MSC CONSTRUCTION CONTRACTS

FY 1966 (Cont'd)

Apprn	NDPR Or Contract Number	Description	Location	Contractor	Total Cost*	Anticipated Completion Date
R&D	NAS9-6356	Install LN_2 Burst Disc; air lock; stairway enclosure, and LOX trailer pad	Houston, Texas	Evans Construction Company	$ 220,029	Feb., 1967
R&D	NAS9-6355	Modifications to Thermochemical area and outside Bottle Storage, Bldg. 36	Houston, Texas	Stone Construction Company	57,741	Dec., 1966
A&O	NAS9-6355	Graphics Service addition; central gas cylinder; and Contractor Shop/Warehouse	Houston, Texas	Stone Construction Company	195,874	Feb., 1967
CofF	NAS9-6355	G&N Checkout Lab and Instrument Construction Shop, Bldg. 16A	Houston, Texas	Stone Construction Company	38,215	Dec., 1966
R&D	NAS9-6336	Addition to Health Physics Lab; LN_2 Facility, Bldg. 7; Microminiature Lab, Bldg. 15; and mockup facility, Bldg. 5.	Houston, Texas	Evans Construction Company	212,593	Feb., 1967
CofF	NAS9-6131	Modifications to computer area, Bldg. 440	Houston, Texas	Chambers & McGregor	$ 59,571	Aug., 1966
CofF	NAS9-6012	Fabrication of 50 ton bridge crane	Houston, Texas	Crane Hoist	74,863	Jan., 1967
R&D	NAS9-6000	Modifications to provide electrical power and air conditioning to Bldg. 30 & 48	Houston, Texas	Chambers & McGregor	170,003	Feb., 1967

*On contract January 1, 1967

MSC CONSTRUCTION CONTRACTS

FY 1967

Apprn	NDPR Or Contract Number	Description	Location	Contractor	Total Cost *	Anticipated Completion Date
CofF	NAS9-6689	Modifications to Equipment Room, Bldg. 45	Houston, Texas	Stone Construction Company	$ 13,860	Jan., 1967
R&D	NAS9-6618	Modifications to computer area, Bldg. 12	Houston, Texas	Evans Construction Company	32,200	Dec., 1966
CofF	NAS9-6594	Modifications to Emergency Repressurization System, Bldg. 32	Houston, Texas	Evans Construction Company	216,100	March, 1967
R&D	NAS9-6527	Lunar Landing Training Vehicle Operations & Maintenance Facility	Houston, Texas	B. J. Larvin, General Contractor	88,948	Dec., 1966
CofF	NAS9-6500	Phase II Construction of Lunar Receiving Laboratory	Houston, Texas	Warrior/NATKIN/ NAT	2,000,000	July, 1967
CofF	NAS9-6451	Phase I Construction of Lunar Receiving Laboratory	Houston, Texas	Warrior Construction Company	1,692,855	March, 1967
R&D	T-95557	Chemistry Laboratory modifications to Bldg. 200	White Sands Test Facility	Corps of Engineers	$ 68,700	May, 1967
R&D	T-95570	Access Fence	White Sands Test Facility	U. S. Department of Interior	19,875	Apr., 1967

*On contract January 1, 1967

III. PROCUREMENT FOR RESEARCH AND DEVELOPMENT

A. Number of Procurement Plans Submitted to Center Director

B. Number Submitted to NASA Headquarters

C. Number of Procurement Plans not Included in A and B above

MSC PROCUREMENT PLAN POLICY

This Section sets forth the policy and level of approving authority for procurement plans at MSC. The number of procurement plans prepared at this Center during Fiscal Years 1965, 1966, and 1967 to date (December 31, 1966) are set forth in the appropriate category. All procurement plans whic have been submitted to NASA Headquarters have been further identified as to "title of procurement" and "estimated value."

If the contract is expected to be less than $1,000,000, the procurement plan does not require approval by the Center Director but is approved by the MSC Procurement Officer after coordination wi the Procurement Policy and Review Section and the cognizant Program Office or Assistant Directorat

If the contract is expected to be more than $1,000,000 but less than $5,000,000, the procurement plan must be approved by the Center Director after coordination with the Procurement Policy and Review Section, the cognizant Program Office or Assistant Directorate, and the MSC Procurement Officer. The plan may then be forwarded to Headquarters if factors indicate such action desirable, for example, when technical responsibility remains in Headquarters. In all instances where the contract is expected to exceed $5,000,000, the procurement plan is forwarded to NASA Headquarters for review and approval.

If the contract is for services, a procurement plan is prepared if the estimated cost is $100,000 or more or if the duration of the contract with the options is six months or more. Such plans are approved by the Director if the estimated cost is less than $1,000,000 or if the duration of the contract with the options is less than a year. Beyond these limits the plans are approved by NASA Headquarters.

PROCUREMENT PLANS

	FY 65	FY 66	FY 67 to Date
Number of procurement plans prepared by MSC	158	174	48
Number of procurement plans submitted to Center Director for approval	23	29	6
Number of procurement plans submitted to NASA Headquarters	12	11	3
Number of procurement plans submitted to the Procurement Officer, MSC, for approval	111	58	0

IV. CONTRACTS, 1966

A. Number of Competitive participants in each Research & Development negotiated Contract

MSC NEGOTIATED COMPETITIVE RESEARCH AND DEVELOPMENT CONTRACTS
CALENDAR YEAR 1966

Contract Number	Description	Total Firms Solicited	Number of Competiti Participants
NAS 9-5266	Design and Integration Study of a Photovoltaic Power System	30	16
NAS 9-5391	Hall Effect System	41	8
NAS 9-5425	Time and Frequency Reference System	48	3
NAS 9-5430	Testing and Evaluation of Thermal Protection System	39	6
NAS 9-5451	Apollo Experiments Pallet Phase I-Program Definition	43	9
NAS 9-5491	The Evaluation and Design of Cryogenic Pressure Vessels	12	6
NAS 9-5499	Orbital Position Indicator	26	3
NAS 9-5567	Accelerator Modification Equipment	20	2
NAS 9-5568	Multiple Frame Electronic Camera	50	3
NAS 9-5580	Static Inverter	100	13
NAS 9-5581	Study Static Inverter	100	13
NAS 9-5592	Thin Film Capacitor Study	29	8
NAS 9-5642	Tape Recorder - Reproducer	10	3
NAS 9-5648	Broad Band Amplifiers	17	2
NAS 9-5682	Comparator	10	3
NAS 9-5692	Video Switching Matrix	15	3
NAS 9-5699	Ultrasonic Cleaning Equipment	14	3
NAS 9-5723	Analog Computer	11	5
NAS 9-5727	X-Y Plotter	17	2
NAS 9-5742	Development of Data Analyzer	83	7
NAS 9-5781	Ablator Material	20	4
NAS 9-5809	Induction Heated Silicon Epitaxial Growth System	15	3
NAS 9-5820	Performance of Tests to Determine the Effects of Space Environment and Reentry Conditions on Parachute Materials	10	4
NAS 9-5825	Double-Chamber Diffusion Furnace	18	4
NAS 9-5829	Apollo Lunar Surface Experiments Package Development Program	36	9
NAS 9-5831	Torque Measuring System	13	1
NAS 9-5842	Investigation of Low-Temperature Creep in Titanium Alloys	49	20
NAS 9-5846	Signal Conditioning Checkout System	66	1
NAS 9-5854	Fabrication Process for Nominally Spherical Beads	30	4
NAS 9-5860	Microminiature Low Level Multicoder	10	10
NAS 9-5868	Versatile Stereoscope with Accessories	12	1
NAS 9-5872	Gloves for use in 10^{-6} TORR Vacuum	24	10

MSC NEGOTIATED COMPETITIVE RESEARCH AND DEVELOPMENT CONTRACTS
CALENDAR YEAR 1966

Contract Number	Description	Total Firms Solicited	Number of Competitive Participants
NAS 9-5887	Digital TV Encoder/Decoder	35	2
NAS 9-5888	Lunar Environment Simulator System	21	11
NAS 9-5910	LM Crew Station Condola	25	8
NAS 9-5919	Laboratory Furniture and Equipment	10	6
NAS 9-5955	Time Delay Correlators	39	1
NAS 9-5976	Meteoroid Detector Analyzer	28	11
NAS 9-5981	LM Film Graphics	32	9
NAS 9-5983	Optical Measuring Device	3	3
NAS 9-5995	Analog Computer	13	6
NAS 9-5997	Data Logging System	110	60
NAS 9-6046	Timing Subsystem	12	7
NAS 9-6064	Star Simulators and Beam Combination Unit	33	16
NAS 9-6077	Digital Tape Transport	10	5
NAS 9-6080	Flat Face Probes	9	6
NAS 9-6081	Airborne Digital Voltohmmeter	7	3
NAS 9-6090	Video Distribution and Test Bay	9	6
NAS 9-6092	Contract for Phase C, Program Definition of the Apollo Lunar Surface Drill Program	43	7
NAS 9-6093	Contract for Phase C, Program Definition of the Apollo Lunar Surface Drill Program	43	7
NAS 9-6105	Liquid Propellant Tests in a Vacuum Chamber	38	12
NAS 9-6106	Pressure Transducers	12	6
NAS 9-6114	Universal Signal Conditioning Modules	45	10
NAS 9-6126	Tape Recorder	10	4
NAS 9-6136	Data Read-out System	10	5
NAS 9-6151	Logic Expansion Units	8	5
NAS 9-6160	Optical Scanner	55	27
NAS 9-6169	Microphotometers	12	8
NAS 9-6173	Implementation and Operation of Apollo Process Control Unit	46	16
NAS 9-6174	Analog Tape Recorder	10	5
NAS 9-6178	Digital High-speed Statistical Calculation Unit	24	11
NAS 9-6193	Irradiation of Thermal Control Coating Materials	26	10
NAS 9-6195	Diode Development of a Gallium Arsenide Laser	17	6
NAS 9-6207	Digital Data Acquisition System	30	15

MSC NEGOTIATED COMPETITIVE RESEARCH AND DEVELOPMENT CONTRACTS
CALENDAR YEAR 1966

Contract Number	Description	Total Firms Solicited	Number of Competitiv Participants
NAS 9-6220	Airborne Time Code Generators	11	8
NAS 9-6287	Design and Development of Radiation Survey Meters and Design and Fabrication of Personal Radiation Dosimeters	66	29
NAS 9-6288	Charring Ablation Material Study	43	13
NAS 9-6294	Strip Chart Recorders	16	10
NAS 9-6305	Calculation of Electrical Charge on Apollo CSM in Lunar Environment	45	22
NAS 9-6324	Study of Biaxial Stress Corrosion	19	2
NAS 9-6333	Infrared Imaging System and Display System	2	2
NAS 9-6334	Dividing Head	3	3
NAS 9-6348	Hyperbaric Chamber	25	10
NAS 9-6352	Video Patching and Distribution	10	6
NAS 9-6376	Multiplex System	11	4
NAS 9-6409	Pressure Switches	60	29
NAS 9-6420	Laser Communication System	35	10
NAS 9-6464	Mars Excursion Module Development	60	18
NAS 9-6468	Testing Machine	19	10
NAS 9-6470	Development and Fabrication Storage System	24	10
NAS 9-6481	Determination of Heat Flow From the Body	18	6
NAS 9-6489	Optic Collimator	16	6
NAS 9-6494	The Effects of Lunar Gravity Simulation for Metabolic Rates	24	5
NAS 9-6506	Vibration Isolation System	20	10
NAS 9-6543	Laboratory Apollo Data Storage Equipment Instrumentation Recorder/ Reproducer	42	7
NAS 9-6557	Slow Scan Test and Sync Generator	28	15
NAS 9-6587	Phase D Apollo Lunar Surface Drill	43	6
NAS 9-6591	Microminiature Telemetry Modulation System	9	5
NAS 9-6615	Modulation Transfer Function Analyzer	9	4
NAS 9-6616	Develop Instrumented Models for use in Qualification of Apollo Thermal Protection System	44	18
NAS 9-6636	Design, Development and Fabrication of Microcircuits in Conjunction with Apollo Personal Communications System	58	17
NAS 9-6642	Automatic Tape Search and Time Display System	20	10

MSC NEGOTIATED COMPETITIVE RESEARCH AND DEVELOPMENT CONTRACTS
CALENDAR YEAR 1966

ntract Number	Description	Total Firms Solicited	Number of Competitive Participants
NAS 9-6709	Instrumentation Recorder	28	11
NAS 9-6720	Therodynamic Properties of Aerozine 50	23	4
NAS 9-95140	Recorder/Reproducer	36	9
NAS 9-95144	Radio Transceivers	71	35
NAS 9-95177	Helium Semitrailers	55	37
NAS 9-95197	Microanalyzer	71	30

TOTAL NUMBER CONTRACTS - 98

IV. CONTRACTS

B. Fixed-price contracts converted to CPIF

C. Contracts scheduled to be converted to CPIF

D. Contracts to a review board to determine final fee

MSC CONTRACT DATA

The following contractual information is furnished for calendar year 1966.

B. MSC had no fixed-price contracts converted to CPIF.

The following information is provided as to CPFF contracts converted to incentive type.

1. On January 26, 1966, Contract NAS 9-150 with North American Aviation, Inc., Space and Information Systems Division, was converted from CPFF to CPIF, with target cost of $629.5 million and a fee range of $27.29 to $85.735 million.

2. Contract NAS 9-996 with International Business Machines, Inc., for the design development implementation, maintenance and operations of the Real Time Computer Complex was converted from CPFF to CPIF on August 5, 1966. The estimated contract cost at conversion was $130,753,098 with an incentive fee range of negative $1,630,000 to positive $9,950,000, and a fixed fee of $1,380,958.

3. The conversion from CPFF to CPIF of Contract NAS 9-1100 for the Lunar Module with Grumman Aircraft Engineering Corporation was approved by NASA Headquarters February 11, 1966. The total estimated cost, exclusive of fee of the contract, is $1,290,000,000 with a fee range of $57,580,000 to $154,050,000.

4. Contract NAS 9-2011 with the Houston Fire and Safety Equipment Company for fire protection of MSC was converted July 1, 1966, from CPFF to CPAF. The estimated contract cost at the time of conversion was $651,947, with a fee range of zero dollars to $45,600.

5. On July 1, 1966, Contract NAS 9-2915 with Lockheed Aircraft Corporation for engineering design and drafting services was converted from CPFF to CPAF. The estimated contract cost is $1,717,575 with a fee range of $2,011 to $123,358.

6. Contract NAS 9-3535 with United Aircraft Division of United Aircraft Corporation for the development of Apollo prototype spacesuits and portable life support system was approved for conversion from CPFF to CPIF by NASA Headquarters on May 4, 1966. The total estimated cost is $24,300,000, with a fee range from $729,000 to $3,645,000.

7. On July 1, 1966, Contract NAS 9-5026 with Taft Broadcasting Company for closed circuit TV maintenance, operation, and engineering services was converted from CPFF to CPAF. The total contract cost is $367,357, with a fee range of zero dollars to $16,000.

MSC CONTRACT DATA

C. The following contract is scheduled to be converted to CPIF.

On September 15, 1966, NASA Headquarters approved the renegotiation incentive position of Contract NAS 9-1261 with Philco-Ford Corporation, Western Development Laboratories Division. This is an effort to continue this contract under incentive arrangement.

D. No contracts were subjected to a review board to determine final contract fee after completion.

IV. CONTRACTS

E. Organization identification of Contract Approval Authority (organization level and type of authority)

MSC CONTRACT APPROVAL AUTHORITY

The following sets forth the Center and NASA policy for authority to approve contracts reflecting the type of authority available at each organization level.

All contracts in excess of $2,500,000 and specialty contracts such as certain categories of utility services; all contracts for personal services; management consultants; advance payments; leases of real property where the annual rental exceeds $25,000; architect-engineering contracts when the total dollar value is $250,000 or the work to be performed under a cost-plus-fixed-fee or fixed-price contract includes preparation of designs, plans, drawings, and specifications (Title I Services) and the fee, inclusive of the architect-engineer's costs, to be paid to the architect-engineer for the performance of such services exceeds 6% of the estimated cost of the related construction project, exclusive of the amount of such fee; and facility contracts where the total cost of facilities will exceed $250,000 or which involve real property regardless of amount, are subject to approval by NASA Headquarters.

Authority for issuance of contracts under $2,500,000 subject to the above exceptions which require NASA Headquarters approval resides in the Center Director, who in turn delegates the authority to the Center Procurement Officer.

Contract modifications which, of themselves, commit the Government to expenditures within the monetary limits cited above are, for approval purposes, treated as contracts.

IV. CONTRACTS

F. Contracts Renegotiated

G. Percentage of Contracts to Small Business

F. There were no contracts renegotiated by MSC.

G. The following two statements are based on fiscal year, not calendar year, computations:

(1) Forty-six percent of the total number of MSC contracts awarded in FY 66 was let to small business.

V. FACILITIES

A. Furnish information to show the status of projects; whether in planning, design or construction for Fiscal Years 1962, 1963, 1964, 1965, 1966, 1967, 1968 and future years when incrementally funded. Provide fiscal data to include unobligated balances as of January 1, 1967. (An unobligated balance exists for this purpose when available funds are not obligated to a contract or work order to another Government agency.)

STATUS OF FACILITY PROJECTS

MANNED SPACECRAFT CENTER, HOUSTON, TEXAS

	Project	FY Approved	Program Plan	Unobligated Balance Jan. 1, 1967	Status
7201	Environmental Testing Laboratory	1962	$37,954,400	$ 672,376	Construction 99% complete. Claims pending.
7203	MSC Facilities	1962	$34,167,000	0	Construction completed. Claim pending.
7203	MSC Facilities	1963	7,403,380	12,428	Construction completed. Claims pending.
7205	Flight Acceleration Facility	1963	11,245,100	94,688	Construction completed. Claims pending.
7207	Mission Control Center	1963	21,678,676	0	Construction completed. Claims pending.
7207	Additions to the Mission Control Center	1964	8,409,000	14,815	Completed.
7212	Mission Simulation and Training Facility	1964	2,069,000	56,500	Construction completed.
7213	Spacecraft Control Technology Laboratory	1964	5,557,800	452,941	Construction completed. Equipment Procurement 95% complete.
7214	Atmospheric Re-entry Materials and Structures Evaluation Facility	1964	$ 2,695,000	$ 63,137	Construction 85% complete.
7215	Center Support Facilities	1964	3,821,000	225,000	Construction 99% complete. Equipment Procurement 94% complete.
7216	Launch Environment and Antenna Test	1964	7,514,400	1,168	Construction completed. Claims pending.
7218	Project Engineering Facility	1964& 1965	4,525,000	805,790	Construction 99% complete.
7220	Ultra-High Vacuum Space Chamber Facility	1964	1,728,600	39,308	Construction 90% complete. Claims pending.
7222	Lunar Mission and Space Facility	1965	2,554,000	35,770	Construction 98% complete. Claims pending.
7223	Electronic Systems Compatibility Facility	1965	3,435,000	252,087	Construction completed.
7224	Modification to Environmental Test Laboratory	1965	6,043,000	3,873,964	Construction 48% complete.
7226	Technical Services Facility	1965	2,330,400	216,400	Construction 90% complete.
7227	Crew Systems Facility	1965	1,626,000	0	Construction complete. Claims pending.

STATUS OF FACILITY PROJECTS

	Project	FY Approved	Program Plan	Unobligated Balance Jan. 1, 1967	Status
7228	Cafeteria	1965	$ 787,500	$ 25,823	Construction 99% complete
7230	Central Heating and Cooling Plant and Warehouse Addition	1965	1,450,000	225,100	Construction completed. Claims pending. Equipment Procurement 85% complete.
7215	Center Support Facilities	1966	800,000	200,800	Construction completed.
7224	Modifications to Environmental Testing Laboratory	1966	3,380,000	551,540	Construction 85% complete
7215	Center Support Facilities	1967	1,000,000	1,000,00	Under design
7235	Lunar Sample Receiving Laboratory	1967	8,100,000	4,011,234	Construction 50% complete
7242	Flight Crew Training Facility	1967	1,100,000	1,100,000	Under design
7245	Engineering Building	1967	2,600,000	2,600,000	Planning
7215	Center Support Facilities	1968	525,000	525,000	Planning
7224	Modifications to Environmental Testing Laboratory	1968	1,900,000	1,900,000	Planning

STATUS OF FACILITY PROJECTS

MANNED SPACECRAFT CENTER - VARIOUS LOCATIONS

	Project	FY Approved	Program Plan	Unobligated Balance Jan. 1, 1967	Status
9121	Apollo Propulsion Systems Development Facility (WSTF)	1963	$ 8,809,000*	$ 0	Completed. Claims pending.
9137	Lunar Module Test Facility (WSTF)	1964	14,430,000	1,150	Construction. Claims pending
3581	Apollo Spacecraft Facilities (Downey)	1963	9,289,000*	0	Construction.

* R&D Appropriation

V. FACILITIES

B. Furnish a listing of Cost-Plus-Fixed-Fee and Cost-Plus-Award-Fee Contracts entered into for facility management, services and construction. Provide information as to the purpose of each.

CPFF CONTRACT FOR FACILITIES EFFORT

Chambers and McGregor, Inc.
P. O. Box 74
Houston, Texas

Cost-plus-fixed-fee contract to install additional air conditioning controls and air handling units, and modifications to accommodate new Real Time Computer Complex equipment in Building 30.

Contract No. NAS9-6000 Total Estimated Cost: $246,766

CPFF CONTRACT FOR FACILITIES EFFORT

Chambers and McGregor, Inc. and
C Equipment Sales Company
P. O. Box 74
Houston, Texas

Cost-plus-fixed-fee contract to provide electrical cable and wiring installation in Building 440, move computer equipment from Building 420, and install this equipment in Building 440.

Contract No. NAS9-6131 Total Estimated Cost: $59,571

CPFF CONTRACT FOR FACILITIES EFFORT

CryoVac, Inc.
930 Kinnear Road
Columbus, Ohio

Cost-plus-fixed-fee contract for modification to the cryogenic and vacuum systems in the Space Environmental Simulation Laboratory, Building 32.

Contract No. NAS9-5710 Total Estimated Cost: $821,191

CPFF CONTRACT FOR FACILITIES EFFORT

Thiokol Chemical Corporation
Reaction Motors Division
Denville, New Jersey

Cost-plus-fixed-fee contract for the design, fabrication, installation, and testing of two emergency isolation devices for the LM Test Facility at WSTF.

Contract No. NAS9-5107 Total Estimated Cost: $468,000

CPAF CONTRACT FOR FACILITIES EFFORT

Warrior Construction, Inc.,
Natkin and Company, Inc., and
National Electric Corporation
(A joint venture)
P. O. Box 127
Houston, Texas 77001

Cost-plus-award-fee contract to provide all labor, services, material and equipment, except GFE, necessary to complete construction of the Lunar Receiving Laboratory, and to install, checkout, and perform acceptance test on all equipment and systems in the facility.

Contract No. NAS9-6500 Total Estimated Cost: $4,802,000

V. FACILITIES

C. An estimate of future construction fund requirements for facility together with a general description of probable work.

Future Construction Fund Requirements for Projects Included in FY 1968 Program

1. Modifications to Environmental Testing Laboratory - due to the complex and sophisticated nature of this facility, $1 to $2 million will be required on a yearly basis to retain present capabilities and incorporate technological advances.

2. Center Support Facilities - It is anticipated that additional funds will be required for utilities and center development to support any future construction programs.

SUPPLEMENTAL APPENDIX

STATEMENT BY DR. GEORGE E. MUELLER, ASSOCIATE ADMINISTRATOR FOR MANNED SPACE FLIGHT, NASA, SUBMITTED IN EXECUTIVE SESSION, APRIL 24, 1967, ON APOLLO AND APOLLO APPLICATIONS R. & D. BUDGET ADJUSTMENTS FOR APPOLLO AS-204 ACCIDENT

The purpose of this statement is to provide data requested by the Subcommittee on Manned Space Flight during the April 24, 1967, authorization hearing (executive session).

Specifically, the request was to update, in consideration of the Apollo AS-204 accident, the schedule and funding data submitted to the committee in support of the fiscal year 1968 NASA manned space flight budget request.

In the hearing before the Subcommittee on NASA Oversight on May 10, 1967, Mr. Webb and Dr. Seamans discussed the effect of the AS-204 accident on schedules and cost. During this hearing I discussed in detail the specific actions to be taken in relation to each of the Apollo 204 Board recommendations; additional actions to be taken that are not related to the Board's recommendations but that are appropriate in terms of the first manned flight of a Block II spacecraft and the planned steps leading to the first manned Apollo flight.

To highlight the impact of the Apollo 204 accident:

1. It has reduced but not eliminated the probability of a manned lunar landing attempt in this decade.
2. It has reduced our overall manned flight program flexibility at an increase in runout costs of over $400 million.
3. It has delayed the earliest target for major Apollo applications program missions.
4. It has necessitated readjustment of fiscal year 1967 and fiscal year 1968 cost estimates which we are determined to absorb within the current budget request.

Above all, the accident has had an impact on the NASA organization and the industrial teams it directs. We are certain we can make the changes and run the tests and accomplish the missions we have planned since 1961. We are certain we can find effective means of adjusting workloads, within the framework of the total job to be done, to reflect the capacity of each element in the organization to accomplish its task.

The attached enclosures discuss the schedule and cost adjustments for the Apollo and Apollo Applications programs.

APOLLO PROGRAM

SCHEDULE

The Apollo Flight program utilizes the all-up concept which I have discussed before this committee in the past. This concept means that complete launch vehicles and spacecraft are used as early in the flight program as possible. This provides an early readiness of the system and enables us to capitalize on success. Another advantage of this concept is that a single vehicle is capable of performing more than one mission type. This concept has become increasingly

important since the accident because it allows the flight program to maintain flexibility in manning the uprated Saturn I and Saturn V and in the transfer of testing between the two series. In addition, this concept allows rapid response to flight failures and to changes in the expected availability of the flight hardware. The preplanned mission types have remained fixed, but the assignment of particular pieces of hardware to missions has been changed following the accident.

The basic flight program remains the same as before and the flight missions are adjusted only in the point of transfer to the Saturn V series of launch vehicles. This transfer now will occur after the Command-Service Module operations phase using the Saturn V.

The mission types and launch schedules appear on figures 1 and 2. The first manned flight is scheduled to take place in the first quarter of 1968. This means that there has been approximately a year's delay in the schedule of the first manned Apollo flight. The first rendezvous and docking mission with a complete Lunar Module and Command-Service Module will be delayed about 9 months. The first complete manned space vehicle with lunar configured hardware will also be delayed about 9 months. These delays have reduced the flexibility in achieving the Apollo goal—that of landing men on the moon and returning them safely to the earth before 1970—but it still remains within reach.

It has been the plan for some time to perform unmanned missions this year using the first two Saturn V launch vehicles and an uprated Saturn I. In addition to flight testing the launch vehicles, these flights can evaluate the performance of the spacecraft heat shield at lunar return reentry velocities and other subsystems of the spacecraft in orbital flight. It is also planned to use these vehicles to begin testing the changes in procedures and hardware that are a result of the accident investigation.

The next uprated Saturn I launch will be a Lunar Module development flight. This launch is scheduled for the second half of calendar year 1967, which is a delay from previous schedules. The cause of this delay is not the result of the accident, but rather the result of the problems associated with moving the first Lunar Module article through manufacturing and checkout. Further, we have found it desirable to change the uprated Saturn I launch vehicle for this mission from SA–206 to SA–204. The basis for this decision was:

1. The SA–204 launch vehicle suffered no damage as a result of the 204 accident.
2. The SA–204 is a more highly instrumented launch vehicle than SA–206. Its utilization at this time will enhance the confidence in launch vehicle reliability for later manned flights.
3. The use of SA–204 avoids the necessity for refurbishment of the launch vehicle after a period of extended storage.

The first Saturn V launch in the Apollo program is the Apollo/Saturn V AS–501. The purpose of this mission is the development of the Saturn V launch vehicle, evaluation of the performance of the spacecraft heat shield at lunar return velocities, and verification of other spacecraft subsystems in flight. This mission is now scheduled for the third quarter of calendar year 1967. This is a delay of several months from what we had planned previously. The cause of this delay is the review of the AS–501 Block I spacecraft (CSM 017) with respect to those things learned as a result of the AS–204 accident.

The third launch will be the second unmanned Apollo/Saturn V, AS–502, scheduled late this year. This will be a repeat of the AS–501 mission and will complete the launch vehicle qualification. We are also considering the modification of the CSM 020 Block I spacecraft assigned to this mission to include a test of the new unified hatch.

As mentioned earlier, the first manned Apollo flight is scheduled for early calendar year 1968. This flight will use an uprated Saturn I and a Block II spacecraft to check out the command-service module and the crew in space flight. This spacecraft will be modified to incroporate all changes that have been defined as a result of our work following the AS–204 accident.

In summary then, the plan for the immediate future is an unmanned lunar module flight with an uprated Saturn I; two unmanned launches of the Saturn

with the modified Block I command-service module; and the first manned Apollo flight, using the Block II spacecraft and an uprated Saturn I.

The nominal program calls for the next phase to develop the more complex operations in space, including rendezvous, which will be required for the lunar mission. When this phase is completed, we plan to demonstrate the maturity of the overall system for accomplishment of the lunar landing by performing a simulation of the lunar mission in earth orbit.

The command-service module lunar module operations may be flown on SA–206/207 and subsequent uprated Saturn I vehicles or on SA–503 and subsequent vehicles. Mission objectives for this flight are:

1. Verify lunar module/crew performance in earth orbital environment.
2. Verify spacecraft/crew operation in earth orbit.
3. Demonstrate mission support facilities performance during an earth orbital mission.

The Lunar Mission Simulation which will be conducted on the Saturn V launch vehicle will have these objectives:

1. Demonstrate launch vehicle capability for inserting a manned, fully loaded Apollo spacecraft on an ellipse, employing a nearly full duration S–IVB burn, including S–IVB restart in orbit.
2. Demostrate capability of the Apollo spacecraft/crew/ground support facilities to perform the Lunar Orbit Rendezvous mission operations by simulations.
3. Demonstrate crew/spacecraft performance in simulated lunar mission.

After completion of the Lunar Mission Simulation the next series of flights will have the objective to:

1. Demonstrate the capability to perform manned lunar landing and return.
2. Perform selenological inspection, survey, and sampling.

Because we are now close to the initial Saturn V flights and our known major problems are solved, we feel we can compress the interval between the early and later launches. This has allowed us to arrive at the revised program that has just been discussed.

APOLLO BACKUP MISSIONS

Several of the launch vehicles can be used for backup missions. SA–206 and SA–207 can be used as backup for the Lunar Module Development or the Command-Service Module operations missions, respectively. There are preplanned alternate missions that accomplish the development of Command-Service Module Lunar Module operations using the uprated Saturn I in place of the Saturn V launch vehicle if we encounter difficulties in the Saturn V development. All uprated Saturn I vehicles are configured to allow these preplanned missions to be flown. We plan to transfer development of manned spacecraft operations to the Saturn V series as soon as that vehicle is flight proven, at which time the remaining uprated Saturn I vehicles will be available for the Apollo Applications program. However, we are prepared with boilerplate spacecraft in the event that Saturn V development problems are encountered; we can devote missions entirely to launch vehicle objectives.

All Saturn V vehicles, with the exception of the first three, are configured to be capable of performing the required missions for Command-Service Module Lunar Module operations for simulating the lunar mission in earth orbit (Lunar Mission Simulation) and for performing lunar missions. This planning will continue to allow program flexibility to minimize the impact of possible future contingencies.

BUDGET SITUATION

The program planning I have described has flexibility; however, it depends upon full support of the fiscal year 1968 budget request. As a matter of policy, NASA will not request a supplemental appropriation in fiscal year 1968; the impact of the accident will be contained within the total budget plan as presently before the Congress. I would like now to discuss our plans in this regard.

First, the immediate problem posed is how can be absorb the added costs in fiscal year 1967 and fiscal year 1968 and still maintain a balanced program. The

budget charts used before the committee during the fiscal year 1968 authorizatio hearings have been marked up to show the changes. Our review of the Apol budget for the 2 years indicated the following increases over the combined fisc year 1967 operating plan and fiscal year 1968 request:

1. The required materials changes and flammability testing for the new spac craft configuration are estimated at $5 million.

2. The design and incorporation of equipment changes and modifications in th Block II spacecraft are estimated at $40 million.

3. The development of new spacesuits is estimated at $8 million.

4. The rescheduling of spacecraft deliveries, both Command-Service Modul and Lunar Module, is estimated at $17 million.

5. The modifications to the launch facilities are estimated at $5 million.

In total, then, about $75 million of additional costs through fiscal year 196 have been identified to date. Offsetting reductions of $25 million in fund require ments, stemming from the lower than planned level of mission operations, hav been established, of which $15 million relates to less launch preparation and $1 million for fewer recovery operations.

The remaining $50 million of additional costs will have to be offset by carefu management of existing contracts. The contracts provide strong incentives for a maximum contractor effort to achieve the best in meeting performance, cost, and time requirements. Additionally, through the control of obligations in the large Saturn V contracts, we anticipate making up a large part of the $50 million deficit. I wish to stress again that these are estimates at this time and are subject to revision as the individual contractual actions are taken.

In the longer term, the runout costs of Apollo are estimated to increase by $410 million from our previous estimates, largely as a factor of extending the basic Saturn V launch schedule into fiscal year 1971.

The net effect of these changed requirements on the fiscal year 1968 budget request are shown on the following charts.

Apollo assignments

	Primary	Backup
204	Lunar Module development	None.
205	Command-Service Module operations	None.
206/207 and subs	Command-Service Module-Lunar Module operations.	Lunar Module development, Command-Service Module operations.
501	L/V and S/C development	None.
502	L/V and S/C development	None.
503	Command-Service Module-Lunar Module operations.	L/V and S/C development.
504	Lunar mission simulation	Command-Service Module-Lunar Module operations.
505 and subs	Lunar mission capability	Lunar mission simulation

FIGURE 1

Summary of adjustments to schedule through SA–212 and SA–515

Launches	Fiscal year 1967	Fiscal year 1968	Fiscal year 1969	Fiscal year 1970	Fiscal year 1971
Previous schedule:					
Saturn IB	4	6	1		
Saturn V	1	4	5	5	
Revised schedule:					
Saturn IB	2	4	5		
Saturn V		3	5	6	1

FIGURE 2

NASA

MANNED SPACE FLIGHT

FY 1968 BUDGET ESTIMATE

(MILLIONS OF DOLLARS)

	FY 1966	FY 1967	FY 1968	
RESEARCH AND DEVELOPMENT	$3,199.5	$3024.0	$3,069.2	
APOLLO	2,941.0	2916.2	2,606.5	
APOLLO APPLICATIONS	51.2	80.0	454.7	
ADVANCED MISSIONS	10.0	6.2	8.0	NO CHANGE
GEMINI	197.3	21.6	-0-	
CONSTRUCTION OF FACILITIES	17.5	43.8	27.9	
ADMINISTRATIVE OPERATIONS	296.9	315.4	323.5	
TOTAL	$3513.9	$3,383.2	$3,420.6	

NASA HQ MP67-5440
1-15-67

FIGURE 3

MANNED SPACE FLIGHT

RESEARCH AND DEVELOPMENT

APOLLO

FY 1968 BUDGET ESTIMATE

(MILLIONS OF DOLLARS)

	FY 1966	FY 1967	FY 1968
SPACECRAFT	$ 1,233.8	1,261.3 $ ~~1,250.3~~	1,095.3 $ ~~1,036.3~~
UPRATED SATURN I	274.8	236.6	156.2
SATURN V	1,134.9	1,131.6 ~~1,135.6~~	1,062.5 ~~1,108.5~~
ENGINE DEVELOPMENT	133.2	49.8	24.5
MISSION SUPPORT	164.3	236.9 ~~243.9~~	268.0 ~~281.8~~
TOTAL	$2,941.0	$2,916.2	$2,606.5

NASA HQ MP67-5441
1-15-67

FIGURE 4

MANNED SPACE FLIGHT
RESEARCH AND DEVELOPMENT
APOLLO SPACECRAFT
FY 1968 BUDGET ESTIMATE
(MILLIONS OF DOLLARS)

	FY 1966	FY 1967	FY 1968
COMMAND AND SERVICE MODULES	612.8	565.4 ~~560.4~~	524.0 ~~494.0~~
LUNAR MODULE	362.6	472.5	395.1 ~~373.1~~
GUIDANCE AND NAVIGATION	137.2	76.6	55.4
INTEGRATION, RELIABILITY AND CHECKOUT	32.3	30.0	23.2
SPACECRAFT SUPPORT	88.9	116.8 ~~110.8~~	97.6 ~~90.6~~
TOTAL	$ 1,233.8	1,261.3 $~~1,250.3~~	1,095.3 $ ~~1,036.3~~

NASA HQ MP67-5438
1-15-67

FIGURE 5

MANNED SPACE FLIGHT
RESEARCH AND DEVELOPMENT
UPRATED SATURN I
FY 1968 BUDGET ESTIMATES
(MILLIONS OF DOLLARS)

	FY 1966	FY 1967	FY 1968	
1st STAGE (S-IB)	51.6	43.1	30.5	
2nd STAGE (S-IVB)	64.0	56.9	37.1	
INSTRUMENT UNIT	47.7	40.6	22.6	
GROUND SUPPORT EQUIPMENT	26.6	11.5	6.5	NO CHANGE
H-1 ENGINES	10.1	8.1	5.2	
J-2 ENGINES	13.5	6.7	.9	
VEHICLE SUPPORT	61.3	69.7	53.4	
TOTAL	$ 274.8	$ 236.6	$ 156.2	

NASA HQ MP67-5437
1-15-67

FIGURE 6

MANNED SPACE FLIGHT

RESEARCH AND DEVELOPMENT
SATURN V
FY 1968 BUDGET ESTIMATE
(MILLIONS OF DOLLARS)

	FY 1966	FY 1967	FY 1968
1st STAGE (S-IC)	191.9	184.9	~~162.2~~ ~~174.7~~
2nd STAGE (S-II)	256.2	~~244.6~~ ~~248.6~~	~~233.9~~ ~~246.9~~
3rd STAGE (S-IVB)	162.0	154.0	~~139.8~~ ~~151.2~~
INSTRUMENT UNIT	67.8	72.9	75.1
GROUND SUPPORT EQUIPMENT	107.6	60.9	~~35.8~~ ~~96.2~~
F-1 ENGINES	66.2	92.3	~~82.3~~ ~~105.3~~
J-2 ENGINES	67.2	83.5	~~78.5~~ ~~241.0~~
VEHICLE SUPPORT	216.0	238.5	~~242.0~~
TOTAL	$ 1,134.9	~~1,131.6~~ $ ~~1,135.6~~	~~1,062.5~~ $ ~~1,100.5~~

NASA HQ MP67-5436
1-15-67

FIGURE 7

MANNED SPACE FLIGHT

RESEARCH AND DEVELOPMENT

ENGINE DEVELOPMENT & MISSION SUPPORT
FY 1968 BUDGET ESTIMATES
(MILLIONS OF DOLLARS)

	FY 1966	FY 1967	FY 1968
ENGINE DEVELOPMENT	$ 133.2	$ 49.8	$ 24.5
MISSION SUPPORT	$ 164.3	~~236.9~~ $ ~~243.9~~	~~268.0~~ $ ~~281.0~~
OPERATIONS	112.9	~~189.9~~ ~~196.9~~	~~216.0~~ ~~220.0~~
SYSTEMS ENGINEERING	20.0	20.0	20.0
SUPPORTING DEVELOPMENT	31.4	27.0	32.0

NASA HQ MP67-5439
1-15-67

FIGURE 8

APOLLO APPLICATIONS PROGRAM

First, I believe it is wise to reaffirm one of the important Apollo Applicatio program elements—the continued availability of the Saturn launch vehicles f space activities beyond the initial production in support of the Apollo mainli activity. The fiscal year 1968 Apollo Applications program plan calls for continu tion of both the Saturn V and the uprated Saturn at an average launch rate four per year. There are no reasons at this time to change this plan; the ra of delivery is scaled to the most economical level we have identified, and termin tion of either or both production capabilities would leave this Nation without major spacebooster at a time when the rest of the technologically powerful cou tries of the world are showing evidence of increasing their strength in this fiel

Second, I believe that the fundamental concept of the Apollo Application pr gram—to capitalize upon a developed capability rather than start a whole ne developmental effort for an incremental improvement in performance, is soun Through the Apollo Applications program we will identify the goals and reward that the space environment can offer—at what cost and for what returns.

The impact of the Apollo 204 accident on the orbital workshop and the Apoll solar telescope experiments leads to a slightly different organization of progra elements than that projected at the time of the fiscal year 1968 budget.

One result of the accident has been the decision to include in Apollo earth orbital flights only those experiments relating directly to the eventual luna mission. This leaves a number of scientific and technological experiments whic have been approved and are under development without a spacecraft assignment

Another result has been the need to reconsider the use of the Apollo prime spacecraft contractor for experiment integration and spacecraft modificatio required by the individual Apollo Applications program missions; in order to avoid diversions from the mainline task, the spacecraft contractor will concentrate on the task of providing reliable standard lunar-configured spacecraft. A third result has been the requirement to retain, for possible mainline Apollo alternate or backup flights, the uprated Saturn I launch vehicles that, under earlier plans, might have become excess to mainline needs at an earlier date, thereby permitting their allocation to the Apollo Applications program.

It is presently planned to select an entirely separate industrial organization to support the Apollo Applications program effort. This new industry team competitively selected, would be responsible for the integration of Apollo Applications program experiments with the standard Apollo spacecraft, including the necessary engineering, design, development, and test effort for Apollo Applications program required modifications.

The mission planning for the Apollo Applications program is basically sound and does not change under the circumstances of the 204 accident. The basic concept of orbital storage and reuse of manned space systems remains at the heart of the earth orbit program, continuing scientific and applications missions with the development of long-duration (up to 1 year) mission capability. For lunar operations, the plan is to increase stay time on the lunar surface through the landing of unmanned supply and shelter systems. The investigation of the utility of manned systems in synchronous orbit is still attractive, especially for astronomical and meterological observations.

Detailed mission planning for early Apollo Applications program missions must be based on certain assumptions. I wish to make these assumptions very clear so that the relationship of the Apollo Applications program to the mainline Apollo is not ambiguous.

In 1968 and 1969 the Source of flight hardware for Apollo Applications program is the Apollo program; flight availability of systems funded under the Apollo Applications program does not begin until 1969 for the uprated Saturn I and 1970 for the spacecraft and Saturn V. Depending upon the progress of Apollo, some flight hardware may become available to the Apollo Applications program effort under differing circumstances. For example, early Apollo success in moving from the uprated Saturn I to the Saturn V would release uprated Saturn I vehicles for Apollo Applications program missions in 1968 and 1969. At the same time, a lower rate of Apollo utilization of spacecraft after completion of the command-service module/lunar module operations phase could release standard lunar mission spacecraft for alternate missions in earth orbit. It is not possible to predict with accuracy today which of the many program alternatives is the most likely, but it is clear that appropriate Apollo Applications program payloads should continue to be developed to take advantage of either the success expected in Apollo or the difficulties that may be encountered.

In the event that spacecraft availability alone becomes a pacing item for the Apollo Applications program because of Apollo priorities, it is possible to reuse previous flown spacecraft. Studies have been completed on the feasibility of this approach and appear encouraging. It is planned to turn over one or two of the first Apollo earth orbital Command Modules to the Apollo Applications program organization for experimental refurbishing, after they have completed their assigned missions. This work could be undertaken by the Apollo Applications program industrial team charged with experiment integration; it is not now planned to add such a task to the workload of the basic spacecraft production organization. Refurbished spacecraft, then, could be available in 1969 to support Apollo Applications program flights without interference and in parallel with Apollo missions.

The following specific tasks will be implemented and/or furnished by the spacecraft modification contractor:

1. Furnish the required engineering, development, and test effort to produce a final detailed hardware design for the Command-Service Module modifications.
2. Fabricate, assemble, test, and install the modifications in the Command-Service Modules (new or refurbished) in kit form or by other appropriate methods.
3. Perform the necessary engineering analysis to determine the extent of renovation necessary to accomplish the refurbishment of previous flown command modules and refurbish two previous flown Apollo Command Modules.
4. Perform tests to assure that the refurbished and modified command module and the modified service module are fully integrated, operational and ready for assembly into a flight article.

The revised mission plan includes a new single launch, uprated Saturn I manned mission in the last half of calendar year 1968. Assuming that the Apollo program is successful in transferring its flight activity to the Saturn V vehicle in mid-1968, then a single launch mission employing an uprated Saturn I vehicle and a Block II Command-Service Module identified as AAP–IA could be available for flight in the fall of 1968.

This mission would have the primary objective of conducting science and technology experiments which have been removed from the Apollo program. As I have stated, current plans for Apollo earth orbital missions call for concentration solely on qualification of Apollo-Saturn space vehicle systems and flight operations to provide the earliest possible availability of the lunar mission configuration.

As many as possible of the experiments already under development for flight in Apollo would be integrated with the AAP–IA Command and Service Module at the Kennedy Space Center. The mission would be of a nominal 14-day duration at an altitude of approximately 125 nautical miles and an orbital inclination of between 28½° and 50°, as may be required by the experiments. Included in the experiments for AAP–IA would be the earth orbital test of the lunar mapping and survey system, which can form the basic experiment carrier for integrating other experiments. In this way, it appears possible to minimize the work required on the Command and Service Module after it is delivered to Kennedy Space Center in the standard Block II lunar configuration.

The Workshop mission, utilizing two uprated Saturn I launches, would be the second mission in the revised Apollo Applications program plan and would be flown approximately 6 months later than provided for in the current plan. Current assessments of the launch dates for the Orbital Workshop 28-day mission and the Apollo Telescope Mount 56-day mission indicate approximately 6 months delay from the previously planned 1968 launch dates for those missions. The earliest possible availability of Apollo Command and Service Modules for use on these two Apollo Applications program missions now appears to support an early 1969 launch of the Orbital Workshop and a mid-1969 launch of the Apollo Telescope Mount. There will be a mission flown between the Workshop and Apollo Telescope Mount mission which would be a single uprated Saturn I launch of a refurbished command module to be used for resupply and reuse of the Workshop. Following the Apollo Telescope Mount mission, a second refurbished command module would be launched to resupply and further extend use of the Workshop-Apollo Telescope Mount cluster.

Earth orbit missions in 1970 and 1971 would be essentially unchanged from the previously approved plan with Apollo Applications experiments being major payloads to be carried and utilized in conjunction with the Workshop. Alternate plans provide for launch of a second Workshop and Apollo Telescope Mount in 1970.

In the case of Saturn V, missions previously designated as alternate Apollo-Apollo Applications program missions would revert to basic Apollo lunar landing missions. Under the new plan, we would carry out in early 1970 on a later vehicle the same lunar orbit mission previously planned for late 1969. The synchronous orbit Workshop mission and the dual Saturn V extended lunar exploration mission would remain on the same schedule as in the previously approved plan.

After careful review of the alternatives available for rescheduling Apollo launches to meet the planned mission objectives, we have planned Apollo Applications schedules for delivery and launch of the uprated Saturn V vehicles, the command and service modules, and the lunar modules. The schedules reflect the capabilities of the stage and spacecraft contractors and the launch schedules will establish and maintain the momentum required to achieve both the Apollo objective of a manned lunar landing in this decade and the Apollo Applications program objectives of increasingly long duration flights in earth orbit; significant science and applications experiments; and extensions of our Apollo lunar exploration beginning in the early 1970's.

FISCAL YEAR 1968 BUDGET—APOLLO APPLICATIONS

The Apollo Applications budget plan for fiscal year 1968 (fig. 1) has also been reviewed in the light of schedule and program changes. The major increase results from the plan to refurbish and reuse command modules previously flown on Apollo missions and to procure and modify additional service modules to mate with the refurbished command modules. This effort is expected to cost over $55 million to initiate in fiscal year 1968. A corresponding decrease, however, will be applied to the funds earlier planned for follow-on spacecraft procurement, mission-peculiar modification, and experiments.

The command and service module procurement budget will decrease $18 million. There will be an estimated decrease of $33 million for spacecraft modifications and about $4 million for experiments. These decreases result from the rescheduling of experiments between Apollo and Apollo Applications as discussed earlier. The net effect of these changed requirements on the fiscal year 1968 budget request are shown on the following charts.

MANNED SPACE FLIGHT
RESEARCH AND DEVELOPMENT
APOLLO APPLICATIONS
FY 1968 BUDGET ESTIMATES
(MILLIONS OF DOLLARS)

	FY66	FY67	FY68
SPACE VEHICLES	$ 8.5	$ 38.6	$ 267.7 ~~263.7~~
EXPERIMENTS	40.3	35.6	136.7 ~~140.7~~
MISSION SUPPORT	2.4	5.8	50.3
TOTAL	$ 51.2	$ 80.0	$ 454.7

NASA HQ MPR67-5725
2-2-67

FIGURE 1

MANNED SPACE FLIGHT
RESEARCH AND DEVELOPMENT
APOLLO APPLICATIONS
FY 1968 BUDGET ESTIMATES
(MILLIONS OF DOLLARS)

	FY 66	FY 67	FY 68
SPACE VEHICLES	$8.5	$38.6	~~$263.7~~ 267.7
CSM PROCUREMENT	-0-	-0-	~~43.5~~ 29.8
UPRATED SATURN I PROCUREMENT	1.0	24.0	78.5
SATURN V PROCUREMENT	-0-	-0-	45.6
* SPACECRAFT MODIFICATION	7.5	14.6	~~91.3~~ 113.6
LAUNCH VEHICLE MODIFICATION	-0-	-0-	5.0

NASA HQ MP67-5709
1-15-67

FIGURE 2

MANNED SPACE FLIGHT
RESEARCH AND DEVELOPMENT
APOLLO APPLICATIONS
FY 1968 BUDGET ESTIMATES
(MILLIONS OF DOLLARS)

	FY 66	FY 67	FY 68
EXPERIMENTS	$40.3	$35.6	~~$140.7~~ 136.7
DEFINITION	34.4	12.0	33.7
* DEVELOPMENT	5.9	23.6	~~107.0~~ 103.0
MISSION SUPPORT	$2.4	$5.8	$ 50.3
PAYLOAD INTEGRATION	.1	4.4	40.0
OPERATIONS	2.3	1.4	10.3

NASA HQ MP67-5708
1-15-67

FIGURE 3

○