	1,000	2,170
TOTAL FOR PROJECTS IN FY 1965 ESTIMATE				1,804		

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CONSTRUCTION OF FACILITIES

FISCAL YEAR 1965 BUDGET ESTIMATES

NASA INSTALLATION	COGNIZANT PROGRAM OFFICE FOR INSTALLATION	LOCATION OF INSTALLATION	COUNTY	NEAREST CITY
All	Office of the Associate Administrator	---	---	---

INSTALLATION MISSION

See justification.

PERSONNEL STRENGTH	FY 19	FY 19	FY 19
NASA PERSONNEL *(End of Year)*			
CONTRACTOR & OTHER PERSONNEL			
TOTAL ALL PERSONNEL	Not Applicable		

INVENTORY		
ITEM	ACRES	COST *(Thous.)*
LAND *(Fee)*		
LAND *(Lease or Permit)*		
PLANT VALUE *(as of June 30, 19)*		
TOTAL		

Authorization Line Item	PROJECT SPONSOR	FUNDING *(Thousands of dollars)* FY 1963 AND PRIOR YEARS	FY 1964 *(Estimated)*	FY 1965 *(Estimated)*	FUTURE YEARS *(Estimated)*	TOTAL ALL YEARS *(Estimated)*
Facility Planning and Design	---	13,355	10,490	15,000	Not Applicable	Not Applicable
TOTAL FOR PROJECTS IN FY 1965	ESTIMATE			15,000		

NASA FORM 1029 DEC 63

GPO 868-667

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION BILL

ADMINISTRATIVE OPERATIONS

For necessary expenses, not otherwise provided for, of the operation of the National Aeronautics and Space Administration, including uniforms or allowances therefor, as authorized by the Act of September 1, 1954, as amended (5 U.S.C. 2131); minor construction; supplies, materials, *services*, and equipment; awards; *purchase or* hire[,] *of not to exceed two aircraft for administrative use;* maintenance and operation of *administrative* aircraft; purchase and hire of motor vehicles (including purchase of not to exceed [twenty-four] *one hundred and fourteen* passenger motor vehicles, of which [eleven] *sixty-eight* shall be for replacement only); and maintenance, repair, and alteration of real and personal property; [$494,000,000] *$641,000,000.* *(42 U.S.C. 2451, et seq., 50 U.S.C. 151–160, 511–515 Independent Offices Appropriation Act, 1964; additional authorizing legislation to be proposed.)*

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

ADMINISTRATIVE OPERATIONS

Program and Financing (in thousands of dollars)

	Budget Plan			Obligations		
	1963	1964	1965	1963	1964	1965
Program by activities:						
Direct:						
1. Manned space flight.....	$197,406	$249,051	$334,200	$189,103	$255,223	$334,200
2. Space applications.....	9,562	9,400	11,900	9,235	9,633	11,900
3. Unmanned investigations in space.....	51,080	66,300	75,700	49,778	67,941	75,700
4. Space research and technology.....	129,340	136,700	147,900	126,438	140,082	147,900
5. Aircraft technology.....	29,743	29,300	32,200	28,973	30,030	32,200
6. Supporting operations.....	21,544	26,100	39,100	20,888	26,749	39,100
Total direct.....	438,675	516,851	641,000	424,415	529,658	641,000
Reimbursable:						
2. Space applications.....	1,200	645	655	1,023	1,072	655
3. Unmanned investigations in space.....	3,066	1,776	1,717	2,209	2,976	1,717
4. Space research and technology.....	300	350	300	285	365	300
Total reimbursable....	4,566	2,771	2,672	3,517	4,413	2,672
Total.....	443,241	519,622	643,672	427,932	534,071	643,672

Program and Financing (in thousands of dollars)--continued

	Budget plan			Obligations		
	1963	1964	1965	1963	1964	1965
Financing:						
Comparative transfer from other accounts.....	$-443,241	.....	.....	$-427,932	$-14,199	.....
Unobligated accepted reimbursable order transferred from other accounts.....	.....	.....	.....	.....	-250	.....
Advances and reimbursements from—						
Other accounts.....	.....	-2,571	-2,472	.....	-2,571	-2,472
Non-Federal sources[1].....	.....	-200	-200	.....	-200	-200
New obligational authority	.....	516,851	641,000	.....	516,851	641,000
New obligational authority:						
Appropriation.....	.....	494,000	641,000	.....	494,000	641,000
Transferred from:						
"Research and development" (77 Stat. 439).....	.....	16,385	.....	.....	16,385	.....
"Construction of facilities" (77 Stat. 439).....	.....	6,500	.....	.....	6,500	.....
Transferred to "Operating expenses, Public Buildings Service," General Services Administration (77 Stat. 436)	.....	-34	.....	.....	-34	.....
Appropriation (adjusted)..	.....	516,851	641,000	.....	516,851	641,000

Program and Financing (in thousands of dollars)--continued

	1963 actual	1964 estimate	1965 estimate
Note.—Reconciliation of budget plan to obligations:			
Total budget plan	$443,241	$519,622	$643,672
Deduct portion of budget plan to be obligated in subsequent years	14,199	.....	.....
Add obligations of prior year budget plans	-1,110	14,449	.....
Total obligations	427,932	534,071	643,672

[1]Reimbursement from non-Federal sources are derived from the sale of personal property (40 U.S.C. 481).

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ADMINISTRATIVE OPERATIONS
FISCAL YEAR 1965 BUDGET ESTIMATES

SUMMARY OF BUDGET PLAN BY INSTALLATION
(In thousands of dollars)

	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1965
MANNED SPACE FLIGHT			
John F. Kennedy Space Center, NASA	$18,804	$32,375	$47,877
Manned Spacecraft Center.....	50,960	68,071	98,104
Marshall Space Flight Center.....	112,576	128,834	158,589
SPACE SCIENCE AND APPLICATIONS			
Goddard Space Flight Center.....	52,810	62,620	83,156
Pacific Launch Operations Center..	641	720	883
Wallops Station.....	8,881	9,400	9,910
ADVANCED RESEARCH AND TECHNOLOGY			
Ames Research Center.....	25,550	28,968	31,806
Electronics Research Center.....	-	394	2,561
Flight Research Center.....	7,549	9,539	10,402
Langley Research Center.....	51,756	52,474	55,270
Lewis Research Center.....	53,448	61,107	65,617
Space Nuclear Propulsion Office...	970	1,493	1,482
SUPPORTING OPERATIONS			
Northeastern Office.....	195	475	595
Western Operations Office.....	3,449	4,485	5,398
NASA Headquarters.....	51,086	55,896	69,350
TOTAL.....	$438,675	$516,851	$641,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

ADMINISTRATIVE OPERATIONS

NUMBER OF POSITIONS BY LOCATION

	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1965
MANNED SPACE FLIGHT			
John F. Kennedy Space Center, NASA	1,181	1,713	2,242
Manned Spacecraft Center	3,345	4,340	4,811
Marshall Space Flight Center	7,332	7,658	7,658
SPACE SCIENCE AND APPLICATIONS			
Goddard Space Flight Center	3,487	3,660	3,660
Pacific Launch Operations Office	17	22	22
Wallops Station	493	530	530
ADVANCED RESEARCH AND TECHNOLOGY			
Ames Research Center	2,116	2,196	2,196
Electronics Research Center	-	50	250
Flight Research Center	616	618	618
Langley Research Center	4,220	4,348	4,348
Lewis Research Center	4,697	4,817	4,817
Space Nuclear Propulsion Office	96	103	103
SUPPORTING OPERATIONS			
Northeastern Office	25	40	40
Western Operations Office	308	390	390
NASA Headquarters	2,001	2,115	2,115
TOTAL	29,934	32,600	33,800

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

JOHN F. KENNEDY SPACE CENTER, NASA

SUMMARY

MISSION:

The Kennedy Space Center is responsible for the overall planning and supervision of the launch preparation and launch of NASA space vehicle systems at Cape Kennedy and MILA in addition to furnishing administrative and technical support for all NASA elements located there. The Center has unique launch capabilities developed through the experience of numerous launches beginning with the Redstone program in 1952, under the Department of the Army. Capabilities include launch instrumentation, design of launch and related facilities and the design of ground support equipment.

The tempo of NASA launch activities at the Kennedy Space Center has increased steadily over the past several years and will continue to do so throughout fiscal year 1965. The magnitude of administrative and logistic support will increase by about twenty five percent during fiscal year 1965. The Merritt Island Launch Area which has been under construction for two years will approach completion this year. A shift in effort from the relatively limited Saturn I development program to the more complex Saturn IB program for the manned Apollo flights will take place during this year. The buildup of Saturn V launch capability and the support of the Saturn V Launch Complex 39 will accelerate during this year.

DESCRIPTION:

The John F. Kennedy Space Center, NASA, is located on the East Coast of Florida adjacent to and north of the Cape Kennedy Launch Area. The Center occupies 87,400 acres of land acquired by purchase, and designated as the Merritt Island Launch Area (MILA). The Center includes launch and related support facilities and an industrial-administrative complex at MILA, and launch complexes (for which NASA is designated launch agency) and supporting facilities within the Cape Kennedy Missile Annex. The plant value as of June 30, 1963, totals $122,747,000.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.....	1,181	1,713	2,242
Administrative operations.....	$18,804	$32,375	$47,877

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

MANNED SPACECRAFT CENTER

SUMMARY

MISSION:

The primary mission of the Manned Spacecraft Center is the development of spacecraft for manned space flight programs and the conduct of manned space flight operations.

Significant personnel increases are planned in the Gemini and Apollo program areas representing scheduled progress toward a series of two-man capsule flight missions to develop and demonstrate rendezvous and docking techniques in orbit, and a greater degree of maneuverability both in space and landing. In concert with the two-man capsule flights, additional effort will be applied toward the preparation for three-man flight missions in the Apollo program. Additional personnel are also required for the research and technology areas to support the Gemini and Apollo projects and to generate the knowledge required to advance the technology of space and manned spacecraft development. Effort will be also expended on acceleration of the project test program, and on manning the facilities required to support this program at the Manned Spacecraft Center Clear Lake site.

DESCRIPTION:

The Manned Spacecraft Center is located on Road 528, two miles east of the town of Webster, Texas. The site is approximately 20 miles southwest of downtown Houston, 25 miles northwest of Galveston, and 20 miles southwest of Baytown. Primary access to the site is by the Gulf Freeway (U. S. 75) and Road 528. The total area occupied by the Manned Spacecraft Center is 1,600 acres and the plant value as of June 30, 1963, was $53,334,000.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.	3,345	4,340	4,811
Administrative operations.....	$50,960	$68,071	$98,104

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

MARSHALL SPACE FLIGHT CENTER

SUMMARY

MISSION:

The primary mission of the Marshall Space Flight Center is the development of launch vehicle and space transportation systems to meet national space program requirements. Highly skilled Government scientific and engineering personnel, some possessing more than thirty years of experience in aerospace technology, coupled with unique laboratory facilities at Marshall, give the Nation a vital resource for the national space program.

This Center is assigned project management responsibility for the Saturn I, Saturn IB, and Saturn V launch vehicles, the H-1, RL-10A, J-2, and F-1 rocket engines, a micrometeoroid satellite, and a large variety of supporting research projects. The Center also performs advanced studies on launch vehicles and space systems.

DESCRIPTION:

The Marshall Space Flight Center at Huntsville, Alabama is located on 1,850 acres acquired on a non-revocable use permit from Department of the Army. The center has a plant value of $149 million. Marshall manages two NASA sub-installations: Michoud Plant at New Orleans, Louisiana, including the computer facility at Slidell, Louisiana, with a plant value of $81 million on 839 acres; and Mississippi Test Facility, located in southwest Mississippi with a plant value of $12 million on 141,950 acres (to be purchased or acquired under easement).

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.....	7,332	7,658	7,658
Administrative operations.....	$112,576	$128,834	$158,589

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

GODDARD SPACE FLIGHT CENTER

SUMMARY

MISSION:

The Center is responsible for: complete development of sounding rockets; orbiting unmanned spacecraft (such as the OAO, OGO, and OSO); application spacecraft (such as the NIMBUS, TIROS, Echo, and Syncom); operating the world-wide satellite tracking and communications network stations; data acquisition and data reduction; and project management of NASA's highly successful Delta rocket.

Several of the scientific satellites such as OAO and OGO used to conduct studies which reveal the hazards of space flights will be entering the flight model integration, test, and flight phases during fiscal year 1965. The development of advanced weather and communication satellite systems will receive major emphasis in fiscal year 1965.

The range and launch support effort required during fiscal year 1965 will be devoted to support Delta, Atlas-Agena, and Centaur launches. The Goddard Space Flight Center administers the operation of the global network of stations which provide precision tracking, command and telemetry data, voice communications, and data reduction for manned and unmanned exploration in space. Increased effort will be required in fiscal year 1965 to adequately support and operate the Gemini and Apollo networks. Goddard will also devote resources in research and development of optical, pressure, temperature, and acoustic sensors to be used on future missions to Venus, Mars, and to the Moon.

DESCRIPTION:

The Goddard Space Flight Center is located 15 miles northeast of Washington, D. C., one mile off the Baltimore-Washington Expressway on a 530 acre main site transferred from the Department of Agriculture. Three separate areas totaling 426 acres, located within two miles of the Center, are used for the antenna test range, magnetic test area, and the optical and ground plane facility. The plant value as of June 30, 1963 amounted to $84,300,000.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.	3,487	3,660	3,660
Administrative operations.....	$52,810	$62,620	$83,156

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

PACIFIC LAUNCH OPERATIONS OFFICE

SUMMARY

MISSION:

The mission of the Pacific Launch Operations Office is to represent NASA, as a single point of contact, in its relationships with the Pacific Missile Range, including negotiating for and coordinating the use of range services and facilities to support requirements developed by NASA Centers or their local field project groups; and to provide or arrange for administrative, logistic, and technical support for NASA programs and projects at the Pacific Missile Range.

The Pacific Launch Operations Office provides general support services for all NASA programs and projects at the Pacific Missile Range including Launch Vehicles and Propulsion Systems, Meteorological Satellites, Communications Satellites, Geophysics and Astronomy, and the Manned Space Flight program. The projected flight schedule at the Pacific Missile Range which the Pacific Launch Operations Office will support will be 12 launches of spacecraft using the Scout and Thor-Agena launch vehicles in 1964 and the same number in 1965.

DESCRIPTION:

The Pacific Launch Operations Office is located mainly at Point Arguello, California, within the Naval Missile Facility. In addition, a small staff is stationed at Point Mugu, California, to maintain direct contact with the Headquarters Staff, Pacific Missile Range. During fiscal year 1965 it is anticipated that management of the Point Arguello facility will be assumed by the Air Force and that a major portion of the contact maintained at Point Mugu will subsequently be maintained with Vandenberg Air Force Base. Consequently, it is planned to reduce operations at the Point Mugu office accordingly and transfer these operations to the Point Arguello office. Point Mugu is located 60 miles north of Los Angeles, and Point Arguello is 120 miles northwest of Point Mugu, adjacent to the southern boundary of Vandenberg Air Force Base. The value of the NASA plant at the Pacific Missile Range, including down-range sites, as of June 30, 1963 was $12,720,000.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.	17	22	22
Administrative operations.....	$641	$720	$883

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

WALLOPS STATION

SUMMARY

MISSION:

The mission of Wallops Station is to prepare, assemble and launch scientific experiments, achieve the desired position and velocity in space, track, and acquire and record the data sought. Other research and development activities of the Wallops Station are: supporting aeronautical research in areas such as re-entry physics and materials studies; conducting components and systems development tests; rendering assistance in training and launching to other NASA centers, government agencies, educational institutions; and conducting experiments for training and advising foreign nations on launch techniques and operations.

This support center conducts some 300 launches a year including sounding rockets, scientific satellites and re-entry vehicles. The launch vehicles used vary in size and power from small meteorological rockets to the four-stage Scout vehicle with orbital capability.

DESCRIPTION:

Wallops Station located on the eastern shore of Virginia, approximately 40 miles southeast of Salisbury, Maryland, consists of three areas: (1) the main base, which is the location of the administrative offices, technical service support shops, and such facilities as the Range Control Center and main telemetry building; (2) Wallops Island, off the coast of Virginia, approximately 7 miles southeast of the main base, separated from the mainland by two miles of marsh and inland waterway and connected with the mainland by a causeway and bridge. The island is approximately five miles long and about one-half mile in width at its widest point. The launch sites, assembly shops, blockhouses, rocket storage buildings and related facilities are on the island; (3) the Wallops mainland, a half-mile strip at the opposite end of the causeway behind the island, which is the location of a long range radar and optical tracking site. A total area of 6,478 acres is owned and occupied with 2,230 acres at the main base, 108 acres at the mainland area, 3,000 acres on the island and 1,140 acres of marsh land. The plant value as of June 30, 1963 was $38,716,000.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.....	493	530	530
Administrative operations.....	$8,881	$9,400	$9,400

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

AMES RESEARCH CENTER

SUMMARY

MISSION:

The primary mission of Ames Research Center is the conduct of supporting research and technology in the physical sciences, the space sciences, and the life sciences. The Center is also assigned project management responsibility for the Pioneer and the Biosatellite projects.

The Ames Center has many unique facilities for simulating both atmospheric and space flights ranging from low speeds to escape velocity. The major research tools consist of conventional wind tunnels, flight simulators, free-flight ballistic test facilities, and specialized laboratory equipment.

The specialized capabilities of the Ames research staff have generated assignment as the principal NASA center in the fields of human factors and the bioscience programs. The requirements of present and future space missions underscore the need for basic research in the physiological and behavior sciences concerned with the effects of space travel. The Pioneer and the Biosatellite projects are examples of this endeavor.

Other work includes the stability and control performance of a wide range of spacecraft configurations, spacecraft materials and structures, and electronic navigation and control systems. In the aeronautics field, emphasis is being given toward problems associated with the Supersonic Transport, the V/STOL aircraft, and the hypersonic research aircraft. Research in the area of space sciences includes studies of the solar physics, planetary environments, and geophysics.

DESCRIPTION:

Ames Research Center occupies a 235 acre plot of land contiguous to the Naval Air Station at Moffett Field, California, of which 115 acres are owned by the NASA and 120 acres occupied under permit from the Department of the Navy. The center is located approximately 35 miles southeast of San Francisco and 15 miles northwest of San Jose, California. The physical plant value as of June 30, 1963, was $140,701,000.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.....	2,116	2,196	2,196
Administrative operations.....	$25,550	$28,968	$31,806

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ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

ELECTRONICS RESEARCH CENTER

SUMMARY

MISSION:

The primary mission of the Electronics Research Center will be to serve as a national focal point for advanced research and technology in space electronics. The center will organize, manage, and conduct comprehensive programs in basic and applied research aimed at providing the information required as a prerequisite to more reliable and efficient space electronic equipment.

The facilities to be constructed in the near future at the presently undetermined site will provide the initial research tools necessary to implement the mission of the center. The technical staff will include experts in the fields of electronics, physics, and flight mechanics.

The programs to be undertaken at the proposed center will include effort in the fundamental disciplines of electrostatics, microwave radiation, inertial sensing, optics, and solid state physics. Technique and component advances will be refined to demonstrate instrumentation applications and system utility or feasibility for communications, data processing, control and guidance systems.

DESCRIPTION:

The site location of the proposed center is currently under study.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year....	---	50	250
Administrative operations.....	---	$394	$2,561

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

FLIGHT RESEARCH CENTER

SUMMARY

MISSION:

The primary mission of the Flight Research Center is the conduct of flight research, and study of the problems of manned flight both within and outside the atmosphere. These areas include supporting research and technology effort on take-off and landing, low-speed flight, supersonic and hypersonic flight, and reentry.

The facilities at Flight Research Center consist of research and fighter aircraft, and special purpose vehicles such as paragliders, lifting bodies, lunar landing research vehicles, airborne simulators, and specialized ground support equipment. Structural facilities include an office-laboratory building, flight maintenance hanger and a calibration hanger. The technical staff of the center includes leading experts in the fields of flight research, aerodynamics, loads and structures, thermodynamics, biotechnology, and electronics.

Direct support of the agency's aeronautical program involves a substantial part of the total staff of the center, the majority of which is required for support of the X-15 aircraft program and related projects. Support of the manned space flight program is provided to the Gemini and Apollo projects through efforts on parachute and paraglider development. Other effort is directed in support of space vehicle systems, electronics, and the man-machine integration problems associated with the operation of manned vehicles.

DESCRIPTION:

Flight Research Center occupies a 171 acre plot of land under permit from the Air Force. The center is located at the northeast end of Edwards Air Force Base, California, adjacent to Rogers Dry Lake, approximately 65 air miles north of Los Angeles. The plant value as of June 30, 1963, was $14,571,000.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.....	586	604	604
Administrative operations.....	$7,549	$9,539	$10,402

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

LANGLEY RESEARCH CENTER

SUMMARY

MISSION:

The primary mission of Langley Research Center is the conduct of basic and applied research in the areas of advanced aeronautics and space flight. In addition to providing technical support for the development of advanced types of manned vehicles, the Langley Center is assigned project management responsibility for the Scout vehicle development and procurement, flight projects associated with reentry problems, and the lunar orbiter satellite.

Specialized facilities at the Langley Research Center include conventional wind tunnels ranging from subsonic to hypersonic speeds, flight simulators and extensive aerospace facilities utilized for the advancement of knowledge in rendezvous, lunar landings, and other space flight operations. These facilities are supplemented by free-flight studies of models and full-scale research aircraft.

In addition to the primary mission of Langley Research Center, supporting research and technology in the areas of space vehicle systems, electronic systems, life and space sciences, space power, and chemical propulsion systems is conducted. Studies include structural and operational problems associated with the Supersonic Transport and technical support for the Gemini and Apollo projects, involving problems in connection with lunar landings, rendezvous techniques and reentry flights.

Other effort is being expended in the areas of passive communications satellites and meteorological satellites, as well as providing support for other Government agencies, including the Department of Defense and the Federal Aviation Agency. In addition to assuming project responsibility for the Scout vehicle development and procurement, Project Fire, and the Lunar Orbiter satellite, Langley Research Center is also exercising management responsibility for the Joint Italian - United States international satellite program.

DESCRIPTION:

Langley Research Center occupies a 772 acre plot of land at Hampton, Virginia, of which 430 acres are owned by NASA and 342 acres occupied under permit from the Air Force. The center, divided into two separate areas by facilities of the Langley Air Force Base, is approximately 10 miles north of Hampton, Virginia. A plot of 110 acres at Newport News, Virginia, was recently acquired from the Air Force for construction of the Space Radiation

Effects Laboratory. The physical plant value as of June 30, 1963, including the acreage located at Newport News, Virginia, was $242,649,000.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.....	4,220	4,348	4,348
Administrative operations.....	$51,756	$52,474	$55,270

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

LEWIS RESEARCH CENTER

SUMMARY

MISSION:

The primary mission of the Lewis Research Center is basic and applied research, and development in advanced propulsion and space power generation. In addition, the Lewis Research Center is assigned project management responsibility for the M-1 engine, the Centaur launch vehicle, and Agena procurement.

In addition to the development of the M-1 engine and the Centaur launch vehicle, considerable in-house effort will be expended in support of experimental and developmental projects associated with nuclear-electric and nuclear rocket propulsion systems; space vehicle technology, including propellant handling under environmental conditions; advanced concepts and basic research studies on liquid and solid propulsion systems and components; and investigations of solar and chemical power generating systems.

Major activities are being conducted in materials research in support of propulsion systems. Other research support includes electronics systems and fluid physics.

In the field of aeronautics, research on propulsion systems for the supersonic transport will be accelerated.

Major research facilities at Lewis (including Plum Brook Station) include a nuclear reactor for components testing; a space radiator and condenser facility for study of heat-transfer; space environmental vacuum chambers; atmospheric wind tunnels; and numerous test stands for engine and subsystem studies.

DESCRIPTION:

Lewis Research Center occupies a 364 acre plot of land immediately west of the Cleveland-Hopkins Airport, 12 miles southwest of downtown Cleveland, Ohio, and consists of 349 acres of Government-owned land and 15 acres of leased property. The Plum Brook Station, which is a part of the Lewis Research Center, occupies a 6,031 acre NASA-owned tract near Sandusky, Ohio. The Plum Brook Station is approximately 45 miles west of the Cleveland site. The physical plant value on June 30, 1963, for both Lewis and Plum Brook was $219,232,000.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.....	4,697	4,817	4,817
Administrative operations.....	$53,448	$61,107	$65,617

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

SPACE NUCLEAR PROPULSION OFFICE

SUMMARY

MISSION:

The Space Nuclear Propulsion Office is a joint office of the National Aeronautics and Space Administration and the Atomic Energy Commission.

The primary mission of SNPO is to establish the basic technology, and to develop and provide qualified nuclear rocket engines for accomplishing operational missions in advanced launch vehicles.

SNPO was established to assure the formulation and execution of a well integrated program for nuclear rockets which fulfills the responsibilities of both agencies. Implementation of the assigned programs will encompass basic research on reactors, engine systems, and nuclear vehicle technology; development of practical heat-exchanger-type rocket reactors and engine systems; and ground testing of reactors and engines, and the development of reliability.

DESCRIPTION:

The SNPO organization consists of a headquarters office located at Germantown, Maryland, and three field extensions located in Ohio, New Mexico, and Nevada. The physical plant value of NASA funded facilities amounted to $4,000,000 as of June 30, 1963.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.....	96	103	103
Administrative operations.....	$970	$1,493	$1,402

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

NORTHEASTERN OFFICE

SUMMARY

MISSION:

The Northeastern Office provides overall liaison with non-profit scientific and educational institutions, industry, and with civic and government organizations in the northeastern region. The Office also is responsible for continuing evaluation of the effect of the space program on the region, for the identification of the industrial, scientific, and educational resources which may be utilized in the space program, and for the development of the most appropriate methods for utilizing new technology developed for, or as a by-product of, the space program in other commercial or industrial applications.

The Office has three major areas of responsibility. These include technical programs, which covers the two major areas of quality assurance, including the Reliable Electrical Connections School, and the Technical Assistance Program; regional development which includes direct contract administration, and surveillance of reimbursable Department of Defense contract administration, pre-award surveys of prospective sources, pricing and cost analysis assistance to NASA Headquarters, other NASA installations, and local industrial and educational communities; and the educational programs activity, which has been established to provide support on a regional basis to the recently decentralized NASA educational programs, including scheduling of the Spacemobile, distributing of films and publications, and supervising, developing, and coordinating the entire regional educational program.

LOCATION:

The Northeastern Office is located in Cambridge, Massachusetts.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.....	25	40	40
Administrative operations.....	$195	$475	$595

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

WESTERN OPERATIONS OFFICE

SUMMARY

MISSION:

The Western Operations Office represents NASA in the area of the United States west of Denver to support technical and contractual requirements placed on the Office by NASA Program Offices and field installations. The Office's responsibilities are to: provide support to NASA Project Managers in technical management of research and development and facilities contracts and quality assurance; perform quality surveys of industrial plants and organizations; monitor advanced technology contracts; conduct a NASA quality assurance and process controls school; and provide administrative support to the contract management personnel reporting to the Office of Space Science and Applications, NASA Headquarters but which are in residency at the Jet Propulsion Laboratory, Pasadena, California. The Office negotiates, executes and administers research and development, facilities and other contracts as assigned by Headquarters and Centers; procures pressurants and propellants for West Coast, NASA and contractor requirements; and provides a support organization to handle reliability and quality assurance and contract management at the North American Aviation plant at Downey, California for the Apollo and Saturn projects.

LOCATION:

The Western Operations Office is located in Santa Monica, California, with the NASA-O-Downey portion of the Office located at the North American Aviation plant in Downey, California.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.....	308	390	390
Administrative operations.....	$3,449	$4,485	$5,398

ADMINISTRATIVE OPERATIONS

FISCAL YEAR 1965 ESTIMATES

NASA HEADQUARTERS

SUMMARY

MISSION:

The NASA Headquarters is responsible for the planning, coordination, and executive direction of programs established to implement the national objectives stated in the National Aeronautics and Space Act of 1958, as amended. To assist NASA general management in carrying out these objectives, the Headquarters is organized into broad programs - Manned Space Flight, Space Science and Applications, Advanced Research and Technology, and a support function for Tracking and Data Acquisition. The November 1, 1963, Headquarters reorganization provided for the consolidation of authority and responsibility for the management of major programs and the research and development centers primarily required to carry out these same programs. Under this concept the Office of Manned Space Flight is responsible for the management of the George C. Marshall Space Flight Center, Manned Spacecraft Center and the John F. Kennedy Space Center; the Office of Space Science and Applications for the Goddard Space Flight Center, Wallops Station, Pacific Launch Operations Office and the administration of the contract for the operation of the Jet Propulsion Laboratory; the Office of Advanced Research and Technology for the Ames Research Center, Flight Research Center, Langley Research Center, Lewis Research Center, and the Space Nuclear Propulsion Office.

LOCATION:

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 space leased in the Universal North Building and a storage area in Virginia, personnel occupy Government-owned buildings.

SUMMARY OF RESOURCES REQUIREMENTS:

	(Dollars in Thousands)		
	1963	1964	1965
Number of positions, end of year.....	2,001	2,115	2,115
Administrative operations:			
NASA Headquarters.....	$51,086	$55,896	$59,000
JPL (purchase of computers).....	---	---	10,350
Total.....	$51,086	$55,896	$69,350

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

DISTRIBUTION OF RESEARCH AND DEVELOPMENT BUDGET PLAN BY INSTALLATION AND FISCAL YEAR

(In thousands of dollars)

PROGRAM OFFICE	TOTAL	J. F. KENNEDY SPACE CENTER, NASA	MANNED SPACECRAFT CENTER	MARSHALL SPACE FLIGHT CENTER	GODDARD SPACE FLIGHT CENTER	PACIFIC LAUNCH OPERATIONS OFFICE	WALLOPS STATION	AMES RESEARCH CENTER	ELECTRONICS RESEARCH CENTER	FLIGHT RESEARCH CENTER	LANGLEY RESEARCH CENTER	LEWIS RESEARCH CENTER	SPACE NUCLEAR PROPULSION OFFICE	HEADQUARTERS	WESTERN OPERATIONS OFFICE
Office of Manned Space Flight															
1963	1,503,583	10,106	687,361	767,143	-	-	-	-	-	-	1,000	3,062	-	34,106	805
1964	2,649,800	66,000	1,335,750	1,195,157	-	-	-	75	-	-	1,700	3,200	-	47,548	370
1965	3,011,900	104,900	1,344,100	1,503,400	-	-	-	-	-	-	1,000	3,000	-	55,500	-
Office of Space Science and Applications															
1963	615,345	-	-	11,261	184,745	177	-	7,456	-	44	11,047	151,809	-	72,292	176,514
1964	742,500	700	2,100	700	239,900	-	-	26,000	-	100	33,600	193,300	-	83,800	162,300
1965	776,900	1,000	6,400	500	224,500	-	-	30,900	-	100	45,600	235,500	-	89,400	143,000
Office of Advanced Research and Technology															
1963	271,560	-	2,613	24,473	4,528	-	-	9,469	-	9,889	32,555	92,361	53,465	20,772	21,435
1964	320,200	-	5,349	31,830	7,855	-	-	14,552	-	8,986	40,174	92,648	59,215	27,212	32,379
1965	320,300	-	5,525	31,570	7,778	-	-	17,250	2,000	10,415	31,325	115,916	43,300	24,489	30,732
Office of Tracking and Data Acquisition															
1963	122,142	-	-	3,153	87,434	-	2,731	-	-	1,615	1,176	-	-	7,047	18,986
1964	210,000	-	-	3,325	142,400	-	4,675	-	-	1,800	2,500	-	-	7,540	47,760
1965	267,900	-	-	4,000	200,200	-	5,500	-	-	2,300	2,200	-	-	7,900	45,800
Office of Technology Utilization and Policy Planning															
1963	2,164	-	-	18	94	-	-	-	-	-	27	2	-	1,956	67
1964	3,500	-	5	25	45	-	-	10	-	-	20	5	-	3,320	70
1965	5,000	-	15	50	60	-	-	20	-	-	50	20	-	4,715	70
Total Budget Plan															
1963	2,514,794	10,106	689,974	806,048	276,801	177	2,731	16,925	-	11,548	45,805	247,234	53,465	136,173	217,807
1964	3,926,000	66,700	1,343,204	1,281,037	390,200	-	4,675	40,637	-	10,886	77,994	289,153	59,215	169,420	242,879
1965	4,382,000	105,900	1,356,040	1,539,520	432,538	-	5,500	48,170	2,000	12,815	80,175	354,436	43,300	182,004	219,602
Office of Manned Space Flight															
Proposed supplemental, 1964	141,000	-	31,000	110,000	-	-	-	-	-	-	-	-	-	-	-

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

DISTRIBUTION OF RESEARCH AND DEVELOPMENT BUDGET PLAN BY INSTALLATION AND FISCAL YEAR

(In thousands of dollars)

PROGRAM		TOTAL	J. F. KENNEDY SPACE CENTER, NASA	MANNED SPACECRAFT CENTER	MARSHALL SPACE FLIGHT CENTER	GODDARD SPACE FLIGHT CENTER	PACIFIC LAUNCH OPERATIONS OFFICE	WALLOPS STATION	AMES RESEARCH CENTER	ELECTRONICS RESEARCH CENTER	FLIGHT RESEARCH CENTER	LANGLEY RESEARCH CENTER	LEWIS RESEARCH CENTER	SPACE NUCLEAR PROPULSION OFFICE	HEADQUARTERS	WESTERN OPERATIONS OFFICE
OFFICE OF MANNED SPACE FLIGHT, TOTAL	1963	1,503,583	10,106	687,361	767,143	-	-	-	-	-	-	1,000	3,062	-	34,106	805
	1964	2,649,800	66,000	1,335,750	1,195,157	-	-	-	75	-	-	1,700	3,200	-	47,548	370
	1965	3,011,900	104,900	1,344,100	1,503,400	-	-	-	-	-	-	1,000	3,000	-	55,500	-
Gemini	1963	288,090	-	288,090	-	-	-	-		-	-	-	-	-	-	-
	1964	383,800	-	383,800	-	-	-	-	-	-	-	-	-	-	-	-
	1965	308,400	-	308,400	-	-	-	-	-	-	-	-	-	-	-	-
Apollo	1963	1,183,965	9,715	377,387	760,601	-	-	-	-	-	-	-	3,062	-	32,395	805
	1964	2,243,860	65,700	946,850	1,184,582	-	-	-	75	-	-	-	3,200	-	43,083	370
	1965	2,677,500	103,900	1,030,200	1,491,900	-	-	-	-	-	-	-	3,000	-	48,500	-
Advanced missions	1963	11,391	391	1,747	6,542	-	-	-	-	-	-	1,000	-	-	1,711	-
	1964	22,140	300	5,100	10,575	-	-	-	-	-	-	1,700	-	-	4,465	-
	1965	26,000	1,000	5,500	11,500	-	-	-	-	-	-	1,000	-	-	7,000	-
Completed missions	1963	20,137	-	20,137	-	-	-	-	-	-	-	-	-	-	-	-
	1964	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	1965	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OFFICE OF SPACE SCIENCE AND APPLICATIONS, TOTAL	1963	615,345	-	-	11,261	184,745	177	-	7,456	-	44	11,047	151,809	-	72,292	176,514
	1964	742,500	700	2,100	700	239,900	-	-	26,000	-	100	33,600	193,300	-	83,800	162,300
	1965	776,900	1,000	6,400	500	224,500	-	-	30,900	-	100	45,600	235,500	-	89,400	143,000
Geophysics and astronomy	1963	147,689	-	-	3,162	104,338	-	-	327	-	44	7,078	8,653	-	15,998	8,089
	1964	186,200	-	-	200	142,000	-	-	700	-	100	8,700	16,800	-	17,300	400
	1965	190,200	-	200	-	137,800	-	-	500	-	100	5,600	25,300	-	20,300	400
Lunar and planetary exploration	1963	222,802	-	-	1,177	978	-	-	3,483	-	-	56	50,328	-	10,452	156,328
	1964	270,800	-	2,100	400	5,300	-	-	15,400	-	-	20,100	56,900	-	10,500	160,100
	1965	300,400	-	6,100	400	9,400	-	-	14,600	-	-	33,900	82,400	-	12,500	141,100
Sustaining university program	1963	30,600	-	-	-	-	-	-	-	-	-	-	-	-	30,540	60
	1964	40,000	-	-	-	-	-	-	-	-	-	-	-	-	40,000	-
	1965	46,000	-	-	-	-	-	-	-	-	-	-	-	-	46,000	-
Launch vehicle development	1963	105,729	-	-	5,222	1,400	177	-	-	-	-	3,246	92,828	-	673	2,183
	1964	125,100	700	-	-	2,800	-	-	-	-	-	3,500	117,300	-	800	-
	1965	128,200	1,000	-	-	3,300	-	-	-	-	-	4,500	118,500	-	900	-
Bioscience	1963	13,731	-	-	-	-	-	-	3,646	-	-	-	-	-	9,281	804
	1964	20,600	-	-	-	300	-	-	9,900	-	-	-	-	-	9,600	800
	1965	31,000	-	-	-	5,800	-	-	15,800	-	-	-	-	-	7,900	1,500
Meteorological systems	1963	54,051	-	-	1,200	44,983	-	-	-	-	-	147	-	-	2,821	4,900
	1964	67,800	-	-	100	60,800	-	-	-	-	-	1,100	1,000	-	4,800	-
	1965	37,500	-	100	100	32,500	-	-	-	-	-	1,100	3,400	-	300	-
Communication satellites	1963	32,075	-	-	500	25,878	-	-	-	-	-	520	-	-	2,527	2,650
	1964	13,500	-	-	-	11,200	-	-	-	-	-	200	1,300	-	800	-
	1965	12,600	-	-	-	10,600	-	-	-	-	-	500	-	-	1,500	-
Advanced technological satellites	1963	8,668	-	-	-	7,168	-	-	-	-	-	-	-	-	-	1,500
	1964	18,500	-	-	-	17,500	-	-	-	-	-	-	-	-	-	1,000
	1965	31,000	-	-	-	25,100	-	-	-	-	-	-	5,900	-	-	-

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

DISTRIBUTION OF RESEARCH AND DEVELOPMENT BUDGET PLAN BY INSTALLATION AND FISCAL YEAR

(In thousands of dollars)

PROGRAM		TOTAL	J. F. KENNEDY SPACE CENTER, NASA	MANNED SPACECRAFT CENTER	MARSHALL SPACE FLIGHT CENTER	GODDARD SPACE FLIGHT CENTER	PACIFIC LAUNCH OPERATIONS OFFICE	WALLOPS STATION	AMES RESEARCH CENTER	ELECTRONICS RESEARCH CENTER	FLIGHT RESEARCH CENTER	LANGLEY RESEARCH CENTER	LEWIS RESEARCH CENTER	SPACE NUCLEAR PROPULSION OFFICE	HEADQUARTERS	WESTERN OPERATIONS OFFICE
OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY, TOTAL	1963	271,560	-	2,613	24,473	4,528	-	-	9,469	-	9,889	32,555	92,361	53,465	20,772	21,435
	1964	320,200	-	5,349	31,830	7,855	-	-	14,552	-	8,986	40,174	92,648	59,215	27,212	32,379
	1965	320,300	-	5,525	31,570	7,778	-	-	17,250	2,000	10,415	31,325	115,916	43,300	24,489	30,732
Basic research	1963	17,696	-	-	840	202	-	-	1,085	-	-	1,482	2,465	-	5,535	6,087
	1964	21,000	-	-	927	235	-	-	1,665	-	-	1,466	2,725	-	7,477	6,505
	1965	21,000	-	375	840	270	-	-	1,655	-	230	1,570	2,745	-	7,050	6,265
Space vehicle systems	1963	43,990	-	1,127	7,117	681	-	-	1,296	-	252	19,418	5,663	-	4,142	4,294
	1964	49,000	-	1,143	12,608	1,205	-	-	2,622	-	1,240	18,172	3,117	-	3,661	5,232
	1965	38,800	-	975	6,770	1,138	-	-	3,530	-	2,300	12,105	3,602	-	3,265	5,115
Electronic systems	1963	17,071	-	482	2,943	1,555	-	-	1,605	-	711	6,119	200	-	2,312	1,144
	1964	28,700	-	1,800	4,850	2,800	-	-	2,550	-	1,300	8,975	500	-	3,150	2,775
	1965	28,400	-	1,725	4,450	2,750	-	-	2,455	2,000	1,285	7,690	700	-	2,360	2,985
Human factor systems	1963	9,790	-	1,004	-	-	-	-	2,623	-	500	1,031	42	-	4,519	71
	1964	13,200	-	2,006	685	-	-	-	3,061	-	1,272	913	250	-	5,013	-
	1965	16,200	-	2,050	1,200	-	-	-	4,050	-	2,000	1,200	400	-	5,300	-
Nuclear-electric systems	1963	39,893	-	-	40	214	-	-	-	-	-	600	36,542	-	1,110	1,387
	1964	44,700	-	100	290	1,165	-	-	-	-	-	-	38,978	-	1,897	2,270
	1965	48,100	-	100	290	1,170	-	-	-	-	-	-	42,338	-	1,932	2,270
Nuclear rockets	1963	69,465	-	-	10,548	-	-	-	-	-	-	-	5,113	53,465	-	339
	1964	82,700	-	-	8,100	-	-	-	-	-	-	-	10,685	59,215	-	4,700
	1965	58,000	-	-	600	-	-	-	-	-	-	-	10,700	43,300	200	3,200
Chemical propulsion	1963	49,722	-	-	2,565	405	-	-	-	-	-	1,065	38,236	-	1,094	6,357
	1964	45,800	-	300	3,620	350	-	-	-	-	-	1,350	29,800	-	2,080	8,300
	1965	59,800	-	300	16,620	350	-	-	-	-	-	1,350	30,800	-	2,080	8,300
Space power	1963	8,335	-	-	420	1,471	-	-	3	-	-	478	3,763	-	444	1,756
	1964	13,000	-	-	500	2,100	-	-	100	-	-	770	6,521	-	412	2,597
	1965	13,000	-	-	500	2,100	-	-	100	-	-	770	6,521	-	412	2,597
Aeronautics	1963	15,598	-	-	-	-	-	-	2,857	-	8,426	2,362	337	-	1,616	-
	1964	22,100	-	-	250	-	-	-	4,554	-	5,174	8,528	72	-	3,522	-
	1965	37,000	-	-	300	-	-	-	5,460	-	4,600	6,640	18,110	-	1,890	-
OFFICE OF TRACKING AND DATA ACQUISITION																
Tracking and data acquisition	1963	122,142	-	-	3,153	87,434	-	2,731	-	-	1,615	1,176	-	-	7,047	18,986
	1964	210,000	-	-	3,325	142,400	-	4,675	-	-	1,800	2,500	-	-	7,540	47,760
	1965	267,900	-	-	4,000	200,200	-	5,500	-	-	2,300	2,200	-	-	7,900	45,800
OFFICE OF TECHNOLOGY UTILIZATION AND POLICY PLANNING																
Technology utilization	1963	2,164	-	-	18	94	-	-	-	-	-	27	2	-	1,956	67
	1964	3,500	-	5	25	45	-	-	10	-	-	20	5	-	3,320	70
	1965	5,000	-	15	50	60	-	-	20	-	-	50	20	-	4,715	70
TOTAL BUDGET PLAN	1963	2,514,794	10,106	689,974	806,048	276,801	177	2,731	16,925	-	11,548	45,805	247,234	53,465	136,173	217,807
	1964	3,926,000	66,700	1,343,204	1,231,037	390,200	-	4,675	40,637	-	10,886	77,994	289,153	59,215	169,420	242,879
	1965	4,382,000	105,900	1,356,040	1,539,520	432,538	-	5,500	48,170	2,000	12,815	80,175	354,436	43,300	182,004	219,602
OFFICE OF MANNED SPACE FLIGHT Proposed supplemental, 1964																
Apollo	1964	141,000	-	31,000	110,000	-	-	-	-	-	-	-	-	-	-	-

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

SUMMARY OF LAUNCH VEHICLE PROCUREMENT FOR UNMANNED PROGRAMS

(Thousands of Dollars)

Program/Project	Vehicle	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1965
Geophysics and Astronomy				
Orbiting Solar Observatory	Delta	$2,289	$3,700	$2,700
Orbiting Astronomical Observatory	Atlas-Agena	1,356	7,900	13,400
Orbiting Geophysical Observatory	Atlas-Agena	4,890	4,800	5,200
Orbiting Geophysical Observatory	Thor-Agena	2,366	3,000	5,700
Explorers	Scout	4,954	6,600	4,300
Explorers	Delta	14,100	11,700	7,500
Explorers	Thor-Agena	3,100	1,100	1,000
Lunar and Planetary Exploration				
Ranger	Atlas-Agena	32,416	11,200	2,000
Surveyor Lander	Atlas-Centaur	13,900	32,000	54,000
Lunar Orbiter	Atlas-Agena	---	---	15,500
Mariner	Atlas-Centaur	---	---	6,300
Mariner	Atlas-Agena	4,812	13,700	4,600
Pioneer	Delta	---	4,100	8,100
Bioscience				
Biosatellite	Delta	---	---	6,500
Meteorological Satellites				
TIROS	Delta	10,200	3,800	3,300
Nimbus	Thor-Agena	1,200	1,000	3,400
Communications Satellites				
Echo II	Thor-Agena	500	1,300	---
Relay	Delta	1,000	300	---
Syncom	Delta	4,000	3,100	---

Program/Project	Vehicle	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1965
Advanced Technological Satellites				
Advanced Technological Satellites	Atlas-Agena	---	---	$5,900
Space Vehicle Systems				
Reentry	Scout	$1,000	$1,000	1,000
Micrometeoroid	Scout	1,500	500	---
FIRE	Atlas	4,000	1,530	1,110
Nuclear Electric Systems				
SERT	Scout	600	---	---
TOTAL		$108,183	$112,330	$151,510

SUMMARY BY VEHICLE

Vehicle	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1965
Scout	$8,054	$8,100	$5,300
Delta	31,589	26,700	28,100
Thor-Agena	7,166	6,400	10,100
Atlas	4,000	1,530	1,110
Atlas-Agena	43,474	37,600	46,600
Atlas-Centaur	13,900	32,000	60,300
TOTAL	$108,183	$112,330	$151,510

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1965 ESTIMATES

SUPPORTING RESEARCH AND TECHNOLOGY
(Thousands of Dollars)

	Fiscal Year 1963	Fiscal Year 1964	Fiscal Year 1965
OFFICE OF MANNED SPACE FLIGHT.....	$25,570	$46,500	$48,900
Apollo.....	25,570	46,500	48,900
Spacecraft technology.....	(7,963)	(18,700)	(20,200)
Launch vehicle technology.....	(6,299)	(12,900)	(13,000)
Propulsion technology.....	(9,004)	(12,800)	(12,200)
Launch operations technology...	(2,304)	(2,100)	(3,500)
OFFICE OF SPACE SCIENCE AND APPLICATIONS.....	$65,713	$58,800	$60,400
Geophysics and astronomy.....	13,581	15,100	14,800
Lunar and planetary.....	22,205	19,000	18,100
Launch vehicle development.....	1,598	1,900	4,500
Bioscience.....	11,772	12,100	11,800
Meteorology satellites.....	4,877	6,900	6,600
Communications satellites.....	3,012	1,700	3,500
Advanced technological satellites	8,668	2,100	1,100
OFFICE OF ADVANCED RESEARCH AND TECHNOLOGY.....	$124,783	$174,900	$178,100
Basic research.....	17,696	21,000	21,000
Space vehicle systems.....	20,226	26,300	26,300
Electronic systems.....	15,535	24,900	25,400
Human factors systems.....	9,678	13,200	13,200
Nuclear-electric systems.....	19,463	24,600	25,000
Nuclear rockets.....	12,878	21,200	23,000
Chemical propulsion.....	14,392	21,800	21,800
Space power.....	8,335	13,000	13,000
Aeronautics.....	6,580	8,900	9,400
OFFICE OF TRACKING AND DATA ACQUISITION.....	$13,277	$12,000	$15,500
GRAND TOTAL.....	$229,343	$292,200	$302,900

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