National Aeronautics and Space Administration

BUDGET ESTIMATES

BUREAU OF THE BUDGET SUBMISSION

FISCAL YEAR 1971

Volume I

SUMMARY DATA

RESEARCH AND DEVELOPMENT

Honorable Robert P. Mayo
Director
Bureau of the Budget
Washington, D. C. 20503

Dear Mr. Mayo:

The purpose of this letter is to place before you the FY 1971 budget proposal of the National Aeronautics and Space Administration. This proposed budget provides for the implementation of program Option 2 of the Space Task Group report. It is this option that I have recommended to the President because it represents a balanced and challenging program -- pursued at a reasonable rate -- which includes as major objectives: The Earth Orbiting Space Station, Space Shuttle, and reusable Nuclear Stage in the 1970's, leading to the capability for a manned mission to Mars in the 1980's; application of our space capabilities to a wide range of services covering air and ocean traffic control, navigation, weather, pollution and earth resource surveys; scientific investigations through ground and space research programs for physics and astronomy; and the investigation of the near and outer planets. In addition, I have recommended to the President that as the Nation progresses toward meeting its other needs in the next few years we should re-examine such a decision and move closer to the rate of accomplishment represented by Option 1.

The budget to carry out our recommendations will require $4.497 billion in budget authority and result in outlays of $4.2 billion in FY 1971. Of the required $4.497 billion in budget authority, $4.112 billion is necessary to carry out currently approved programs, with $385 million required to fund the initiation of the minimum program additions that represent the new initiatives in space of the Nixon Administration.

The FY 1971 budget inaugurates the second decade of space for this Nation. Through the activities of the Space Task Group and the efforts of the Congress and the Administration, the space program has been exposed to deep and critical review of past accomplishments, immediate returns, and prospects for the future. The question of the future of manned and unmanned space activities has been directly addressed and the range of immediate and long term goals and optional approaches to achieve these goals have been extensively and exhaustively debated. The space program

is literally at the crossroads. The coming years might be directed primarily toward optimal utilization of the techniques and technologies that have resulted in significant accomplishments in the past or, alternatively, toward the development of new capabilities for the more distant future. I believe, and the Task Group supports, that we must move in both directions, with a program balanced between achievement of a reasonable return from our past investments and new developments and programs which offer a significant challenge to man's technological capability and his spirit of adventure and exploration. Implicit in this course of action, as the Task Group makes clear, is a commitment to resource levels which must rise above current levels, although not significantly in the years immediately ahead.

In its report to the President, the Task Group recognized the essential necessity for the President at this time to set the course of the space program for the next two decades as the key to continued space leadership by the United States. The Task Group has recommended the basic goal of a balanced manned/unmanned space program conducted for the benefit of all mankind. The program objectives to achieve this goal have been set forth and a focus for the development of new capabilities has been provided, i.e., the option or goal of manned planetary exploration with a manned Mars mission before the end of this century. There are clear indications of general public agreement with these recommendations for the future direction of our Nation's space program. In fact, the report of the Task Group has received overwhelmingly favorable response in the press. I believe that the Space Task Group's activities participated in by the Congress, other Government agencies, universities, and the selected general public could well serve as a model in the formulation of future national programs outside the space area.

The significant variable which must now be placed in the context of national fiscal demands and priorities is the pace of space progress in this Administration. The range of resource levels considered by the Task Group for NASA included an upper bound, defined by a program conducted at a maximum rate limited, not by funds, but by technology; three options which illustrate programs consistent with the Task Group's recommendations but conducted under varying degrees of funding restraints; and a lower bound, defined as a program with an increased unmanned science and applications effort but, because of the significant lower budget levels, requiring termination of manned flight activities after completion of the current Apollo and Apollo Applications programs. It was the Task Group's realistic conclusion that to achieve major reductions in NASA's budget over the long term, it would be necessary to suspend manned space flight operations. In developing our FY 1971 budget proposal we have not considered this course of action as a viable alternative since it is totally inconsistent with the

Task Group's recommendations and our judgments of minimum levels at which a balanced space program could be continued. The upper bound, although technically achievable with maximum stimulation to our overall capabilities and fully consistent with the Task Group's recommendations requires resource levels in the near term which would be inconsistent with necessary government-wide fiscal constraints. We have, therefore, developed our proposals around program Option 2 and strongly urge their approval as the most acceptable program providing a reasonable rate of progress and taking account of near term funding constraints.

In summary, our FY 1971 budget proposal includes the following:

a. Manned Space Flight. The currently approved manned space flight programs for lunar exploration and earth orbital operations are continued and will require $1.781 billion in FY 1971. A Phase II Apollo lunar exploration program is proposed to follow the current program using a slightly modified Saturn V launch vehicle. These missions will carry improved scientific instrumentation and experiment packages and uprated CSM-LM spacecraft with up to three-day surface staytime capability. A Rover vehicle will provide added mobility and along with improved space suits and other equipment, the operational radius for each landing will be greatly increased. The current lunar missions using Apollo hardware and the Phase II missions represent a step-by-step manned exploration of the moon which can lead to lunar orbital stations and a lunar surface base. To begin the necessary Phase II work in FY 1971, $60 million is requested.

For earth orbital operations, after the initial orbiting Dry Workshop scheduled for 1972, we are proposing that the design and development of a long duration multi-manned space station with integral and interdependent operational systems and experimental modules be initiated in FY 1971. In addition, we propose the initiation of a low cost earth-to-orbit transportation system - or "shuttle" - for men and materials. These two major new developments are the key to space flight operations for the next two decades and we believe that reasonable financial flexibility must be provided now to insure adequate preparations for their undertaking. For these new developments, we are requesting $263 million.

b. Space Science and Applications. To support Space Science and Applications on-going programs, $870 million is required for FY 1971. The major part of this funding is required to support the peak requirements for Viking, Pioneer, Synchronous Meteorological Satellite, and the Earth Resources Technology Satellite. Three new starts are proposed in FY 1971 which will require $23 million. In Physics and Astronomy, the

development of a new High Energy Astronomy Observatory is planned to obtain high quality, high resolution data on x-ray, gamma ray, and cosmic ray sources. In Applications we propose two new starts: in Earth Resources, film recovery flights will be added to enhance the returns from ERTS A&B; and a Navigation and Traffic Control Satellite will also be initiated to test systems which will improve the safety and efficiency of over-ocean aircraft and ship travel.

c. Space and Aviation Technology. In the Aviation Technology program we are proposing increased funding to a level of $125 million. This program will continue to support the requirements of the Departments of Defense and Transportation and advance the technological base in the most vital areas. This increase represents, for the most part, current program commitments with a minimum of new program additions: short range aircraft technology concept and operation; aircraft noise and operational characteristics; and supersonic aircraft technology comprise most of the increase. For Space Technology, we are requesting $224 million. In this area, effort is focused on the development of the NERVA engine and advancing the technology needed in the development of the space shuttle, the space station, and the nuclear shuttle.

d. Supporting Activities. To provide the necessary Tracking and Data Acquisition support to both manned and unmanned programs, we will require $318 million; for Technology Utilization, $5 million is requested; and for the Sustaining University Program, $26 million is required to support this program at current cost levels. For Construction of Facilities, we propose a funding level of $90.2 million to provide the construction and maintenance projects necessary to support our on-going and proposed new programs. Of the total requested, $25 million is related to test facilities required for the space shuttle. The balance is for projects related to currently approved programs which must be undertaken to provide for the necessary facility support.

For Research and Program Management, we are proposing a level of $707 million which represents a continuation of the austere operating levels of recent years. We are requesting an increase in employment of 475. This is essential to provide a balanced workforce at the Electronics Research Center, increases at Langley and Lewis in support of the Viking project, and increases at Ames and Langley to support the increasing aeronautics program. Ten positions are requested for the NASA Aerospace Safety Research and Data Institute which has been established at Lewis to integrate the experience of all elements of NASA, its contractors, and other organizations.

Although the requested increase in employment is not large, it is of extreme importance that it be approved. In my communications to you concerning the problems we faced under the restrictive hiring practices

over the last three years and additional employment reductions proposed by your office, we discussed in depth the serious situation facing NASA. Because of the significant reductions already taken in employment and the decline in separation rates, we have reached a point that even modest requirements for personnel cannot be accommodated. For the most part, these reductions in employment have not been directly associated with changes in workload requirements, but rather have been directed in response to general government-wide expenditure and employment restrictions.

The request for 475 additional positions for the purposes indicated represents our best judgment of requirements at this time. It is my strong feeling, however, that given approved program goals and objectives, NASA must have the flexibility within the total dollar resources available to establish the proper balance between government employment and supporting services in order to achieve the most effective and economical means of carrying out the approved programs. I cannot emphasize too strongly that we view our situation with respect to employment as one of the most serious problems facing the Agency. Therefore, I urge that the request for additional personnel be approved and that reasonable flexibility be allowed in the allocation of resources to carry out our programs.

Our FY 1971 budget proposal, supporting Option 2 of the Task Group report, can be accomplished within the alternative planning figures provided in your guideline letter of July 28, 1969. The difference in budget authority and outlays between our budget proposal and the Option 2 projection in the Task Group report represents, essentially, the accommodation of price increases in the research and development sector and the need for financial flexibility during the early developmental phases of the space station and the space shuttle. Concerning the target of $3.5 billion provided in your guideline letter issued prior to the Task Group's report and recommendations, it is clear that, faced with such severe limitations on resources in FY 1971, major program decisions totally inconsistent with the Task Group's recommendations would have to be made. In this regard, the Task Group reviewed similar lower resources levels and concluded that to achieve significant reductions in NASA's budget over the long term it would be necessary to phase out manned space flight operations which, on the assumption that the current inventory of Saturn Apollo space vehicles would be flown, would still require significantly more than $3.5 billion for the next few years. In order to adjust activities to operate at a realistic level of $3.5 billion in FY 1971, we would have to face immediate decisions on terminating manned space flight operations. I am sure you agree that such actions would not be in the best interest of the Nation and, certainly, are not indicated.

The details of the estimates with associated summary and decision statements and other supporting materials are being made available to your staff in accordance with arrangements that have been worked out jointly. I look forward to a discussion with you of the major policy aspects and implications of our estimates.

Sincerely yours,

Original signed by
T. O. Paine

T. O. Paine
Administrator

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cc:
XC/File (A-250-43)
B/MR. Lilly (B-829)
BR/Mr. Malaga

National Aeronautics and Space Administration

EARTH ORBITAL MANNED SPACE FLIGHT PROGRAM MEMORANDUM

SUMMARY AND DECISIONS

The success of Apollo 11 has had a significant influence in shaping the FY 1971 budget for extending manned space flight capability. This success both in terms of mission accomplishment and equipment performance has permitted modifications in operational procedures resulting in major economies for the near term program. The Apollo program has provided the technological foundation for the development of new and improved capabilities necessary for further advanced exploration of the earth's environment, the moon, and the solar system.

Earth Orbital Manned Space Flight

The major objective of Earth Orbital Manned Space Flight as established by the Space Task Group is: "to extend and utilize the unique capabilities in earth orbit for the development of the capability to utilize and explore space, for the enhancement of our scientific and technical knowledge and for beneficial applications." In pursuit of this objective, it is necessary to develop systems with emphasis upon the critical factors of commonality, reusability, and economy to place and sustain men in orbit for extended periods of time. The achievement of this capability requires the

development of long-duration multi-manned space stations with integral and interdependent operational systems and experimental modules and a low cost earth-to-orbit transportation system for resupply.

Mercury, Gemini and early Apollo flights have provided the space flight experience that will lead to the establishment of a large permanent manned orbiting base. The core of the current earth orbital program is Apollo Applications with initial orbiting of a Dry Workshop scheduled for 1972. This mission relies heavily on existing hardware and systems and will provide necessary insight for design and operation of a future space station. The Workshop will be outfitted on the ground, launched on a two-stage Saturn V, and will include the major subsystems and experiments necessary to qualify as an embryonic space station. The Workshop experiments include a manned solar astronomy telescope which will provide additional data on the sun's surface and corona, and experience in manned operations of scientific instruments in space. The Workshop will be revisited by astronaut crews at intervals over the span of a year. For the first time the concept of reusing a habitable space structure after an untended stay in orbit will be tested. The initial mission is planned for 28 days duration; the second and third will be extended to 56 days each. The primary experiments in addition to the solar telescope are medical and deal with physiological and psychological evaluation of man's performance capabilities in space.

FY 1971 Budget - Major Decisions

Saturn V Workshop

The AAP program has been redirected to provide a dry workshop mission in 1972 with three manned visits planned during the one-year lifetime. The concept of equipping the laboratory on the ground and one-year lifetime enhances the Workshop mission as a building block providing valid data on experimental and operational hardware and manned operating techniques for application in space station planning and design.

Space Station

We are recommending funding in FY 1971 to support the development of a space station module for operation by 1977. The initial space module would be sized for 12 astronauts with the capability of expanding later to a 50-man base and by the mid 1980's, to a 100-man capability. The space station modular concept permits the incremental approach to greater capabilities with permanent habitability as the design goal.

Space Shuttle

We are recommending funding in FY 1971 to support the development of the space shuttle for operation by 1977. The development of the space shuttle is essential to future efficient and economical space operations, especially the space station, and will represent a low-cost earth-to-orbit system, featuring reusability and maintenance and operations analagous to current

aircraft techniques. Preliminary definition effort on the propulsion systems and structure is being initiated in FY 1970.

National Aeronautics and Space Administration

LUNAR EXPLORATION PROGRAM MEMORANDUM

SUMMARY AND DECISIONS

The basic objectives of the Lunar Exploration program are to understand the moon in terms of its origin and evolution, to search its surface for evidence related to origin of life, to apply new data on the differences and similarities between the earth and moon to the reasonable explanation of dynamic processes that shaped our planet, to develop the technology essential for a continued exploration program which will permit effective utilization of the moon laying the foundation for future lunar bases, and to extend man's domain to include the moon.

Building on the basic knowledge obtained from Ranger, Orbiter, Surveyor and Apollo, the current program will dramatically expand our knowledge of the moon by close-in photography, direct personal observation, collection of lunar material for laboratory analysis, and emplacement of research instruments on the moon. The current program continues manned landings using hardware procured under Apollo with eight additional missions scheduled through 1972. The first four post-Apollo 11 missions will use basic Apollo equipment and experiments. The subsequent missions including post-Apollo missions (Phase II) will introduce improved lunar surface experiment packages; extended lunar surface staytime of up to three days;

greater surface mobility through improved space suits, longer duration life support systems and roving vehicles; and orbital science packages to be carried on the CSM. With these system improvements the follow-on missions will have expanded capabilities including high latitude landings, exploration of far-side locations, and increased range for surface traverses to cover much greater portions of the moon.

These later misssions will carry improved payloads to enhance scientific data returns from both lunar orbit and the lunar surface. A lunar base is the final objective of the lunar program and this would evolve from a lunar orbit station, similar to the manned earth orbiting station, to be placed in orbit around the moon in the 1981 timeframe. On this schedule a surface base would be established on the moon by 1983 with gradual expansion to accommodate up to 50 men toward the end of the 1980's. A reusable nuclear shuttle using NERVA technology must be developed to provide economical transportation between earth orbit and lunar orbit for men and supplies.

FY 1971 Budget - Major Decisions

Apollo lunar exploration missions will continue through 1972 with eight flights using launch vehicles and spacecraft procured under the Apollo program. In FY 1971 a Phase II Lunar Exploration program will be initiated with four flights planned during the 1973-1975 period using Saturn V

vehicles from the follow-on procurement. Additional LM's and SM's will be procured as required for these follow-on missions and CM's used on previous lunar flights will be refurbished.

National Aeronautics and Space Administration

PLANETARY EXPLORATION PROGRAM MEMORANDUM

SUMMARY AND DECISIONS

One of the dominant interests in the investigation of our solar system is the study of the other eight planets in the solar system. For centuries men have observed the planets from Earth and speculated about their interrelationship with Earth. The space program provides the capability to obtain detailed information of the planets, their atmospheric composition, surface characteristics, relationship with the Sun, and their biological environment. The President's Space Task Group report urged continued planetary exploration activity using increasingly sophisticated systems, building to a manned planetary exploration capability with a manned Mars landing before the end of the century. The current and future unmanned planetary missions will provide significant data from Mars and the other planets and will contribute that planetary data required for manned planetary missions.

In the past, planetary missions have returned measurements of the surface temperature and atmospheric composition of Mars and Venus and remarkable photographs of the Martian surface. The current program is focused on Mars with the fly by missions completed earlier this year, orbiter

missions in 1971 and the Viking Orbiter-Lander missions scheduled for 1973. The on-going program also provides for the broad based exploration of the solar system. Other planets to be studied under the current program are: Venus and Mercury with a dual planet fly by in 1973 and Jupiter with the Pioneer fly bys in 1972 and 1973. The future program anticipates that spacecraft would be launched to Mars at each opportunity through 1983. Viking class missions are envisioned in 1975 and 1977; Planetary Explorers in the mid 1970's to perform specialized investigation on a quick response basis. Missions to Venus and the outer planets are also planned. Planetary Explorers would be used for obtaining additional data on the Venus atmosphere and the planet's relationship with the Sun. "Grand Tour" missions are planned consisting of Jupiter-Saturn-Pluto swingbys in 1977 and Jupiter-Uranus-Neptune swingbys in 1979. Missions to representative Comets and Asteroids are being considered.

The pace of the automated planetary program can support a manned expedition to Mars in the mid 1980's. Much of the basic technology and systems development required for manned planetary missions will be accomplished in producing hardware systems required for the space station module and the nuclear shuttle under the Earth Orbital and Lunar programs. The most difficult technical problems peculiar to a manned expedition to Mars, such as the design of a landing system, require significant increases in the accumulated data on the Mars environment to be obtained from the automated missions summarized above.

FY 1971 Budget - Major Decisions

No new starts are proposed for initiation in FY 1971. A strong unmanned program in support of planetary science is continued on the following on-going missions:

Venus and Mercury Fly by 1973

Data on Mercury is difficult to obtain from earth observations. This mission involves a fly by of both Venus and Mercury during the flight of a modified Mariner spacecraft. Major objectives are close-up observation of Mercury surface features and temperature, solar wind, mass density, etc. The first T.V. pictures of Venus will be received during the fly by of that planet.

Mars Mariner-Orbiter 1971

Mars will be mapped with Mariner orbiter. In addition, the dynamic nature of the planet will be studied in detail. These missions will provide important operational information for the Viking missions.

Mars Viking - Orbiter/Soft Lander 1973

These missions will be the most comprehensive planetary missions to be flown by the United States. They will provide data on the atmospheric surface characteristics, the nature of the planetary environment, and the search for extraterrestrial life. The long lifetime lander design and orbiter daya relay support enhance the potential value of these missions.

Jupiter Pioneer F/G - Fly by 1972/1973

Modified Pioneer spacecraft will measure the particles and fields environment out to 5AU, the particle density of the Asteroid belt and magnetic fields at Jupiter. In addition, initial information on the JOVIAN atmosphere and the first close up photograph of Jupiter will be obtained. These are important missions to provide design data for later flights to the outer planets.

National Aeronautics and Space Administration

ASTRONOMY
PROGRAM MEMORANDUM

SUMMARY AND DECISIONS

In Astronomy there are extensive opportunities to conduct important scientific research to acquire basic knowledge of the status and evolution of the universe including the Sun and solar system; and the existence of extraterrestrial life. In order to exploit these opportunities further, increasingly sophisticated instrumentation must be developed to observe the Sun, planets, stars, galaxies and interstellar matter in the broadest possible range of wavelengths. Astronomical observatories with increased capabilities are needed to acquire this knowledge. A fully operational diffraction limited 120-inch telescope in orbit can look ten times farther into space and see objects 100 times fainter than the 200-inch instrument on Mt. Palomar. Such an instrument could be flown in the early 1980's.

The Astronomy program encompasses four major areas: high energy, solar, optical, and radio astronomy. The solar program continues observation and measurement of the solar atmosphere and solar activity using OSO spacecraft, to be followed by high resolution solar missions associated with the Saturn V Workshop and the space station. The optical program continues with the OAO missions for detailed mapping of the hot, faint,

and distant stars and galaxies and interstellar matter. Preliminary studies show great promise in developing new concepts for the Large Space Telescope mission. Recent concepts would provide a manned maintenance and long lifetimes through improved subsystems. Work in the area of high energy astronomy, a major new area of great interest, will be advanced with the development of spacecraft which combine observations of discrete x-ray and gamma ray sources with observations of high energy cosmic rays. These missions will also take advantage of man's capabilities in space. In radio astronomy, the emphasis will be on the development of higher resolution systems as precursors to a large radio telescope either in orbit or on the moon.

FY 1971 Budget - Major Decisions

The budget for Astronomy continues the OSO missions thru K and the OAO mission through C. The ATM experiments on the Saturn V Workshop is included under the on-going program. A new start, the High Energy Astronomical Observatory is initiated with four missions to be launched in 1974, 1975, 1976, and 1977. These large, heavy spacecraft will provide essential capabilities for scientific investigation of celestial x-rays, gamma rays and cosmic rays. These projects are a major step in achieving the optimal astronomy program recommended by the NASA Astronomy Missions Board.

The space station offers important opportunities to conduct meaningful experiments in solar astronomy, high energy astronomy, and optical astronomy. Work on a platform for a variety of ultraviolet survey experiments is supported in this program.

National Aeronautics and Space Administration

SPACE PHYSICS
PROGRAM MEMORANDUM

SUMMARY AND DECISIONS

The Space Physics program is directed toward obtaining a better understanding of the physical phenomena in space by making *in situ* measurements using specialized satellites and probes. The current program encompasses continued observation and study of regions already explored to obtain greater definition of the earth's environment. The new program is consistent with the Space Task Group's objective of increasing man's knowledge of the universe through understanding the nature of the space environment and the physical processes that shape it. In the near term Space Physics will continue the ISIS, Atmospheric Explorers, and Interplanetary Monitoring Probes. The High Energy Astronomy Observatory, to be started in FY 1971, will furnish important data on galactic cosmic rays, as well as in X- and gamma-ray astronomy. The IMP follow-on missions in the 1975-1976 timeframe will provide near-Earth data on galactic and solar cosmic rays for correlation with Pioneer G, then approaching Jupiter, and with the German Solar Probe, Helios, approaching the Sun. The Space Weather Probe will also permit an assessment of the influences of interplanetary conditions on the terrestrial environment.

In the future, studies using space as a laboratory will be possible from a man-operated space platform. Environment-modifying experiments such as electron and ion injection into the magnetosphere and experimental research on the physics and chemistry of solids and liquids in zero gravity, are among the leading condidate experiments for the space station. Other uses of space including an experiment on general relativity are scheduled for initiation in subsequent years.

FY 1971 Budget - Major Decisions

The program for FY 1971 maintains the supporting work required to enhance the scientific return from OGO and IMP, and complements the major experimentation performed under manned, astronomy, and planetary programs. The Saturn V Workshop, the initiation of the High Energy Astronomy Observatory, and the scientific packages on interplanetary missions promise substantial data returns in space physics. Continued experimentation to obtain understanding of energetic particles and the transfer of energy between magnetic fields, energetic particles and electromagnetic radiation must be pursued along with studies of such phenomena as the inter-action of the solar wind with the Earth and planets to obtain insight into the laws and processes governing behavior of matter in the solar system. The support of planning and definition of relativity experiments, the plasma physics and environmental perturbation experiments, and of the high energy physics experiments is contained in this year's program to ensure optimal use of space station capability.

National Aeronautics and Space Administration

LIFE SCIENCES
PROGRAM MEMORANDUM

SUMMARY AND DECISIONS

Life Sciences is composed of two major subprograms: Space Medicine, concerned with the physiological and behavioral characteristics of man operating in space environment and the definition and development of his support requirements in order to realize optimal use of his unique capability in space operations; and Space Biology, concerned with the effects and use of space environment to improve our understanding of biological systems. The fundamental environmental factors of importance are gravitational field strength, induced periodic regulating influences, and radiation. Exobiology, a related area of study, the search for life elsewhere in the universe and the understanding of life processes and evolution of life, is part of the Planetary Exploration program.

The Space Medicine activity involves the investigation of man's reaction to space and the requirements for maintaining him in a healthy state medically and psychologically during varying staytimes in space. Additionally, it provides major input to the development of life support and protective systems and other operating equipment that allow man to be

fully effective in space. A comprehensive program of ground based and flight research is underway to validate improvements to hardware systems and crew operating procedures that must be demonstrated prior to application to the space base, the lunar base, and manned planetary exploration.

Space Biology also combines ground based research with flight experiments that concentrate on the unique characteristics of the space flight environment. The use of cells, plants and small animals enables complex and hazardous testing which cannot be conducted on man. Past experiments have already shown that biological matter is greatly affected by space conditions. The effects of radiation and weightlessness on metabolism, growth and reproduction must be pursued for fuller understanding of these influences on life processes. Additional experiments in earth orbit, on the moon, and in planetary orbit are needed to gain insight into the influence of environmental rhythms on life spans. The biolaboratory proposed for the space station will provide the bioscientist with an excellent facility for conducting experiments that are difficult or impossible to conduct on earth. Information obtained in the Space Biology program could impact biological activity in such fields as medicine, public health and agriculture.

FY 1971 Budget - Major Decisions

This budget sustains the present program with emphasis in Human Factors on providing technology to support partially closed loop life support systems, improved EVA capability, and advanced protective systems in support of the space shuttle, the long duration space base, and lunar applications. The medical habitability experiments for AAP continue to receive significant funding support in this budget. An initial increment is provided for the biotechnology laboratory and experiments in preparation for the space station.

National Aeronautics and Space Administration

SPACE APPLICATIONS PROGRAM MEMORANDUM

SUMMARY AND DECISIONS

The Space Applications program in broad terms is directed towards the study of earth using remote sensors and the application of satellite systems for meteorology, communications, and navigation and traffic control. A substantial automated program exists which has solidly established the economic usefulness of operational satellite systems in communications and meteorology. For the future, space technology in these areas, as well as Earth Resources, Earth Physics, and Navigation and Traffic Control must be intensively pursued and exploited, in particular where benefits are predictably great.

The Earth Resources Survey program is expected to provide useful data for assessing and developing the potential contribution of satellite-based remote sensing to forestry, agriculture, geography, hydrology, geology and oceanography. The Space Task Group highlights the values of establishing the capability for responsible management of the earth's resources and environment. The Departments,of Agriculture, Commerce, Interior and Navy are working closely with NASA to ensure that data acquired from space will satisfy the experimental needs and future

operational needs of the various earth resources disciplines. The Earth Resources Survey program must test different approaches to data collection (ground-, aircraft-, and satellite-borne sensors) and data assimilation and information management systems. The recently initiated Earth Resources Technology Spacecraft (A&B) will be supplemented by film recovery spacecraft missions (C&D) and Small Applications Technology Satellites (for testing sensors and critical subsystems prior to commitment to large experimental satellites). Preliminary plans are also being formulated for ERTS E&F which will emphasize acquisition of ocean data. Various studies have assessed returns from the earth resources area at hundreds of millions of dollars annually.

Earth Physics is aimed at increasing our knowledge of the movement of earth land masses, gravitational fields, tides and ice masses. The prime objectives are to provide precise and accurate geometric description of the earth's gravitational field and to determine the time variation and other geophysical parameters of the geometry of the ocean surface, solid earth, etc. Development of a static model of the earth leading to a model of the active earth is a primary requirement. The National Geodetic Satellite program will be continued in pursuit of a unified world datum with the launch of a third GEOS spacecraft. GEOS II launched in January 1968 and the passive PAGEOS continue to provide data for analysis at geodetic control points throughout the world. In addition to the on-going spacecraft, drag-free satellites give promise of significant improvement in measuring the earth's gravity field. The nature of the data

requirements for a model of the active earth will require continuous and very accurate satellite tracking data which will be obtained in future years using satellite-to-satellite tracking with a series of satellites over a period of several years.

In Meteorology the goal is a global observation capability that will furnish quantitative atmospheric data for mathematical models of the world weather system which can be used in long range forecasts of weather and climate. Advances in sensors and improved spacecraft operating subsystems will be necessary for the TIROS, Nimbus and ATS satellites. The development and deployment of a Data Relay Satellite System and the complementary ground systems would add to the utility of the meteorological information. In the program contemplated, continuation of TIROS, Nimbus and ATS as test beds for sensor improvements will be supplemented by a Synchronous Meteorological Satellite and the Global Atmospheric Research Program (GARP). The potential returns from satellite applications to meteorology have been estimated at billions of dollars.

The Communications program will focus on ultimately achieving the capability to broadcast directly to homes, fulfilling special educational and informational needs. It has been recommended that two classes of broadcast satellites be developed, one a multi-channel distribution system for use by television networks dedicated to private and public sectors of the industry, and a multi-channel system of the "teleclub" type for use in developing countries for audiences in the United States

who require special programming, e.g., physicians, educators, and engineers. The development of a Data Relay Satellite capable of providing a continuous communications link between low earth orbiting satellites and the ground is planned to demonstrate the utility of an operational system. The present ATS spacecraft will continue to be used to investigate transmission characteristics in a range of frequency bands. As in Earth Resources, the annual returns from satellite applications in communications are estimated in the hundreds of millions of dollars.

Navigation and Traffic Control spacecraft are the key to safer and more comfortable air and sea travel in the future. The objective of this program is to determine the utility of satellites to meet the over-ocean aircraft and ship navigation traffic control needs. It has been demonstrated that satellites can determine the positions of cooperating vehicles on the surface and in the air with high accuracy and promptness. Continuing work is needed to improve technology and reduce the cost of these systems. Benefits that would accrue from an operational satellite navigation and traffic control system are: faster search and rescue at sea; improved traffic flow of aircraft over high density transoceanic routes; reduction in ship collisions; savings in operating costs of shipping lines; and increased efficiency in commercial fishing.

FY 1971 Budget - Major Decisions

Earth Resources Survey

The Earth Resources Technology Satellite (ERTS A&B) is a research program to develop systems and techniques for collecting data on the earth's

environment and resources, to develop and test various sensors covering both the visual and infrared segments of the electromagnetic spectrum, and to supply information to evaluate the potential dollar returns from such data in a future operational system particularly in the areas of agriculture, hydrology, and geology. Work has begun on the sensor development and selection of the spacecraft configuration and contractor. Flights are scheduled for 1972 and 1973. A follow-on program, ERTS C and D, will be initiated in FY 1971 to obtain hard film imagery of the earth's surface during a portion of the period that ERTS A&B are in service. Comparisons of the recovered film with the video/scanner data from ERTS A&B would be made to determine the actual resolution needs for various disciplines including cartography.

Meteorology

No new starts will be initiated in FY 1971. The substantial on-going program supports the operational satellite system of the Environmental Science Service Administration (ESSA) by testing advanced instrumentation and systems technology. Nimbus D in 1970 will explore new techniques in charting the vertical structure and composition of the earth's atmosphere. Two improved satellites, Nimbus E and F, scheduled for 1972 and 1973 launches, will exploit new microwave sounding techniques and provide increased spectral and spatial imagery resolution using super-cooled infrared detectors. The Global Atmospheric Research Project cited earlier scheduled for a 1974 launch will be a Phase B study. The

Synchronous Meteorological Satellite (SMS) is designed to provide continuous observation of major weather systems and the dissemination of weather data to local meteorologists. It will utilize existing technology developed in the ATS and other R&D programs. Two launches are scheduled for 1972 and 1973.

Communications

In Communications, the Applications Technology Satellite (ATS) brings together diverse satellite capabilities to meet varied requirements efficiently and economically. It tests technology common to a number of satellite applications and conducts various space environmental investigations. Two synchronous orbit ATS flights (F and G) are scheduled for 1972 and 1974 to develop a capability to erect and point a large, 30-foot diameter, parabolic antenna in space, to investigate frequency bands for communications use and to study the means for reducing interference between ground terminals and terrestrial microwave relays under various atmospheric conditions and distances, and to conduct experiments in new techniques for communicating with and tracking low altitude satellites from a satellite in geostationary orbit. Through this program NASA supports other agencies of the U.S. Government such as the DOD, FCC, and OTM by advancing space communications technology, experimenting with new hardware and components, and serving as an advisor and consultant in technical problems. No new starts for Communications will be initiated in FY 1971.

Navigation and Traffic Control

A Navigation and Traffic Control Satellite flight project will be initiated in FY 1971. Objectives include the improvement of air traffic control services, improving aircraft and ship telecommunications (voice and digital data) services to shore and return, providing navigation services to ships and aircraft and providing safety aids and collision prevention services. The Federal Aviation Administration and the United States Coast Guard have participated with NASA in establishing the requirements for this program. The Phase B/C effort in FY 1971 is to identify aircraft and ground station needs and to select the optimal satellite system from among the feasible concepts. The system will be designed to satisfy the primary requirements for an over-ocean capability in aircraft and ships communication and surveillance.

National Aeronautics and Space Administration

SPACE TECHNOLOGY
PROGRAM MEMORANDUM

SUMMARY AND DECISIONS

The Space Technology program, in consonance with STG objectives, is directed toward reducing the cost and expanding the versatility and usefulness of space operations and hardware, advancing the fundamental knowledge pertinent to space flight and providing the technical capability for undertaking future missions.

The concepts of our future space capability in the form of reusable earth-to-orbit shuttles, permanent space stations and nuclear shuttles have provided a focus for a much more intensive effort in all pertinent areas: propulsion, life support, materials and structures, optics and electronics, guidance and control, power systems, and data handling and analysis.

Illustrative of the major areas where advances are to be pursued are: low-cost refurbishable heat shields and strong light-weight structural materials for reusable earth orbital reentry vehicles, investigating planetary descent systems, developing techniques for lunar shelters and storage of liquid hydrogen in space, providing system capability for more effective generation of power in space, obtaining improved reliability and longer lifetimes in electronic components and subsystems.

FY 1971 Budget - Major Decisions

The Space Technology program, while continuing the search for basic knowledge in pertinent space disciplines, is heavily oriented to intensive efforts geared to the requirements in the flight programs. Significant activity is directed toward developments in shuttle technology with special attention to thermal and load bearing characteristics of structures and materials, new engine designs, controls and navigation. The space station and space base also receive considerable support in the areas of power supplies, materials and structures, navigation and control, and life support systems.

Development of the NERVA engine is a major element in Space Technology. In FY 1971, definition of a reusable nuclear stage will be initiated.

National Aeronautics and Space Administration

AVIATION TECHNOLOGY PROGRAM MEMORANDUM

SUMMARY AND DECISIONS

The NASA Aviation Technology program has been recast this year to represent more clearly the scope of NASA activity and to provide for more compatibility with DOT and DOD activities. The program has been described in three major elements with appropriate subgroupings: Advanced Research, Vehicle Technology, and Systems Technology.

Advanced Research covers that effort directed toward increasing knowledge in scientific disciplines important to the advancement of atmospheric flight. The program is responsive to demands for fundamental data required to achieve specific objectives such as: developing lightweight, inexpensive structures, and providing simulation capabilities in air traffic control research. Advanced research is divided into six broad areas: fluid mechanics, materials, energy processes, flight dynamics, biotechnology, and information sensing and processing.

Vehicle Technology uses the knowledge gained in Advanced research to provide the basis for assessing alternatives on which sound development programs may be formulated. The work is directed toward the aircraft type concentrating on five classes of aircraft: General Aviation Aircraft,

V/STOL Aircraft, Subsonic Jet Aircraft, Supersonic Aircraft, and Hypersonic Aircraft. The work under each class is divided into four subgroups: performance (the mission capability), propulsion (the unique aspects in each vehicle class), loads and structures (materials and structural concepts required for mission accomplishment), and guidance and control (man and automated systems for safe aircraft management).

Systems Technology is a total system approach which applies the knowledge gained in Advanced Research toward the effective solution of total systems performance. This total systems approach has evolved from the increasing awareness of the interaction between the aircraft and the total aviation systems that make up the operational environment. Systems Technology is divided into: Navigation and Control (covering remote terminal and surface operation of aircraft, including on-board as well as ground-based systems and communications), operational hazards (weather, collision avoidance, and emergency conditions during ground operations), and environmental impact (the effect of aircraft operations on the environment in such areas as noise, sonic boom, and propellants).

FY 1971 Budget - Major Decisions

In the area of Advanced Research increased funding in FY 1971 is proposed for fundamental effort in fluid mechanics, aerodynamic loads and structures work, data acquisition and test equipment, development of equipment and techniques to simulate low visibility flights in terminal area operations for V/STOL and commercial transport.

The Vehicle Technology program will be increased in FY 1971 to cover such efforts as VTOL and STOL airframe-propulsion interference and supporting wind tunnel studies; higher efficiency rotor studies for advanced helicopters; V/STOL terminal operations, including avionics studies at ERC; V/STOL propulsion effort at Lewis; proof-of-concept work in V/STOL research aircraft covering concepts such as a rotating cylinder flap with propeller interconnect for enhanced STOL capability, a joint program with the Air Force utilizing an augmentor wing jet V/STOL concept, a tilt rotor for high speed rotorcraft, an advanced fan-in-wing V/STOL, and a tilt wing Canadian CL-84 for terminal area research, and a test vehicle to evaluate new rotor concepts.

A jet transport airplane will be procured for flight research into turbulence and handling qualities, emphasizing supercritical wing technology, proof-of-concept F-8 flight testing, and improved low-speed characteristics. Investigations of aircraft noise alleviation will include the decrease of installed engine noise through acoustic treatment, nacelle treatment, and tailpipe treatment. The Quiet Engine program is developing test engines utilizing current technology for the FY 1974-1975 period, with ultimate application to advanced engines.

For Systems Technology a slight increase is planned in FY 1971 to carry out studies of operational and environmental hazards.

National Aeronautics and Space Administration

SUPPORTING ACTIVITIES
PROGRAM MEMORANDUM

SUMMARY AND DECISIONS

Research and Program Management

Formerly designated as Administrative Operations, this activity supports research in Government laboratories and the management of the Agency's far-ranging programs. The principal element is personnel costs, which rise annually due to external factors despite the fact that NASA is in its third consecutive year of significant staff reductions. The overall funding level represents a continuation of the FY 1970 level of support, with essential modest manpower increases requested to provide: minimum adequate staffing for the stunted Electronics Research Center (at only half its originally projected level); support for the developing Viking program; restoration of a suitable manpower level for a growing aeronautics effort; and staffing of the NASA Aerospace Safety Research and Data Institute.

Tracking and Data Acquisition

This program, embracing four worldwide networks, is being sustained at essentially the same level except for increased funds required for equipment and components. This is occasioned by procurement requirements in support of AAP, Space Applications, the Planetary programs, much of which was deferred from operating programs in FY 1969 and FY 1970.

Sustaining University Program

NASA has grants and contracts with over 200 universities in areas of research, training or facilities. A major commitment has been NASA's funding of support for 7,600 predoctoral candidates, 1,700 of whom have received Ph.D's. Responding to changing requirements, the agency will restrict such grants to critical manpower areas rather than to all space-related fields of learning. Focusing on a specific problem area, NASA is including a program of research and interpretation of space flight data on earth resources to make it useful to the general community.

Technology Utilization

This key effort to disseminate knowledge for practical, widespread application continues at the present level.

Base Support and Product Improvement

The integration of the Titan III with the improved Centaur upper stage moves toward a scheduled Proof Flight in late 1972. An operational test carrying Pioneer G aloft in the first quarter of 1973 prior to launch of the 1973 Mars Viking lander mission is also scheduled.

FY 1971 Budget - Major Decisions

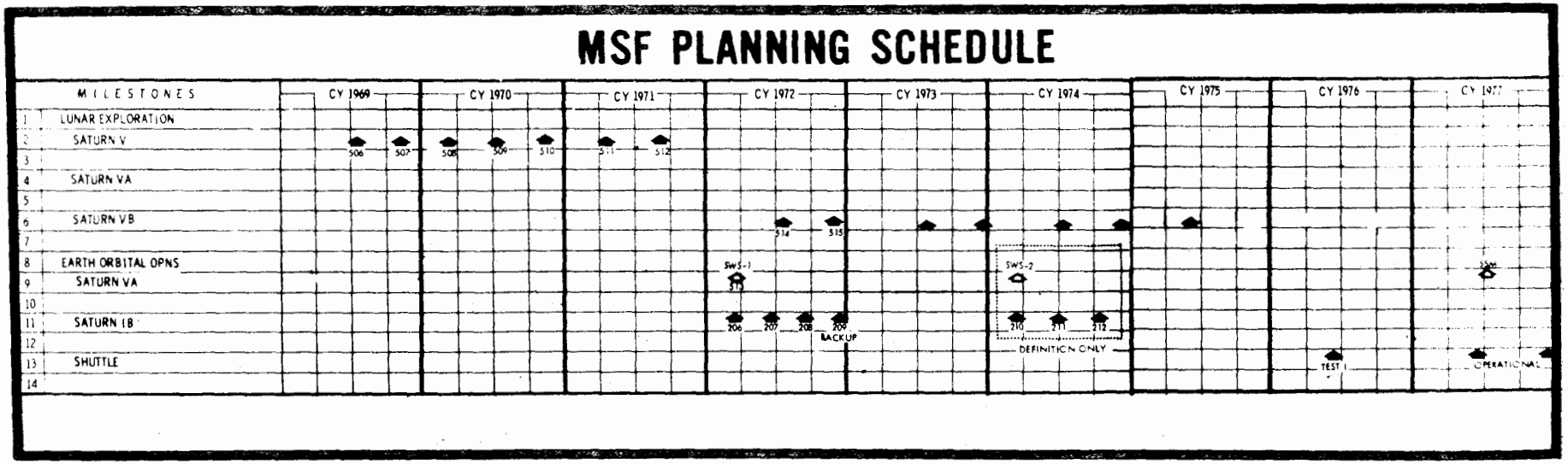
Modest increases in manpower are requested in support of new or expanding missions in the face of continuing attrition of personnel. The Electronics Research Center must be brought up to a viable staffing level of 1,000

and support for the bold Viking mission cannot be postponed. Attention to the Nation's growing aeronautics and aerospace safety problems is also required. The requested increases total 475 positions above the planned end FY 1970 strength.

Increases in Tracking and Data Acquisition are provided in support of AAP, Space Applications, and Planetary programs.

The Sustaining University program is supported at current cost levels, with increased emphasis on critical manpower areas and an Earth Resources research program.

MSF PLANNING SCHEDULE



PLANETARY

MISSION	LAUNCH VEHICLE	1970	1971	1972	1973	1974	1975	1976	1977
ON-GOING									
MARS									
MARINER	AT/CENTAUR		HI						
VIKING	T/CENTAUR				AB				
VENUS-MERCURY									
MARINER	T/CENTAUR				J				
OUTER PLANETS									
PIONEER F	AT/CENTAUR			F					
PIONEER G	T/CENTAUR				G				

ASTRONOMY

MISSION	LAUNCH VEHICLE	1970	1971	1972	1973	1974	1975	1976	1977
ON-GOING AND FY 71 NEW*									
SOLAR OBSERVATORIES	DELTA		H		I	J		K	
ASTRONOMICAL OBSERVATORIES	AT/CENTAUR	B	C						
LUNAR RADIO ASTRONOMY EXPL.	DELTA			B					
SMALL ASTRONOMY EXPLORER	SCOUT	A	B	C					
INTERNATIONAL COOP. SAT.	SCOUT				UK-5	DUTCH A			
HIGH ENERGY ASTRO. OBS.	TIII-C					A*	B*	C*	D*

SPACE PHYSICS

MISSION	LAUNCH VEHICLE	1970	1971	1972	1973	1974	1975	1976	1977
ON-GOING									
PIONEER/HELIOS	T/CENTAUR					A	B		
IMP	DELTA	I		H	J				
ISIS	DELTA		B	C					
ATMOSPHERE	DELTA				C	D	E		
SMALL SCIENTIFIC SAT.	SCOUT	A							
AF/CRL	SCOUT	A							
NRL	SCOUT	C							
GERMAN RESEARCH SAT.	SCOUT	B		Az					
SAN MARCO	SCOUT	C							
INTERNATIONAL COOP. SAT.	SCOUT		UK-4						

SPACE APPLICATIONS

MISSION	LAUNCH VEHICLE	1970	1971	1972	1973	1974	1975	1976	1977
ON-GOING AND FY 71 NEW*									
EARTH SURVEYS									
ERTS	DELTA			AC*	BD*				
METEOROLOGY									
NIMBUS	TAT/AGENA	D							
NIMBUS	DELTA			E	F				
SYN. METEOROLOGICAL SAT.	DELTA		A	B					
COOPERATIVE APPL. SATELLITE	SCOUT	A							
COMMUNICATIONS & NAVIGATION									
ATS	TIII-C			F	G				
GEODETIC	DELTA		C						
NAV/TRAFFIC CONTROL	DELTA				A*B*				

LIFE SCIENCES

MISSION	LAUNCH VEHICLE	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
On-Going												
Frog Otolith	SCOUT	A										

SPACE TECHNOLOGY

On-Going												
RAM-C	SCOUT	C										
Re-Entry	SCOUT			H								
Plan. Atmos. Entry Test	SCOUT		G									
Meteoroid	SCOUT		A									

SUPPORTING ACTIVITIES

On-Going												
Proof Flight	T/CENT			X								

NOTES ON PROGRAM AND FINANCIAL PLAN
FY 1971 BUDGET SUBMISSION TO BOB, 10/6/69

1. General

This PFP reflects estimated funding requirements for on-going programs covered in the amended FY 1970 Budget and for proposed FY 1971 program extensions and new starts. Program content is essentially consistent with Program Option II of the Space Task Group report and the considerations outlined in the Summary and Highlight memorandum.

2. SRT, ART, Level-of-Effort - FY 1972 and Subsequent

The amounts for FY 1972 and subsequent years for SRT, ART, and other "level-of-effort" activities are held to the FY 1971 level to establish a funding baseline. Actual funding requirements for these areas are subject to future program decisions.

3. Saturn V

The estimates for follow-on Saturn V production reflect a production rate of 2 vehicles per year, an assumption of successful efforts to reduce vehicle costs, and provision for the modifications necessary for a two-stage vehicle to launch space station modules and a nuclear shuttle. Determination of the production rate to be implemented will be dependent upon reviews of contractor proposals and operational decisions with respect to phasing of vehicle completion and launch readiness requirements.

4. MSF Operating Base

In FY 1974 and 1975, amounts are included to cover requirements for mission operations and continuing R&D operations at the Manned Space Flight centers. Functions include operation and maintenance of the industrial area, launch complexes and other facilities at KSC; operation and maintenance of the Mission Control Center at MSC; crew training and related operations at MSC; flight operations, including task force support, mission planning, and trajectory analysis; and overall systems engineering; and laboratory and test support operations at MSFC and MSC.

5. University Affairs

The runout includes NOA to support the Sustaining University program at the current cost level.

6. Construction of Facilities

Values are included for Construction of Facilities for FY 1972 and subsequent years to recognize the requirement to maintain and improve the existing physical plant but do not include estimates for specific new construction projects.

7. OART Budget Line Item Distribution

The OART program is presented in a new program structure. Distribution of the amounts to the current budget line item structure will be furnished separately.

8. Man-Tended Flight Experiments

Amounts programmed for Space Station experiments have been classified by PPB category including Astronomy, Space Physics, Life Sciences, and Space Applications. These amounts shown are based on preliminary estimates of the magnitude of effort related to each area. Experiment definition effort included in the FY 1971 budget will more specifically identify the experiments to be programmed for the initial space station.

Under AAP, amounts peculiar to ATM systems have been classified as Astronomy. In Apollo and AAP, amounts identifiable for Life Sciences have been included in that category.

9. Estimates for Major New Starts

The budget estimates for the major new projects proposed in FY 1971 must be characterized as very preliminary, reflecting the status of systems definition which is under constant change. The lack of design definition has always impeded realistic costing of new development. The absence of a large historical data base of applicable systems seriously implicates the reliability of parametric techniques which are typicall relied on to estimate costs of "soft" designs. In addition, there is a new environment created by the consensus in both government and the aerospace industry that "low cost" is an absolutely essential feature in future space systems. This complicates cost analysis because the scarce historical data may contain a bias not valid for extrapolation to the economy conscious new management. The approach the Agency has adopted in the budget is to present costs consistent with the degree of definition and, through diligent effort on the part of the many contributing disciplines, work to improve the definition of configuration specifications and ensure that the associated cost estimates do not lag the technical input. On this basis, the changes in costs should approximate the changes in design configuration and improved estimates will be available as firm designs are established.

10. Inflationary Impact

The effects of inflation on the NASA budget must be directly addressed because of the importance of this influence in the present economic environment. Our studies show that the net effect of inflation on NASA R&D purchases has been to decrease the purchasing power of NASA contracting dollars by about 5% per year from 1960-1968. There are many indications that this rate of price increase has intensified during the past year. Despite these trends, the Agency has not separately provided for this contingency in establishing the resources requirements in FY 1971 and later years. Although major contractors involved in on-going work typically structure estimates to include the effects of wage increases in future years, the lack of specific government inflationary guidelines precludes identification of the extent to which cost escalation has modified the budget values.

Despite the difficulties encountered in establishing the precise inflationary factor applicable to the overall Agency program it is apparent from all available information that the impact is significant. A special analysis which identifies the effects of wage and price increases on the overall research and development sector will be submitted.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
FY 1971 BUDGET ESTIMATES
AGENCY SUMMARY - ALL APPROPS. / FISCAL YEAR
IN MILLIONS OF DOLLARS

FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	RTC	TOTAL ALL YEARS
1970										
ONGOING 1970										
RESEARCH AND DEVELOPMENT	.0	3204.0	3123.9	3340.1	3058.1	2506.7	1969.4	1766.4	.0	18968.6
CONST. OF FACILITIES	.0	32.1	58.2	65.2	50.0	50.0	50.0	50.0	.0	355.5
RESEARCH + PROG. MGMT.	.0	648.0	685.5	707.0	712.0	717.0	722.0	727.0	.0	4918.5
SUB TOTAL	.0	3884.1	3867.6	4112.3	3820.1	3273.7	2741.4	2543.4	.0	24242.6
1971										
NEW STARTS 1971										
RESEARCH AND DEVELOPMENT	.0	.0	.0	360.1	1389.5	2054.3	2474.5	2324.8	.0	8603.2
CONST. OF FACILITIES	.0	.0	.0	25.0	.0	.0	.0	.0	.0	25.0
SUB TOTAL	.0	.0	.0	385.1	1389.5	2054.3	2474.5	2324.8	.0	8628.2
TOTAL AGENCY REQUEST										
RESEARCH AND DEVELOPMENT	.0	3204.0	3123.9	3700.2	4447.6	4561.0	4443.9	4091.2	.0	27571.8
CONST. OF FACILITIES	.0	32.1	58.2	90.2	50.0	50.0	50.0	50.0	.0	380.5
RESEARCH + PROG. MGMT.	.0	648.0	685.5	707.0	712.0	717.0	722.0	727.0	.0	4918.5
TOTAL	.0	3884.1	3867.6	4497.4	5209.6	5328.0	5215.9	4868.2	.0	32870.8

FY 1971 NEW STARTS

	FY 1971	FY 1972	FY 1973	FY 1974	FY 1975
Space Station	98.0	348.7	651.3	946.8	960.2
Space Shuttle	170.0	696.0	975.0	1,115.0	1,032.0
Lunar Exploration - Phase II	60.0	214.0	250.0	200.0	120.0
High Energy Observatory	4.0	56.5	78.9	76.7	73.0
Navigation/Traffic Control	7.0	19.0	42.0	43.0	14.0
ERTS C-D	10.0	19.3	6.1	1.0	---
500-Day Life Support System	2.0	14.0	12.0	10.0	10.0
100 kw Power Supply	3.7	17.3	26.0	30.0	22.0
Phase B Studies (GARP and SATS)	2.0				
Nuclear Stage Studies	3.0				
Support for New Starts	.4	4.7	13.0	52.0	93.6
Total	360.1	1,389.5	2,054.3	2,474.5	2,324.8

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
FY 1971 BUDGET ESTIMATES
BUDGET LINE ITEM/YEAR
IN MILLIONS OF DOLLARS

FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

BUDGET LINE ITEM	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	RTC	TOTAL ALL YEARS
APOLLO	.0	2025.0	1658.1	1178.5	958.5	798.5	.0	.0	.0	6618.6
SPACE FLIGHT OPERATIONS	.0	150.0	376.1	928.2	1888.8	2338.6	2630.3	2455.7	.0	10767.7
ADVANCED MISSIONS	.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	.0	17.5
OPERATING BASE	.0	.0	.0	.0	.0	.0	600.0	600.0	.0	1200.0
OMSF	.0	2177.5	2036.7	2109.2	2849.8	3139.6	3232.8	3058.2	.0	18603.8
PHYSICS AND ASTRONOMY	.0	128.9	112.0	125.0	144.1	142.2	124.8	111.1	.0	888.1
LUNAR AND PLANETARY EXPL	.0	90.4	148.7	365.9	308.0	189.5	101.5	40.4	.0	1244.4
SPACE BIOLOGY	.0	37.9	19.7	16.4	15.4	16.4	12.4	12.4	.0	130.6
SPACE APPLICATIONS	.0	98.7	128.4	219.0	175.7	145.9	114.0	69.7	.0	951.4
LAUNCH VEHICLE PROC	.0	99.9	109.0	166.7	176.9	105.6	80.2	66.4	.0	804.7
OSSA	.0	455.8	517.8	893.0	820.1	599.6	432.9	300.0	.0	4019.2
BLI DISTRIB. TO BE FURN.	.0	278.2	277.4	349.0	440.2	480.0	437.7	395.2	.0	2657.7
OART	.0	278.2	277.4	349.0	440.2	480.0	437.7	395.2	.0	2657.7
TRACKING + DATA ACQ	.0	279.7	278.0	318.0	306.5	310.8	309.5	306.8	.0	2109.3
SUST UNIVERSITY PROG	.0	9.0	9.0	26.0	26.0	26.0	26.0	26.0	.0	148.0
TECHNOLOGY UTILIZATION	.0	3.8	5.0	5.0	5.0	5.0	5.0	5.0	.0	33.8
RESEARCH AND DEVELOPMENT	.0	3204.0	3123.9	3700.2	4447.6	4561.0	4443.9	4091.2	.0	27571.8
CONST. OF FACILITIES	.0	32.1	58.2	90.2	50.0	50.0	50.0	50.0	.0	380.5
RESEARCH + PROG. MGMT.	.0	648.0	685.5	707.0	712.0	717.0	722.0	727.0	.0	4918.5
TOTAL	.0	3884.1	3867.6	4497.4	5209.6	5328.0	5215.9	4868.2	.0	32870.9

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FY 1971 BUDGET ESTIMATES — PAGE 1
RESEARCH AND DEVELOPMENT DETAIL BY PROGRAM OFFICE/BLI
IN MILLIONS OF DOLLARS

FY 71 PEP BUREAU OF THE BUDGET SUBMISSION 10/06/69

		FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
OMSF		(.0)	(2177.5)	(2036.7)	(2109.2)	(2849.8)	(3139.6)	(3232.8)	(3058.2)	(.0)	(18603.8)
ONGOING	1970	(.0)	(2177.5)	(2036.7)	(1781.2)	(1591.1)	(1263.3)	(971.0)	(946.0)	(.0)	(10766.8)
APOLLO		(.0)	(2025.0)	(1658.1)	(1178.5)	(958.5)	(798.5)	(.0)	(.0)	(.0)	(6618.6)
APOLLO		(.0)	(2006.8)	(1628.8)	(1160.0)	(958.5)	(798.5)	(.0)	(.0)	(.0)	(6552.6)
APOLLO SPACECRAFT		.0	907.4	721.2	532.9	394.0	256.9	.0	.0	.0	2812.4
APOLLO SATURN V		.0	535.7	485.0	282.0	200.0	160.0	.0	.0	.0	1662.7
APOLLO SATURN IB		.0	42.3	.0	.0	.0	.0	.0	.0	.0	42.3
LAUNCH FLIGHT + RECOVERY		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MISSION CONTROL SYSTEMS		.0	47.9	51.0	39.1	48.0	50.5	.0	.0	.0	236.5
SPACE OPERATIONS		.0	49.1	54.7	46.8	41.0	39.3	.0	.0	.0	230.9
LAUNCH OPERATIONS		.0	115.3	90.8	72.7	81.4	89.2	.0	.0	.0	449.4
LAUNCH INSTRUMENTATION		.0	17.5	26.8	24.2	25.8	28.6	.0	.0	.0	122.9
KSC SPACECRAFT		.0	72.8	54.8	46.8	48.3	50.9	.0	.0	.0	273.6
KSC SATURN IB		.0	18.5	.0	.0	.0	.0	.0	.0	.0	18.5
KSC SATURN V		.0	157.4	100.9	71.3	77.4	84.2	.0	.0	.0	491.2
TECHNICAL		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SYSTEMS ENGINEERING		.0	22.1	22.7	24.0	24.5	25.2	.0	.0	.0	118.5
CONTRACT ADMINISTRATION		.0	15.1	13.5	14.2	12.1	9.7	.0	.0	.0	64.6
LIFE SCIENCES APOLLO		.0	5.7	7.4	6.0	6.0	4.0	.0	.0	.0	29.1
LUNAR EXPLORATION		(.0)	(.0)	(11.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(11.0)
LUNAR EXPLOR. DEFIN.		.0	.0	11.0	.0	.0	.0	.0	.0	.0	11.0
ADVANCED DEVELOPMENT		(.0)	(18.2)	(18.3)	(18.5)	(.0)	(.0)	(.0)	(.0)	(.0)	(55.0)
ADVANCED DEVELOPMENT		.0	18.2	18.3	18.5	.0	.0	.0	.0	.0	55.0
SPACE FLIGHT OPERATIONS		(.0)	(150.0)	(376.1)	(600.2)	(630.1)	(462.3)	(368.5)	(343.5)	(.0)	(2930.7)
APOLLO APPLICATIONS		(.0)	(150.0)	(288.1)	(500.2)	(368.6)	(138.8)	(.0)	(.0)	(.0)	(1445.7)
SPACE VEHICLES		.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
AAP SPACECRAFT MODS.		.0	46.3	76.0	143.6	120.2	45.4	.0	.0	.0	431.5
AAP SATURN IB		.0	6.4	7.1	23.0	40.9	12.1	.0	.0	.0	89.5

RESEARCH AND DEVELOPMENT DETAIL BY PROGRAM OFFICE/BLI
IN MILLIONS OF DOLLARS

FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
AAP SATURN V	.0	.0	.8	4.3	2.1	.0	.0	.0	.0	7.2
PAYLOADS + EXPERIMENTS	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPACE STATION DEFINITION	.0	8.8	.0	.0	.0	.0	.0	.0	.0	8.8
EXPERIMENT DEVELOPMENT	.0	7.9	24.1	25.5	14.8	9.3	.0	.0	.0	81.6
SATURN WORKSHOP =1	.0	25.0	79.5	155.7	50.7	15.0	.0	.0	.0	325.9
A T M	.0	21.9	16.2	13.6	8.4	.2	.0	.0	.0	60.3
PAYLOAD INTEGRATION	.0	23.7	22.3	44.4	23.6	9.9	.0	.0	.0	123.9
PROGRAM SUPPORT	.0	.1	9.2	20.8	34.2	12.2	.0	.0	.0	76.5
LAUNCH FLIGHT + RECOVERY	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MISSION OPERATIONS	.0	.0	12.3	20.2	18.9	8.9	.0	.0	.0	60.3
KSC SATURN IB	.0	.0	6.6	13.2	34.7	17.7	.0	.0	.0	72.2
KSC SATURN V	.0	.0	.0	1.6	3.7	.0	.0	.0	.0	5.3
TECHNICAL	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SYSTEMS ENGINEERING	.0	.0	3.1	3.3	3.4	3.4	.0	.0	.0	13.2
CONTRACT ADMINISTRATION	.0	1.2	2.8	4.9	3.5	1.3	.0	.0	.0	13.7
LIFE SCIENCES AAP	.0	8.7	28.1	26.1	9.5	3.4	.0	.0	.0	75.8
SATURN V	(.0)	(.0)	(46.0)	(100.0)	(243.0)	(305.0)	(350.0)	(325.0)	(.0)	(1369.0)
SATURN V FOLLOW-ON	.0	.0	46.0	100.0	243.0	305.0	350.0	325.0	.0	1369.0
SPACE STATION/BASE	(.0)	(.0)	(6.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(6.0)
STATION	.0	.0	6.0	.0	.0	.0	.0	.0	.0	6.0
SPACE SHUTTLE	(.0)	(.0)	(36.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(36.0)
SPACE SHUTTLE	.0	.0	36.0	.0	.0	.0	.0	.0	.0	36.0
ADVANCED DEVELOPMENT	(.0)	(.0)	(.0)	(.0)	(18.5)	(18.5)	(18.5)	(18.5)	(.0)	(74.0)
ADVANCED DEVELOPMENT	.0	.0	.0	.0	18.5	18.5	18.5	18.5	.0	74.0
ADVANCED MISSIONS	(.0)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(.0)	(17.5)
ADVANCED MISSIONS	(.0)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(.0)	(17.5)
ADVANCED STUDIES	.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	.0	17.5
OPERATING BASE	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(600.0)	(600.0)	(.0)	(1200.0)

RESEARCH AND DEVELOPMENT DETAIL BY PROGRAM OFFICE/BLI
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FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
OPERATING BASE	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(600.0)	(600.0)	(.0)	(1200.0)
OPER. BASE - KSC	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
KSC LAUNCH OPERATIONS	.0	.0	.0	.0	.0	.0	95.1	95.1	.0	190.2
KSC LCH INSTRUMENTATION	.0	.0	.0	.0	.0	.0	30.0	30.0	.0	60.0
KSC SPACECRAFT	.0	.0	.0	.0	.0	.0	54.0	54.0	.0	108.0
KSC SATURN V	.0	.0	.0	.0	.0	.0	87.0	87.0	.0	174.0
OPER. BASE - MSC	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MSC CENTER SUPPORT	.0	.0	.0	.0	.0	.0	89.5	89.5	.0	179.0
MSC MISSION CONTROL SYS.	.0	.0	.0	.0	.0	.0	54.0	54.0	.0	108.0
MSC SPACE OPERATIONS	.0	.0	.0	.0	.0	.0	41.3	41.3	.0	82.6
OPER. BASE - MSFC	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MSFC CENTER SUPPORT	.0	.0	.0	.0	.0	.0	115.4	115.4	.0	230.8
OPER. BASE-HQ(SYS ENG)	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
HQ SYSTEMS ENGINEERING	.0	.0	.0	.0	.0	.0	26.0	26.0	.0	52.0
HQ CONTRACT ADM	.0	.0	.0	.0	.0	.0	7.7	7.7	.0	15.4
NEW STARTS 1971	(.0)	(.0)	(.0)	(328.0)	(1258.7)	(1876.3)	(2261.8)	(2112.2)	(.0)	(7837.0)
SPACE FLIGHT OPERATIONS	(.0)	(.0)	(.0)	(328.0)	(1258.7)	(1876.3)	(2261.8)	(2112.2)	(.0)	(7837.0)
LUNAR EXPLORATION	(.0)	(.0)	(.0)	(60.0)	(214.0)	(250.0)	(200.0)	(120.0)	(.0)	(844.0)
LUNAR EXPLOR. PHASE II	.0	.0	.0	60.0	214.0	250.0	200.0	120.0	.0	844.0
SPACE STATION/BASE	(.0)	(.0)	(.0)	(98.0)	(348.7)	(651.3)	(946.8)	(960.2)	(.0)	(3005.0)
EXPERIMENT DEFINITION	.0	.0	.0	18.0	.0	.0	.0	.0	.0	18.0
SS MODULE DEVEL	.0	.0	.0	51.4	200.0	250.0	320.0	270.0	.0	1091.4
SS MODULE PROD	.0	.0	.0	.0	.0	55.0	105.0	95.0	.0	255.0
OPERATIONS	.0	.0	.0	.0	.0	10.0	30.0	60.0	.0	100.0
SP STA EXPER ENG & TECH	.0	.0	.0	4.0	37.5	55.0	77.0	89.0	.0	262.5
SP STA EXPER LIFE SCI	.0	.0	.0	9.4	33.3	61.3	98.3	140.2	.0	342.5
SP STA EXPER PHYSICS	.0	.0	.0	6.5	34.5	74.0	103.5	108.5	.0	327.0
SP STA EXPER EARTH SURV	.0	.0	.0	.0	1.0	5.0	10.0	15.0	.0	31.0
SP STA EXPER COMMUN	.0	.0	.0	1.5	7.0	10.0	12.0	4.5	.0	35.0
SP STA EXPER ASTRONOMY	.0	.0	.0	7.2	35.4	131.0	191.0	178.0	.0	542.6

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FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
SPACE SHUTTLE	(.0)	(.0)	(.0)	(170.0)	(696.0)	(975.0)	(1115.0)	(1032.0)	(.0)	(3988.0)
SPACE SHUTTLE	.0	.0	.0	170.0	696.0	975.0	1115.0	1032.0	.0	3988.0

IN MILLIONS OF DOLLARS

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
OSSA	(.0)	(455.8)	(517.8)	(893.0)	(820.1)	(599.6)	(432.9)	(300.0)	(.0)	(4019.2)
ONGOING 1970	(.0)	(455.8)	(517.8)	(870.0)	(725.1)	(471.5)	(306.9)	(207.8)	(.0)	(3554.9)
PHYSICS AND ASTRONOMY	(.0)	(128.9)	(112.0)	(121.0)	(93.6)	(79.7)	(64.8)	(53.9)	(.0)	(653.9)
P+A SRT/ADV. STUDIES	.0	9.5	6.0	6.0	6.0	6.0	6.0	6.0	.0	45.5
P+A SRT/ADV. STUDIES	.0	12.8	8.6	8.6	8.6	8.6	8.6	8.6	.0	64.4
AIRBORNE RESEARCH	.0	.6	2.0	3.0	3.0	3.0	3.0	3.0	.0	17.6
BALLOON PROG ASTRON	.0	.4	.5	.5	.5	.5	.5	.5	.0	3.4
BALLOON PROG PHYSICS	.0	.4	.4	.4	.4	.4	.4	.4	.0	2.8
P+A DATA ANALYSIS	.0	.3	.4	.4	.4	.4	.4	.4	.0	2.7
P+A DATA ANALYSIS	.0	3.2	2.6	2.6	2.6	2.6	2.6	2.6	.0	18.8
OSO A-K	.0	13.1	14.7	18.7	19.8	17.8	13.8	8.0	.0	105.9
OAO A-C	.0	36.7	33.3	27.1	6.4	3.2	.9	.0	.0	107.6
OGO A-F	.0	13.2	6.9	6.7	3.1	.0	.0	.0	.0	29.9
PHYSICS EXPLORERS	.0	12.0	9.7	15.4	19.2	16.1	9.0	5.0	.0	86.4
ASTRONOMY EXPLORERS	.0	7.4	8.1	12.7	4.7	2.2	.7	.5	.0	36.3
SOUNDING ROCKETS	.0	10.0	10.1	10.2	10.2	10.2	10.2	10.2	.0	71.1
SOUNDING ROCKETS	.0	9.3	8.7	8.7	8.7	8.7	8.7	8.7	.0	61.5
LUNAR AND PLANETARY EXPL	(.0)	(90.4)	(148.7)	(365.9)	(308.0)	(189.5)	(101.5)	(40.4)	(.0)	(1244.4)
L+P SRT/ADV. STUDIES	.0	5.6	7.0	9.0	9.4	9.4	9.4	9.4	.0	59.2
L+P SRT/ADV. STUDIES	.0	16.6	11.4	11.3	11.3	11.3	11.3	11.3	.0	84.5
PLANET ASTRONOMY SRT	.0	.0	3.8	4.9	4.9	4.9	4.9	4.9	.0	28.3
L+P DATA ANALYSIS	.0	1.9	1.6	2.0	2.1	2.1	2.1	2.1	.0	13.9
L+P DATA ANALYSIS	.0	.5	.6	1.9	2.0	1.6	3.0	4.0	.0	13.6
PIONEER/HELIOS	.0	.0	.3	1.9	1.7	1.4	1.0	1.0	.0	7.3
PIONEER A-E	.0	3.6	2.7	1.9	1.3	1.2	.9	.0	.0	11.6
PIONEER F + G	.0	1.1	17.8	29.1	14.2	6.3	2.7	2.3	.0	73.5
VIKING	.0	15.0	41.0	250.0	217.0	128.0	55.0	5.0	.0	711.0
MARINER-MARS 1969	.0	26.1	4.7	.2	.1	.0	.0	.0	.0	31.1
MARINER-MARS 1971	.0	20.0	56.8	29.6	10.5	1.0	.0	.0	.0	117.9
VENUS MERCURY 1973	.0	.0	1.0	24.1	33.5	22.3	11.2	.4	.0	92.5
SPACE BIOLOGY	(.0)	(37.9)	(19.7)	(16.4)	(15.4)	(16.4)	(12.4)	(12.4)	(.0)	(150.6)

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
EXOBIOLOGY SRT	.0	3.0	4.5	4.5	4.5	4.5	4.5	4.5	.0	30.0
BIOSCIENCE SRT	.0	5.9	6.2	6.9	6.9	6.9	6.9	6.9	.0	46.6
PLANETARY QUARANTINE	.0	1.3	3.0	3.5	4.0	5.0	1.0	1.0	.0	18.8
BIOSATELLITE	.0	27.7	6.0	1.5	.0	.0	.0	.0	.0	35.2
SPACE APPLICATIONS	(.0)	(98.7)	(128.4)	(200.0)	(142.2)	(103.4)	(73.0)	(55.7)	(.0)	(801.4)
EARTH SURVEYS	(.0)	(21.4)	(41.1)	(69.6)	(51.9)	(44.9)	(35.3)	(29.6)	(.0)	(293.8)
APPLIC SRT/ADV STUDIES	.0	9.2	13.3	13.3	13.3	13.3	13.3	13.3	.0	89.0
ADV APPLIC FLT EXPER	.0	1.0	1.8	1.8	3.3	3.3	3.3	3.3	.0	17.8
ERTS AIRCRAFT PROGRAM	.0	8.9	11.0	13.0	13.0	13.0	13.0	13.0	.0	84.9
ERTS A+B	.0	2.3	15.0	41.5	22.3	15.3	5.7	.0	.0	102.1
METEOROLOGY	(.0)	(45.8)	(44.2)	(62.8)	(37.4)	(24.2)	(17.6)	(14.7)	(.0)	(246.7)
APPLIC SRT/ADV STUDIES	.0	5.1	5.9	5.9	5.9	5.9	5.9	5.9	.0	40.5
TIROS/TOS IMPROVEMENTS	.0	5.8	3.7	3.2	2.6	2.6	2.6	2.6	.0	23.1
NIMBUS A-F	.0	31.8	27.3	33.4	19.6	9.5	3.0	.1	.0	124.7
SYNCHRON MET SAT A+B	.0	.0	2.7	15.6	3.1	.1	.0	.0	.0	21.5
METEOROLOGICAL SOUNDINGS	.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	.0	21.5
ADV APPL FLT EXPER	.0	.0	1.5	1.5	3.0	3.0	3.0	3.0	.0	15.0
COOP APPLIC SAT	.0	.1	.1	.1	.1	.0	.0	.0	.0	.4
COMMUN. + NAVIG.	(.0)	(31.5)	(43.1)	(67.6)	(52.9)	(34.3)	(20.1)	(11.4)	(.0)	(260.9)
APPLIC SRT/ADV STUDIES	.0	5.3	5.7	6.7	6.7	6.7	6.7	6.7	.0	44.5
ATS A-G	.0	23.7	33.8	55.5	38.7	22.2	8.0	1.0	.0	182.9
ADV APPLIC FLT EXPER	.0	.0	1.9	1.9	3.7	3.7	3.7	3.7	.0	18.6
GEOS A-C	.0	2.5	1.7	3.5	3.8	1.7	1.7	.0	.0	14.9
LAUNCH VEHICLE PROC	(.0)	(99.9)	(109.0)	(166.7)	(165.9)	(82.5)	(55.2)	(45.4)	(.0)	(724.6)
BASE SPT + PRODUCT IMP.	(.0)	(51.2)	(62.0)	(91.3)	(84.4)	(50.2)	(37.9)	(34.0)	(.0)	(411.0)
TITAN/CENT INTEGRATION	.0	.1	3.8	15.1	18.2	.8	.0	.0	.0	38.0
TITAN/CENTAUR PROOF FLT	.0	.0	2.9	10.5	4.7	.0	.0	.0	.0	17.9
SCOUT	.0	8.7	9.0	9.8	9.1	8.2	8.0	8.0	.0	60.8
CENTAUR	.0	22.4	23.3	34.2	28.9	21.2	12.9	9.0	.0	151.9

RESEARCH AND DEVELOPMENT DETAIL BY PROGRAM OFFICE/BLI
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FY 71 PEP BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	R T C	TOTAL ALL YEARS
DELTA	.0	15.4	19.3	20.8	17.0	17.0	17.0	17.0	.0	123.5
AGENA	.0	4.5	3.5	.0	.0	.0	.0	.0	.0	8.0
TITAN III C	.0	.1	.2	1.1	6.5	3.0	.0	.0	.0	10.9
LAUNCH VEHICLES	(.0)	(48.7)	(47.0)	(75.4)	(81.5)	(32.3)	(17.3)	(11.4)	(.0)	(313.6)
L/V SRT/ADV. STUDIES	.0	4.4	4.0	4.0	4.0	4.0	4.0	4.0	.0	28.4
IIBOS/DELTA	.0	1.4	.2	.0	.0	.0	.0	.0	.0	1.6
NIMBUS/THOR/AGENA	.0	5.8	1.6	.0	.0	.0	.0	.0	.0	7.4
SMS A+B/DELTA	.0	.0	1.1	2.6	2.3	.0	.0	.0	.0	6.0
NIMBUS E-F/DELTA	.0	.0	1.2	1.5	3.6	.9	.0	.0	.0	7.2
ATS/CENTAUR	.0	.6	.0	.0	.0	.0	.0	.0	.0	.6
ATS F-G/TITAN III C	.0	3.0	3.7	14.7	9.9	1.8	.0	.0	.0	33.1
ERTS A-B/DELTA	.0	.0	.0	3.9	2.1	.4	.0	.0	.0	6.4
SERT/THOR/AGENA	.0	.8	.2	.0	.0	.0	.0	.0	.0	1.0
REENTRY/SCOUT	.0	.2	.3	2.3	.0	.0	.0	.0	.0	2.8
METEOROID BUMPER/SCOUT	.0	.0	.0	1.1	.0	.0	.0	.0	.0	1.1
RAM/SCOUT	.0	.3	.0	.0	.0	.0	.0	.0	.0	.3
OFO/SCOUT	.0	1.1	.0	.0	.0	.0	.0	.0	.0	1.1
PIONEER F/CENT	.0	1.3	2.1	6.6	2.5	.0	.0	.0	.0	12.5
PIONEER/HELIOS/CENTAUR	.0	.0	.0	1.5	10.6	5.6	4.9	2.8	.0	25.4
PIONEER G/T III D/CENT	.0	.0	.5	9.8	7.4	.6	.0	.0	.0	18.3
PIONEER/DELTA	.0	1.2	.0	.0	.0	.0	.0	.0	.0	1.2
VIKING/TITAN(IIID)CENT	.0	.0	2.0	13.7	15.1	9.5	1.2	.0	.0	41.5
MARINER-MARS 69/CENTAUR	.0	.8	.0	.0	.0	.0	.0	.0	.0	.8
MARINER-MARS 71/CENTAUR	.0	10.2	9.8	1.6	.0	.0	.0	.0	.0	21.6
OSO A-K/DELTA	.0	2.4	1.3	.0	2.0	2.8	4.0	1.4	.0	13.9
OAO/CENTAUR	.0	8.8	5.6	1.5	.0	.0	.0	.0	.0	15.9
OGO/THOR/AGENA	.0	.2	.0	.0	.0	.0	.0	.0	.0	.2
MERCURY 73/CENTAUR	.0	.0	.0	.7	8.1	3.9	.0	.0	.0	12.7
PHYSICS EXPL/DELTA	.0	2.7	6.4	4.9	5.1	1.6	3.2	3.2	.0	27.1
GEOS C/DELTA	.0	.0	2.6	.0	.0	.0	.0	.0	.0	2.6
PHYSICS EXPL/SCOUT	.0	2.3	3.5	1.1	3.6	.0	.0	.0	.0	10.5
CAS/SCOUT	.0	.0	.0	1.1	1.1	.0	.0	.0	.0	2.2
ASTRONOMY EXPL/DELTA	.0	.0	.0	1.3	1.7	.0	.0	.0	.0	3.0
ASTRONOMY EXPL/SCOUT	.0	.0	.9	1.5	2.4	1.2	.0	.0	.0	6.0

IN MILLIONS OF DOLLARS

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
BIOSATELLITE/DELTA	.0	1.2	.0	.0	.0	.0	.0	.0	.0	1.2
NEW STARTS 1971	(.0)	(.0)	(.0)	(23.0)	(95.0)	(128.1)	(126.0)	(92.2)	(.0)	(464.3)
PHYSICS AND ASTRONOMY	(.0)	(.0)	(.0)	(4.0)	(50.5)	(62.5)	(60.0)	(57.2)	(.0)	(234.2)
HI ENERGY ASTRON OBS A-D	.0	.0	.0	4.0	50.5	62.5	60.0	57.2	.0	234.2
SPACE APPLICATIONS	(.0)	(.0)	(.0)	(19.0)	(33.5)	(42.5)	(41.0)	(14.0)	(.0)	(150.0)
EARTH SURVEYS	(.0)	(.0)	(.0)	(11.0)	(14.5)	(4.5)	(1.0)	(.0)	(.0)	(31.0)
SATS PHASE B	.0	.0	.0	1.0	.0	.0	.0	.0	.0	1.0
ERTS C-D	.0	.0	.0	10.0	14.5	4.5	1.0	.0	.0	30.0
METEOROLOGY	(.0)	(.0)	(.0)	(1.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(1.0)
WWW /GARP/ PHASE B	.0	.0	.0	1.0	.0	.0	.0	.0	.0	1.0
COMMUN. + NAVIG.	(.0)	(.0)	(.0)	(7.0)	(19.0)	(38.0)	(40.0)	(14.0)	(.0)	(118.0)
NAV/TRF CTL A-B	.0	.0	.0	7.0	19.0	38.0	40.0	14.0	.0	118.0
LAUNCH VEHICLE PROC	(.0)	(.0)	(.0)	(.0)	(11.0)	(23.1)	(25.0)	(21.0)	(.0)	(80.1)
TITAN III C SUPPORT	.0	.0	.0	.0	.2	1.1	5.3	5.2	.0	11.8
HI ENER AST A-D/T III C	.0	.0	.0	.0	6.0	16.4	16.7	15.8	.0	54.9
NAV/TRF CTL A-B/DELTA	.0	.0	.0	.0	.0	4.0	3.0	.0	.0	7.0
ERTS C-D/DELTA	.0	.0	.0	.0	4.8	1.6	.0	.0	.0	6.4

RESEARCH AND DEVELOPMENT DETAIL BY PROGRAM OFFICE/BLI
IN MILLIONS OF DOLLARS

FY 71 PRE BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
OART	(.0)	(278.2)	(277.4)	(349.0)	(440.2)	(480.0)	(437.7)	(395.2)	(.0)	(2657.7)
ONGOING 1970	(.0)	(278.2)	(277.4)	(340.3)	(408.9)	(442.0)	(397.7)	(363.2)	(.0)	(2507.7)
BLI DISTRIB. TO BE FURN.	(.0)	(278.2)	(277.4)	(340.3)	(408.9)	(442.0)	(397.7)	(363.2)	(.0)	(2507.7)
SPACE ADV RESEARCH	(.0)	(19.3)	(18.8)	(16.0)	(16.0)	(16.0)	(16.0)	(16.0)	(.0)	(118.1)
ADVANCED RESEARCH	.0	19.3	18.8	16.0	16.0	16.0	16.0	16.0	.0	118.1
SPACE VEH TECH	(.0)	(114.3)	(102.8)	(115.8)	(141.3)	(162.9)	(145.1)	(127.9)	(.0)	(910.1)
TRANSP VEH	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SHUTTLE TECH	.0	14.3	27.0	46.0	67.0	83.5	63.0	52.0	.0	352.8
ADV LAUNCH VEH TECH	.0	10.0	4.2	3.6	3.3	3.3	3.3	3.3	.0	31.0
NEAR SP VEH	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPACE STA/BASE TECH	.0	19.0	19.0	22.5	20.5	19.1	20.3	14.1	.0	134.5
NEAR SP VEH APPLIC/SCI	.0	30.2	23.6	18.5	22.4	24.4	25.9	25.9	.0	170.9
DEEP SPACE VEH	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
ADV MND/UNMND TECH	.0	40.8	29.0	25.2	28.1	32.6	32.6	32.6	.0	220.9
NUCLEAR ROCKETS	(.0)	(33.5)	(36.5)	(57.0)	(74.0)	(80.0)	(63.0)	(52.0)	(.0)	(396.0)
NERVA ENGINE	.0	27.5	28.5	49.0	66.0	72.0	55.0	44.0	.0	342.0
NUCLEAR RKT SRT	.0	6.0	8.0	8.0	8.0	8.0	8.0	8.0	.0	54.0
AVIATION ADV RESEARCH	(.0)	(27.6)	(34.6)	(39.0)	(39.0)	(39.0)	(39.0)	(39.0)	(.0)	(257.2)
ADVANCED RESEARCH	.0	27.6	34.6	39.0	39.0	39.0	39.0	39.0	.0	257.2
AVIATION VEH TECH	(.0)	(59.6)	(56.4)	(74.1)	(87.6)	(87.7)	(79.7)	(73.7)	(.0)	(518.8)
GENL AVIATION	.0	.5	.5	.9	1.2	1.4	1.5	1.6	.0	7.6
V/STOL	.0	9.8	12.3	17.8	29.3	33.1	26.2	19.6	.0	148.1
SUBSONIC	.0	19.3	16.0	22.1	22.1	15.6	10.3	7.6	.0	113.0
SUPERSONIC	.0	20.3	20.4	26.0	26.2	28.2	31.0	33.0	.0	185.1
HYPERSONIC	.0	9.7	7.2	7.3	8.8	9.4	10.7	11.9	.0	65.0
AVIATION SYSTEMS TECH	(.0)	(7.5)	(9.1)	(11.9)	(15.9)	(16.0)	(15.5)	(15.8)	(.0)	(91.7)
NAV/CONTROL	.0	4.9	5.5	4.6	6.2	6.2	6.2	6.2	.0	39.8

IN MILLIONS OF DOLLARS

FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
OPNL HAZARDS	.0	2.4	3.3	5.6	7.3	7.4	6.9	7.1	.0	40.0
ENVIRONMENTAL HAZARDS	.0	.2	.3	1.7	2.4	2.4	2.4	2.5	.0	11.9
HUMAN FACTORS ADV RES	(.0)	(6.4)	(6.4)	(7.0)	(7.0)	(7.0)	(7.0)	(7.0)	(.0)	(47.8)
ADVANCED RESEARCH	.0	6.4	6.4	7.0	7.0	7.0	7.0	7.0	.0	47.8
HUMAN FACTORS VEH TECH	(.0)	(10.0)	(12.8)	(19.5)	(28.1)	(33.4)	(32.4)	(31.8)	(.0)	(168.0)
TRANSPORTATION VEHS	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SHUTTLE TECH	.0	1.0	1.4	5.0	7.0	10.5	9.0	7.0	.0	40.9
NEAR SPACE VEH	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SPACE STATION/BASE TECH	.0	8.8	11.2	14.3	19.4	20.7	20.7	21.6	.0	116.7
DEEP SPACE VEH	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
DEEP SPACE VEH TECH	.0	.2	.2	.2	1.7	2.2	2.7	3.2	.0	10.4
NEW STARTS 1971	(.0)	(.0)	(.0)	(8.7)	(31.3)	(38.0)	(40.0)	(32.0)	(.0)	(150.0)
BLI DISTRIB. TO BE FURN.	(.0)	(.0)	(.0)	(8.7)	(31.3)	(38.0)	(40.0)	(32.0)	(.0)	(150.0)
SPACE VEH TECH	(.0)	(.0)	(.0)	(3.7)	(17.3)	(26.0)	(30.0)	(22.0)	(.0)	(99.0)
NEAR SP VEH	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
100 KW PWR SUPPLY	.0	.0	.0	3.7	17.3	26.0	30.0	22.0	.0	99.0
NUCLEAR ROCKETS	(.0)	(.0)	(.0)	(3.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(3.0)
NUCLEAR STAGE STUDIES	.0	.0	.0	3.0	.0	.0	.0	.0	.0	3.0
HUMAN FACTORS VEH TECH	(.0)	(.0)	(.0)	(2.0)	(14.0)	(12.0)	(10.0)	(10.0)	(.0)	(48.0)
NEAR SPACE VEH	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
500 DAY LIFE SUPPORT	.0	.0	.0	2.0	14.0	12.0	10.0	10.0	.0	48.0

IN MILLIONS OF DOLLARS

FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
OUA	(.0)	(9.0)	(9.0)	(26.0)	(26.0)	(26.0)	(26.0)	(26.0)	(.0)	(148.0)
ONGOING 1970	(.0)	(9.0)	(9.0)	(26.0)	(26.0)	(26.0)	(26.0)	(26.0)	(.0)	(148.0)
SUST UNIVERSITY PROG	(.0)	(9.0)	(9.0)	(26.0)	(26.0)	(26.0)	(26.0)	(26.0)	(.0)	(148.0)
SUST UNIV PROGRAM	.0	9.0	9.0	26.0	26.0	26.0	26.0	26.0	.0	148.0

IN MILLIONS OF DOLLARS

FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
OTDA	(.0)	(279.7)	(278.0)	(318.0)	(306.5)	(310.8)	(309.5)	(306.8)	(.0)	(2109.3)
ONGOING 1970	(.0)	(279.7)	(278.0)	(317.6)	(302.0)	(298.9)	(262.8)	(218.4)	(.0)	(1957.4)
TRACKING + DATA ACQ	(.0)	(279.7)	(278.0)	(317.6)	(302.0)	(298.9)	(262.8)	(218.4)	(.0)	(1957.4)
OTDA SRT	.0	11.1	12.4	13.1	12.4	12.4	12.4	12.4	.0	86.2
OTDA NETWORK OPERATIONS	.0	229.4	233.4	235.4	237.1	243.7	216.9	176.5	.0	1572.4
OTDA EQUIP. + COMPONENTS	.0	39.2	32.2	69.1	52.5	42.8	33.5	29.5	.0	298.8
NEW STARTS 1971	(.0)	(.0)	(.0)	(.4)	(4.5)	(11.9)	(46.7)	(88.4)	(.0)	(151.9)
TRACKING + DATA ACQ	(.0)	(.0)	(.0)	(.4)	(4.5)	(11.9)	(46.7)	(88.4)	(.0)	(151.9)
TRKNG 71 SCI/APPL PROG	.0	.0	.0	.4	1.5	1.2	7.2	10.9	.0	21.2
TRKNG 71 LUNAR/EO/	.0	.0	.0	.0	3.0	10.7	39.5	77.5	.0	130.7

RESEARCH AND DEVELOPMENT DETAIL BY PROGRAM OFFICE/BLI
IN MILLIONS OF DOLLARS

FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B T C	TOTAL ALL YEARS
OTU	(.0)	(3.8)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(.0)	(33.8)
ONGOING 1970	(.0)	(3.8)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(.0)	(33.8)
TECHNOLOGY UTILIZATION	(.0)	(3.8)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(.0)	(33.8)
OFF. OF TECH UTIL.	.0	3.8	5.0	5.0	5.0	5.0	5.0	5.0	.0	33.8

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FY 1971 BUDGET ESTIMATES

C OF F BY PROGRAM OFFICE/INSTALLATION/YEAR

IN MILLIONS OF DOLLARS

FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	B.T.C	TOTAL ALL YEARS
HEADQUARTERS NASA	.0	1.0	3.5	7.2	50.0	50.0	50.0	50.0	.0	211.7
VARIOUS LOCATIONS	.0	.0	9.0	15.0	.0	.0	.0	.0	.0	24.0
ODA	.0	1.0	12.5	22.2	50.0	50.0	50.0	50.0	.0	235.7
VARIOUS LOCATIONS	.0	18.9	17.0	1.7	.0	.0	.0	.0	.0	37.6
OTDA	.0	18.9	17.0	1.7	.0	.0	.0	.0	.0	37.6
AMES RESEARCH CENTER	.0	.4	.0	1.3	.0	.0	.0	.0	.0	1.7
LANGLEY RESEARCH CENTER	.0	.0	4.8	3.6	.0	.0	.0	.0	.0	8.4
ELECTRONICS RESEARCH CEN	.0	.0	8.1	6.5	.0	.0	.0	.0	.0	14.6
SPACE NUCLEAR PROPUL OFF	.0	.0	.0	6.0	.0	.0	.0	.0	.0	6.0
JET PROPULSION LAB	.0	.0	.0	1.0	.0	.0	.0	.0	.0	1.0
OART	.0	.4	12.9	18.4	.0	.0	.0	.0	.0	31.7
GODDARD SPACE FLIGHT CEN	.0	.0	.7	2.1	.0	.0	.0	.0	.0	2.8
WALLOPS STATION	.0	.5	.5	.0	.0	.0	.0	.0	.0	1.0
JET PROPULSION LAB	.0	.0	.0	.4	.0	.0	.0	.0	.0	.4
KENNEDY SPACE CENTER	.0	.6	.0	15.1	.0	.0	.0	.0	.0	15.7
VARIOUS LOCATIONS	.0	.0	.4	3.3	.0	.0	.0	.0	.0	3.7
OSSA	.0	1.1	1.6	20.9	.0	.0	.0	.0	.0	23.6
MARSHALL SPACE FLGHT CEN	.0	.0	.0	.5	.0	.0	.0	.0	.0	.5
MICHOUD ASSEMBLY FAC.	.0	.4	.0	.0	.0	.0	.0	.0	.0	.4
MANNEDSPACECRAFT CENTER	.0	1.3	1.7	.9	.0	.0	.0	.0	.0	3.9
KENNEDY SPACE CENTER	.0	7.4	12.5	.6	.0	.0	.0	.0	.0	20.5
VARIOUS LOCATIONS	.0	1.6	.0	25.0	.0	.0	.0	.0	.0	26.6
OMSF	.0	10.7	14.2	27.0	.0	.0	.0	.0	.0	51.9
TOTAL	.0	32.1	58.2	90.2	50.0	50.0	50.0	50.0	.0	380.5

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
FY 1971 BUDGET ESTIMATES
FY 1969 BUDGET LINE ITEM/PPB CATEGORY
IN MILLIONS OF DOLLARS

FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

BUDGET LINE ITEM	EARTH ORBITAL MSF	LUNAR EXP	PLANET EXP	ASTRONOMY	SPACE PHYSICS	LIFE SCIENCES	SPACE APPL.	SPACE TECH	AVIAT. TECH	SUPPORT ACT.			TOTAL
APOLLO	18.2	2001.1	.0	.0	.0	5.7	.0	.0	.0	.0	.0	.0	2025.0
SPACE FLIGHT OPERATIONS	119.4	.0	.0	21.9	.0	8.7	.0	.0	.0	.0	.0	.0	150.0
ADVANCED MISSIONS	2.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	2.5
OMSF	140.1	2001.1	.0	21.9	.0	14.4	.0	.0	.0	.0	.0	.0	2177.5
PHYSICS AND ASTRONOMY	.0	.0	.0	78.0	50.9	.0	.0	.0	.0	.0	.0	.0	128.9
LUNAR AND PLANETARY EXPL	.0	7.5	79.3	.0	3.6	.0	.0	.0	.0	.0	.0	.0	90.4
SPACE BIOLOGY	.0	.0	4.3	.0	.0	33.6	.0	.0	.0	.0	.0	.0	37.9
SPACE APPLICATIONS	.0	.0	.0	.0	.0	.0	98.7	.0	.0	.0	.0	.0	98.7
LAUNCH VEHICLE PROC	.0	.0	12.3	11.2	6.4	1.2	10.8	2.4	.0	55.6	.0	.0	99.9
OSSA	.0	7.5	95.9	89.2	60.9	34.8	109.5	2.4	.0	55.6	.0	.0	455.8
BLI DISTRIB. TO BE FURN.	.0	.0	.0	.0	.0	16.4	.0	167.1	94.7	.0	.0	.0	278.2
OART	.0	.0	.0	.0	.0	16.4	.0	167.1	94.7	.0	.0	.0	278.2
TRACKING + DATA ACQ	.0	.0	.0	.0	.0	.0	.0	.0	.0	279.7	.0	.0	279.7
SUST UNIVERSITY PROG	.0	.0	.0	.0	.0	.0	.0	.0	.0	9.0	.0	.0	9.0
TECHNOLOGY UTILIZATION	.0	.0	.0	.0	.0	.0	.0	.0	.0	3.8	.0	.0	3.8
RESEARCH AND DEVELOPMENT	140.1	2008.6	95.9	111.1	60.9	65.6	109.5	169.5	94.7	348.1	.0	.0	3204.0
CONST. OF FACILITIES	10.5	.0	17.0	.0	.6	.0	.0	.0	.0	4.0	.0	.0	32.1
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	648.0	.0	.0	648.0
TOTAL	150.6	2008.6	112.9	111.1	61.5	65.6	109.5	169.5	94.7	1000.1	.0	.0	3884.1

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
FY 1971 BUDGET ESTIMATES
FY 1970 BUDGET LINE ITEM/PPB CATEGORY
IN MILLIONS OF DOLLARS

FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

BUDGET LINE ITEM	EARTH ORBITAL MSF	LUNAR EXP	PLANET EXP	ASTRON-OMY	SPACE PHYSICS	LIFE SCIENCES	SPACE APPL.	SPACE TECH	AVIAT. TECH	SUPPORT ACT.			TOTAL
APOLLO	18.3	1632.4	.0	.0	.0	7.4	.0	.0	.0	.0	.0	.0	1658.1
SPACE FLIGHT OPERATIONS	285.8	46.0	.0	16.2	.0	28.1	.0	.0	.0	.0	.0	.0	376.1
ADVANCED MISSIONS	2.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	2.5
OMSF	306.6	1678.4	.0	16.2	.0	35.5	.0	.0	.0	.0	.0	.0	2036.7
PHYSICS AND ASTRONOMY	.0	.0	.0	75.1	36.9	.0	.0	.0	.0	.0	.0	.0	112.0
LUNAR AND PLANETARY EXPL	.0	8.6	137.1	.0	3.0	.0	.0	.0	.0	.0	.0	.0	148.7
SPACE BIOLOGY	.0	.0	7.5	.0	.0	12.2	.0	.0	.0	.0	.0	.0	19.7
SPACE APPLICATIONS	.0	.0	.0	.0	.0	.0	128.4	.0	.0	.0	.0	.0	128.4
LAUNCH VEHICLE PROC	.0	.0	14.4	7.8	9.9	.0	10.4	.5	.0	66.0	.0	.0	109.0
OSSA	.0	8.6	159.0	82.9	49.8	12.2	138.8	.5	.0	66.0	.0	.0	517.8
BLI DISTRIB. TO BE FURN.	.0	.0	.0	.0	.0	19.2	.0	158.1	100.1	.0	.0	.0	277.4
OART	.0	.0	.0	.0	.0	19.2	.0	158.1	100.1	.0	.0	.0	277.4
TRACKING + DATA ACQ	.0	.0	.0	.0	.0	.0	.0	.0	.0	278.0	.0	.0	278.0
SUST UNIVERSITY PROG	.0	.0	.0	.0	.0	.0	.0	.0	.0	9.0	.0	.0	9.0
TECHNOLOGY UTILIZATION	.0	.0	.0	.0	.0	.0	.0	.0	.0	5.0	.0	.0	5.0
RESEARCH AND DEVELOPMENT	306.6	1687.0	159.0	99.1	49.8	66.9	138.8	158.6	100.1	358.0	.0	.0	3123.9
CONST. OF FACILITIES	14.2	.0	17.0	.0	.4	.0	.0	8.1	4.8	13.7	.0	.0	58.2
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	685.5	.0	.0	685.5
TOTAL	320.8	1687.0	176.0	99.1	50.2	66.9	138.8	166.7	104.9	1057.2	.0	.0	3867.6

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
FY 1971 BUDGET ESTIMATES
FY 1971 BUDGET LINE ITEM/PPB CATEGORY
IN MILLIONS OF DOLLARS

FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

BUDGET LINE ITEM	EARTH ORBITAL MSF	LUNAR EXP	PLANET EXP	ASTRONOMY	SPACE PHYSICS	LIFE SCIENCES	SPACE APPL.	SPACE TECH	AVIAT. TECH	SUPPORT ACT.			TOTAL
APOLLO	18.5	1154.0	.0	.0	.0	6.0	.0	.0	.0	.0	.0	.0	1178.5
SPACE FLIGHT OPERATIONS	703.9	160.0	.0	20.8	6.5	35.5	1.5	.0	.0	.0	.0	.0	928.2
ADVANCED MISSIONS	2.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	2.5
OMSF	724.9	1314.0	.0	20.8	6.5	41.5	1.5	.0	.0	.0	.0	.0	2109.2
PHYSICS AND ASTRONOMY	.0	.0	.0	82.6	42.4	.0	.0	.0	.0	.0	.0	.0	125.0
LUNAR AND PLANETARY EXPL	.0	11.0	351.1	.0	3.8	.0	.0	.0	.0	.0	.0	.0	365.9
SPACE BIOLOGY	.0	.0	8.0	.0	.0	8.4	.0	.0	.0	.0	.0	.0	16.4
SPACE APPLICATIONS	.0	.0	.0	.0	.0	.0	219.0	.0	.0	.0	.0	.0	219.0
LAUNCH VEHICLE PROC	.0	.0	32.4	4.3	7.5	.0	23.8	3.4	.0	95.3	.0	.0	166.7
OSSA	.0	11.0	391.5	86.9	53.7	8.4	242.8	3.4	.0	95.3	.0	.0	893.0
BLI DISTRIB. TO BE FURN.	.0	.0	.0	.0	.0	28.5	.0	195.5	125.0	.0	.0	.0	349.0
OART	.0	.0	.0	.0	.0	28.5	.0	195.5	125.0	.0	.0	.0	349.0
TRACKING + DATA ACQ	.0	.0	.0	.0	.0	.0	.0	.0	.0	318.0	.0	.0	318.0
SUST UNIVERSITY PROG	.0	.0	.0	.0	.0	.0	.0	.0	.0	26.0	.0	.0	26.0
TECHNOLOGY UTILIZATION	.0	.0	.0	.0	.0	.0	.0	.0	.0	5.0	.0	.0	5.0
RESEARCH AND DEVELOPMENT	724.9	1325.0	391.5	107.7	60.2	78.4	244.3	198.9	125.0	444.3	.0	.0	3700.2
CONST. OF FACILITIES	25.5	.0	14.0	.0	2.2	.0	5.9	8.3	6.5	27.8	.0	.0	90.2
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	707.0	.0	.0	707.0
TOTAL	750.4	1325.0	405.5	107.7	62.4	78.4	250.2	207.2	131.5	1179.1	.0	.0	4497.4

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FY 1971 BUDGET ESTIMATES
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FY 71 PFP BUREAU OF THE BUDGET SUBMISSION 10/06/69

	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	RTC	TOTAL ALL YEARS
1 EARTH ORBITAL MSF										
RESEARCH AND DEVELOPMENT	.0	140.1	306.6	724.9	1305.2	1501.2	1668.0	1567.0	.0	7213.0
CONST. OF FACILITIES	.0	10.5	14.2	25.5	.0	.0	.0	.0	.0	50.2
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	.0	150.6	320.8	750.4	1305.2	1501.2	1668.0	1567.0	.0	7263.2
2 LUNAR EXPLORATION										
RESEARCH AND DEVELOPMENT	.0	2008.6	1687.0	1325.0	1421.0	1361.0	1161.5	1056.5	.0	10020.6
CONST. OF FACILITIES	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	.0	2008.6	1687.0	1325.0	1421.0	1361.0	1161.5	1056.5	.0	10020.6
3 PLANETARY EXPLORATION										
RESEARCH AND DEVELOPMENT	.0	95.9	159.0	391.5	335.1	198.9	94.8	33.4	.0	1308.6
CONST. OF FACILITIES	.0	17.0	17.0	14.0	.0	.0	.0	.0	.0	48.0
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	.0	112.9	176.0	405.5	335.1	198.9	94.8	33.4	.0	1356.6
4 ASTRONOMY										
RESEARCH AND DEVELOPMENT	.0	111.1	99.1	107.7	157.4	257.4	307.2	281.0	.0	1320.9
CONST. OF FACILITIES	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	.0	111.1	99.1	107.7	157.4	257.4	307.2	281.0	.0	1320.9
5 SPACE PHYSICS										
RESEARCH AND DEVELOPMENT	.0	60.9	49.8	60.2	99.4	120.2	142.8	140.8	.0	674.1
CONST. OF FACILITIES	.0	.6	.4	2.2	.0	.0	.0	.0	.0	3.2
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	.0	61.5	50.2	62.4	99.4	120.2	142.8	140.8	.0	677.3
6 LIFE SCIENCES										
RESEARCH AND DEVELOPMENT	.0	65.6	66.9	78.4	104.8	128.0	154.6	195.9	.0	794.2
CONST. OF FACILITIES	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	.0	65.6	66.9	78.4	104.8	128.0	154.6	195.9	.0	794.2

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
7 SPACE APPLICATIONS										
RESEARCH AND DEVELOPMENT	.0	109.5	138.8	244.3	207.5	169.6	139.0	89.2	.0	1097.9
CONST. OF FACILITIES	.0	.0	.0	5.9	.0	.0	.0	.0	.0	5.9
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	.0	109.5	138.8	250.2	207.5	169.6	139.0	89.2	.0	1103.8
8 SPACE TECHNOLOGY										
RESEARCH AND DEVELOPMENT	.0	169.5	158.6	198.9	248.6	284.9	254.1	217.9	.0	1532.5
CONST. OF FACILITIES	.0	.0	8.1	8.3	.0	.0	.0	.0	.0	16.4
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	.0	169.5	166.7	207.2	248.6	284.9	254.1	217.9	.0	1548.9
9 AVIATION TECHNOLOGY										
RESEARCH AND DEVELOPMENT	.0	94.7	100.1	125.0	142.5	142.7	134.2	128.5	.0	867.7
CONST. OF FACILITIES	.0	.0	4.8	6.5	.0	.0	.0	.0	.0	11.3
RESEARCH + PROG. MGMT.	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TOTAL	.0	94.7	104.9	131.5	142.5	142.7	134.2	128.5	.0	879.0
10 SUPPORTING ACTIVITIES										
RESEARCH AND DEVELOPMENT	.0	348.1	358.0	444.3	426.1	397.1	387.7	381.0	.0	2742.3
CONST. OF FACILITIES	.0	4.0	13.7	27.8	50.0	50.0	50.0	50.0	.0	245.5
RESEARCH + PROG. MGMT.	.0	648.0	685.5	707.0	712.0	717.0	722.0	727.0	.0	4918.5
TOTAL	.0	1000.1	1057.2	1179.1	1188.1	1164.1	1159.7	1158.0	.0	7906.3

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
TOTAL NASA										
RESEARCH AND DEVELOPMENT	.0	3204.0	3123.9	3700.2	4447.6	4561.0	4443.9	4091.2	.0	27571.8
CONST. OF FACILITIES	.0	32.1	58.2	90.2	50.0	50.0	50.0	50.0	.0	380.5
RESEARCH + PROG. MGMT.	.0	648.0	685.5	707.0	712.0	717.0	722.0	727.0	.0	4918.5
TOTAL	.0	3884.1	3867.6	4497.4	5209.6	5328.0	5215.9	4868.2	.0	32870.8

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
1 EARTH ORBITAL MSF	(.0)	(140.1)	(306.6)	(724.9)	(1305.2)	(1501.2)	(1668.0)	(1567.0)	(.0)	(7213.0)
OMSF	(.0)	(140.1)	(306.6)	(724.9)	(1305.2)	(1501.2)	(1668.0)	(1567.0)	(.0)	(7213.0)
ONGOING 1970	(.0)	(140.1)	(306.6)	(481.5)	(371.7)	(156.2)	(21.0)	(21.0)	(.0)	(1498.1)
APOLLO APPLICATIONS	(.0)	(119.4)	(243.8)	(460.5)	(350.7)	(135.2)	(.0)	(.0)	(.0)	(1309.6)
SPACE VEHICLES	(.0)	(52.7)	(83.9)	(170.9)	(163.2)	(57.5)	(.0)	(.0)	(.0)	(528.2)
AAP SPACECRAFT MODS.	.0	46.3	76.0	143.6	120.2	45.4	.0	.0	.0	431.5
AAP SATURN IB	.0	6.4	7.1	23.0	40.9	12.1	.0	.0	.0	89.5
AAP SATURN V	.0	.0	.8	4.3	2.1	.0	.0	.0	.0	7.2
PAYLOADS + EXPERIMENTS	(.0)	(65.5)	(135.1)	(246.4)	(123.3)	(46.4)	(.0)	(.0)	(.0)	(616.7)
SPACE STATION DEFINITION	.0	8.8	.0	.0	.0	.0	.0	.0	.0	8.8
EXPERIMENT DEVELOPMENT	.0	7.9	24.1	25.5	14.8	9.3	.0	.0	.0	81.6
SATURN WORKSHOP =1	.0	25.0	79.5	155.7	50.7	15.0	.0	.0	.0	325.9
PAYLOAD INTEGRATION	.0	23.7	22.3	44.4	23.6	9.9	.0	.0	.0	123.9
PROGRAM SUPPORT	.0	.1	9.2	20.8	34.2	12.2	.0	.0	.0	76.5
LAUNCH FLIGHT + RECOVERY	(.0)	(.0)	(18.9)	(35.0)	(57.3)	(26.6)	(.0)	(.0)	(.0)	(137.8)
MISSION OPERATIONS	.0	.0	12.3	20.2	18.9	8.9	.0	.0	.0	60.3
KSC SATURN IB	.0	.0	6.6	13.2	34.7	17.7	.0	.0	.0	72.2
KSC SATURN V	.0	.0	.0	1.6	3.7	.0	.0	.0	.0	5.3
TECHNICAL	(.0)	(1.2)	(5.9)	(8.2)	(6.9)	(4.7)	(.0)	(.0)	(.0)	(26.9)
SYSTEMS ENGINEERING	.0	.0	3.1	3.3	3.4	3.4	.0	.0	.0	13.2
CONTRACT ADMINISTRATION	.0	1.2	2.8	4.9	3.5	1.3	.0	.0	.0	13.7
SPACE STATION/BASE	(.0)	(.0)	(6.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(6.0)
STATION	.0	.0	6.0	.0	.0	.0	.0	.0	.0	6.0
SPACE SHUTTLE	(.0)	(.0)	(36.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(36.0)

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
SPACE SHUTTLE	.0	.0	36.0	.0	.0	.0	.0	.0	.0	36.0
ADVANCED DEVELOPMENT	(.0)	(18.2)	(18.3)	(18.5)	(.0)	(.0)	(.0)	(.0)	(.0)	(55.0)
ADVANCED DEVELOPMENT	.0	18.2	18.3	18.5	.0	.0	.0	.0	.0	55.0
ADVANCED DEVELOPMENT	(.0)	(.0)	(.0)	(.0)	(18.5)	(18.5)	(18.5)	(18.5)	(.0)	(74.0)
ADVANCED DEVELOPMENT	.0	.0	.0	.0	18.5	18.5	18.5	18.5	.0	74.0
ADVANCED MISSIONS	(.0)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(2.5)	(.0)	(17.5)
ADVANCED STUDIES	.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	.0	17.5
NEW STARTS 1971	(.0)	(.0)	(.0)	(243.4)	(933.5)	(1345.0)	(1647.0)	(1546.0)	(.0)	(5714.9)
SPACE STATION/BASE	(.0)	(.0)	(.0)	(73.4)	(237.5)	(370.0)	(532.0)	(514.0)	(.0)	(1726.9)
EXPERIMENT DEFINITION	.0	.0	.0	18.0	.0	.0	.0	.0	.0	18.0
SS MODULE DEVEL	.0	.0	.0	51.4	200.0	250.0	320.0	270.0	.0	1091.4
SS MODULE PROD	.0	.0	.0	.0	.0	55.0	105.0	95.0	.0	255.0
OPERATIONS	.0	.0	.0	.0	.0	10.0	30.0	60.0	.0	100.0
SP STA EXPER ENG & TECH	.0	.0	.0	4.0	37.5	55.0	77.0	89.0	.0	262.5
SPACE SHUTTLE	(.0)	(.0)	(.0)	(170.0)	(696.0)	(975.0)	(1115.0)	(1032.0)	(.0)	(3988.0)
SPACE SHUTTLE	.0	.0	.0	170.0	696.0	975.0	1115.0	1032.0	.0	3988.0

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
2 LUNAR EXPLORATION	(.0)	(2008.6)	(1687.0)	(1325.0)	(1421.0)	(1361.0)	(1161.5)	(1056.5)	(.0)	(10020.6)
OSSA	(.0)	(7.5)	(8.6)	(11.0)	(11.5)	(11.5)	(11.5)	(11.5)	(.0)	(73.1)
ONGOING 1970	(.0)	(7.5)	(8.6)	(11.0)	(11.5)	(11.5)	(11.5)	(11.5)	(.0)	(73.1)
L+P SRT/ADV. STUDIES	.0	5.6	7.0	9.0	9.4	9.4	9.4	9.4	.0	59.2
L+P DATA ANALYSIS	.0	1.9	1.6	2.0	2.1	2.1	2.1	2.1	.0	13.9
OMSF	(.0)	(2001.1)	(1678.4)	(1314.0)	(1409.5)	(1349.5)	(1150.0)	(1045.0)	(.0)	(9947.5)
ONGOING 1970	(.0)	(2001.1)	(1678.4)	(1254.0)	(1195.5)	(1099.5)	(950.0)	(925.0)	(.0)	(9103.5)
APOLLO	(.0)	(2001.1)	(1621.4)	(1154.0)	(952.5)	(794.5)	(.0)	(.0)	(.0)	(6523.5)
APOLLO SPACECRAFT	.0	907.4	721.2	532.9	394.0	256.9	.0	.0	.0	2812.4
APOLLO SATURN V	.0	535.7	485.0	282.0	200.0	160.0	.0	.0	.0	1662.7
APOLLO SATURN IB	.0	42.3	.0	.0	.0	.0	.0	.0	.0	42.3
LAUNCH FLIGHT + RECOVERY	(.0)	(478.5)	(379.0)	(300.9)	(321.9)	(342.7)	(.0)	(.0)	(.0)	(1823.0)
MISSION CONTROL SYSTEMS	.0	47.9	51.0	39.1	48.0	50.5	.0	.0	.0	236.5
SPACE OPERATIONS	.0	49.1	54.7	46.8	41.0	39.3	.0	.0	.0	230.9
LAUNCH OPERATIONS	.0	115.3	90.8	72.7	81.4	89.2	.0	.0	.0	449.4
LAUNCH INSTRUMENTATION	.0	17.5	26.8	24.2	25.8	28.6	.0	.0	.0	122.9
KSC SPACECRAFT	.0	72.8	54.8	46.8	48.3	50.9	.0	.0	.0	273.6
KSC SATURN IB	.0	18.5	.0	.0	.0	.0	.0	.0	.0	18.5
KSC SATURN V	.0	157.4	100.9	71.3	77.4	84.2	.0	.0	.0	491.2
TECHNICAL	(.0)	(37.2)	(36.2)	(38.2)	(36.6)	(34.9)	(.0)	(.0)	(.0)	(183.1)
SYSTEMS ENGINEERING	.0	22.1	22.7	24.0	24.5	25.2	.0	.0	.0	118.5
CONTRACT ADMINISTRATION	.0	15.1	13.5	14.2	12.1	9.7	.0	.0	.0	64.6
LUNAR EXPLORATION	(.0)	(.0)	(11.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(11.0)
LUNAR EXPLOR. DEFIN.	.0	.0	11.0	.0	.0	.0	.0	.0	.0	11.0

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
SATURN V	(.0)	(.0)	(46.0)	(100.0)	(243.0)	(305.0)	(350.0)	(325.0)	(.0)	(1369.0)
SATURN V FOLLOW-ON	.0	.0	46.0	100.0	243.0	305.0	350.0	325.0	.0	1369.0
OPERATING BASE	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(600.0)	(600.0)	(.0)	(1200.0)
OPER. BASE - KSC	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(266.1)	(266.1)	(.0)	(532.2)
KSC LAUNCH OPERATIONS	.0	.0	.0	.0	.0	.0	95.1	95.1	.0	190.2
KSC LCH INSTRUMENTATION	.0	.0	.0	.0	.0	.0	30.0	30.0	.0	60.0
KSC SPACECRAFT	.0	.0	.0	.0	.0	.0	54.0	54.0	.0	108.0
KSC SATURN V	.0	.0	.0	.0	.0	.0	87.0	87.0	.0	174.0
OPER. BASE - MSC	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(184.8)	(184.8)	(.0)	(369.6)
MSC CENTER SUPPORT	.0	.0	.0	.0	.0	.0	89.5	89.5	.0	179.0
MSC MISSION CONTROL SYS.	.0	.0	.0	.0	.0	.0	54.0	54.0	.0	108.0
MSC SPACE OPERATIONS	.0	.0	.0	.0	.0	.0	41.3	41.3	.0	82.6
OPER. BASE - MSFC	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(115.4)	(115.4)	(.0)	(230.8)
MSFC CENTER SUPPORT	.0	.0	.0	.0	.0	.0	115.4	115.4	.0	230.8
OPER. BASE-HQ(SYS ENG)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(33.7)	(33.7)	(.0)	(67.4)
HQ SYSTEMS ENGINEERING	.0	.0	.0	.0	.0	.0	26.0	26.0	.0	52.0
HQ CONTRACT ADM	.0	.0	.0	.0	.0	.0	7.7	7.7	.0	15.4
NEW STARTS 1971	(.0)	(.0)	(.0)	(60.0)	(214.0)	(250.0)	(200.0)	(120.0)	(.0)	(844.0)
LUNAR EXPLORATION	(.0)	(.0)	(.0)	(60.0)	(214.0)	(250.0)	(200.0)	(120.0)	(.0)	(844.0)
LUNAR EXPLOR. PHASE II	.0	.0	.0	60.0	214.0	250.0	200.0	120.0	.0	844.0

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
3 PLANETARY EXPLORATION	(.0)	(95.9)	(159.0)	(391.5)	(335.1)	(198.9)	(94.8)	(33.4)	(.0)	(1308.6)
OSSA	(.0)	(95.9)	(159.0)	(391.5)	(335.1)	(198.9)	(94.8)	(33.4)	(.0)	(1308.6)
ONGOING 1970	(.0)	(95.9)	(159.0)	(391.5)	(335.1)	(198.9)	(94.8)	(33.4)	(.0)	(1308.6)
L+P SRT/ADV. STUDIES	.0	16.6	11.4	11.3	11.3	11.3	11.3	11.3	.0	84.5
PLANET ASTRONOMY SRT	.0	.0	3.8	4.9	4.9	4.9	4.9	4.9	.0	28.3
L+P DATA ANALYSIS	.0	.5	.6	1.9	2.0	1.6	3.0	4.0	.0	13.6
PIONEER F + G	.0	1.1	17.8	29.1	14.2	6.3	2.7	2.3	.0	73.5
VIKING	.0	15.0	41.0	250.0	217.0	128.0	55.0	5.0	.0	711.0
MARINER-MARS 1969	.0	26.1	4.7	.2	.1	.0	.0	.0	.0	31.1
MARINER-MARS 1971	.0	20.0	56.8	29.6	10.5	1.0	.0	.0	.0	117.9
VENUS MERCURY 1973	.0	.0	1.0	24.1	33.5	22.3	11.2	.4	.0	92.5
EXOBIOLOGY SRT	.0	3.0	4.5	4.5	4.5	4.5	4.5	4.5	.0	30.0
PLANETARY QUARANTINE	.0	1.3	3.0	3.5	4.0	5.0	1.0	1.0	.0	18.8
LAUNCH VEHICLES	(.0)	(12.3)	(14.4)	(32.4)	(33.1)	(14.0)	(1.2)	(.0)	(.0)	(107.4)
PIONEER F/CENT	.0	1.3	2.1	6.6	2.5	.0	.0	.0	.0	12.5
PIONEER G/T III D/CENT	.0	.0	.5	9.8	7.4	.6	.0	.0	.0	18.3
VIKING/TITAN(IIID)CENT	.0	.0	2.0	13.7	15.1	9.5	1.2	.0	.0	41.5
MARINER-MARS 69/CENTAUR	.0	.8	.0	.0	.0	.0	.0	.0	.0	.8
MARINER-MARS 71/CENTAUR	.0	10.2	9.8	1.6	.0	.0	.0	.0	.0	21.6
MERCURY 73/CENTAUR	.0	.0	.0	.7	8.1	3.9	.0	.0	.0	12.7

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	RTC	TOTAL ALL YEARS
4 ASTRONOMY	(.0)	(111.1)	(99.1)	(107.7)	(157.4)	(257.4)	(307.2)	(281.0)	(.0)	(1320.9)
OSSA	(.0)	(89.2)	(82.9)	(86.9)	(113.6)	(126.2)	(116.2)	(103.0)	(.0)	(718.0)
ONGOING 1970	(.0)	(89.2)	(82.9)	(82.9)	(57.1)	(47.3)	(39.5)	(30.0)	(.0)	(428.9)
P+A SRT/ADV. STUDIES	.0	9.5	6.0	6.0	6.0	6.0	6.0	6.0	.0	45.5
AIRBORNE RESEARCH	.0	.6	2.0	3.0	3.0	3.0	3.0	3.0	.0	17.6
BALLOON PROG ASTRON	.0	.4	.5	.5	.5	.5	.5	.5	.0	3.4
P+A DATA ANALYSIS	.0	.3	.4	.4	.4	.4	.4	.4	.0	2.7
OSO A-K	.0	13.1	14.7	18.7	19.8	17.8	13.8	8.0	.0	105.9
OAO A-C	.0	36.7	33.3	27.1	6.4	3.2	.9	.0	.0	107.6
ASTRONOMY EXPLORERS	.0	7.4	8.1	12.7	4.7	2.2	.7	.5	.0	36.3
SOUNDING ROCKETS	.0	10.0	10.1	10.2	10.2	10.2	10.2	10.2	.0	71.1
LAUNCH VEHICLES	(.0)	(11.2)	(7.8)	(4.3)	(6.1)	(4.0)	(4.0)	(1.4)	(.0)	(38.8)
OSO A-K/DELTA	.0	2.4	1.3	.0	2.0	2.8	4.0	1.4	.0	13.9
OAO/CENTAUR	.0	8.8	5.6	1.5	.0	.0	.0	.0	.0	15.9
ASTRONOMY EXPL/DELTA	.0	.0	.0	1.3	1.7	.0	.0	.0	.0	3.0
ASTRONOMY EXPL/SCOUT	.0	.0	.9	1.5	2.4	1.2	.0	.0	.0	6.0
NEW STARTS 1971	(.0)	(.0)	(.0)	(4.0)	(56.5)	(78.9)	(76.7)	(73.0)	(.0)	(289.1)
HI ENERGY ASTRON OBS A-D	.0	.0	.0	4.0	50.5	62.5	60.0	57.2	.0	234.2
HI ENER AST A-D/T III C	.0	.0	.0	.0	6.0	16.4	16.7	15.8	.0	54.9
OMSF	(.0)	(21.9)	(16.2)	(20.8)	(43.8)	(131.2)	(191.0)	(178.0)	(.0)	(602.9)
ONGOING 1970	(.0)	(21.9)	(16.2)	(13.6)	(8.4)	(.2)	(.0)	(.0)	(.0)	(60.3)
A I M	.0	21.9	16.2	13.6	8.4	.2	.0	.0	.0	60.3
NEW STARTS 1971	(.0)	(.0)	(.0)	(7.2)	(35.4)	(131.0)	(191.0)	(178.0)	(.0)	(542.6)

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	RTC	TOTAL ALL YEARS
SP STA EXPER ASTRONOMY	.0	.0	.0	7.2	35.4	131.0	191.0	178.0	.0	542.6

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	RTC	TOTAL ALL YEARS
5 SPACE PHYSICS	(.0)	(60.9)	(49.8)	(60.2)	(99.4)	(120.2)	(142.8)	(140.8)	(.0)	(674.1)
OSSA	(.0)	(60.9)	(49.8)	(53.7)	(64.9)	(46.2)	(39.3)	(32.3)	(.0)	(347.1)
ONGOING 1970	(.0)	(60.9)	(49.8)	(53.7)	(64.9)	(46.2)	(39.3)	(32.3)	(.0)	(347.1)
PIONEER/HELIOS	.0	.0	.3	1.9	1.7	1.4	1.0	1.0	.0	7.3
PIONEER A-E	.0	3.6	2.7	1.9	1.3	1.2	.9	.0	.0	11.6
P+A SRT/ADV. STUDIES	.0	12.8	8.6	8.6	8.6	8.6	8.6	8.6	.0	64.4
BALLOON PROG PHYSICS	.0	.4	.4	.4	.4	.4	.4	.4	.0	2.8
P+A DATA ANALYSIS	.0	3.2	2.6	2.6	2.6	2.6	2.6	2.6	.0	18.8
OGO A-F	.0	13.2	6.9	6.7	3.1	.0	.0	.0	.0	29.9
PHYSICS EXPLORERS	.0	12.0	9.7	15.4	19.2	16.1	9.0	5.0	.0	86.4
SOUNDING ROCKETS	.0	9.3	8.7	8.7	8.7	8.7	8.7	8.7	.0	61.5
LAUNCH VEHICLES	(.0)	(6.4)	(9.9)	(7.5)	(19.3)	(7.2)	(8.1)	(6.0)	(.0)	(64.4)
PIONEER/HELIOS/CENTAUR	.0	.0	.0	1.5	10.6	5.6	4.9	2.8	.0	25.4
PIONEER/DELTA	.0	1.2	.0	.0	.0	.0	.0	.0	.0	1.2
OGO/THOR/AGENA	.0	.2	.0	.0	.0	.0	.0	.0	.0	.2
PHYSICS EXPL/DELTA	.0	2.7	6.4	4.9	5.1	1.6	3.2	3.2	.0	27.1
PHYSICS EXPL/SCOUT	.0	2.3	3.5	1.1	3.6	.0	.0	.0	.0	10.5
OMSF	(.0)	(.0)	(.0)	(6.5)	(34.5)	(74.0)	(103.5)	(108.5)	(.0)	(327.0)
NEW STARTS 1971	(.0)	(.0)	(.0)	(6.5)	(34.5)	(74.0)	(103.5)	(108.5)	(.0)	(327.0)
SP STA EXPER PHYSICS	.0	.0	.0	6.5	34.5	74.0	103.5	108.5	.0	327.0

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	RTC	TOTAL ALL YEARS
6 LIFE SCIENCES	(.0)	(65.6)	(66.9)	(78.4)	(104.8)	(128.0)	(154.6)	(195.9)	(.0)	(794.2)
OART	(.0)	(16.4)	(19.2)	(28.5)	(49.1)	(52.4)	(49.4)	(48.8)	(.0)	(263.8)
ONGOING 1970	(.0)	(16.4)	(19.2)	(26.5)	(35.1)	(40.4)	(39.4)	(38.8)	(.0)	(215.8)
HUMAN FACTORS ADV RES	(.0)	(6.4)	(6.4)	(7.0)	(7.0)	(7.0)	(7.0)	(7.0)	(.0)	(47.8)
ADVANCED RESEARCH	.0	6.4	6.4	7.0	7.0	7.0	7.0	7.0	.0	47.8
HUMAN FACTORS VEH TECH	(.0)	(10.0)	(12.8)	(19.5)	(28.1)	(33.4)	(32.4)	(31.8)	(.0)	(168.0)
TRANSPORTATION VEHS	(.0)	(1.0)	(1.4)	(5.0)	(7.0)	(10.5)	(9.0)	(7.0)	(.0)	(40.9)
SHUTTLE TECH	.0	1.0	1.4	5.0	7.0	10.5	9.0	7.0	.0	40.9
NEAR SPACE VEH	(.0)	(8.8)	(11.2)	(14.3)	(19.4)	(20.7)	(20.7)	(21.6)	(.0)	(116.7)
SPACE STATION/BASE TECH	.0	8.8	11.2	14.3	19.4	20.7	20.7	21.6	.0	116.7
DEEP SPACE VEH	(.0)	(.2)	(.2)	(.2)	(1.7)	(2.2)	(2.7)	(3.2)	(.0)	(10.4)
DEEP SPACE VEH TECH	.0	.2	.2	.2	1.7	2.2	2.7	3.2	.0	10.4
NEW STARTS 1971	(.0)	(.0)	(.0)	(2.0)	(14.0)	(12.0)	(10.0)	(10.0)	(.0)	(48.0)
HUMAN FACTORS VEH TECH	(.0)	(.0)	(.0)	(2.0)	(14.0)	(12.0)	(10.0)	(10.0)	(.0)	(48.0)
NEAR SPACE VEH	(.0)	(.0)	(.0)	(2.0)	(14.0)	(12.0)	(10.0)	(10.0)	(.0)	(48.0)
500 DAY LIFE SUPPORT	.0	.0	.0	2.0	14.0	12.0	10.0	10.0	.0	48.0
OSSA	(.0)	(34.8)	(12.2)	(8.4)	(6.9)	(6.9)	(6.9)	(6.9)	(.0)	(83.0)
ONGOING 1970	(.0)	(34.8)	(12.2)	(8.4)	(6.9)	(6.9)	(6.9)	(6.9)	(.0)	(83.0)
BIOSCIENCE SRT	.0	5.9	6.2	6.9	6.9	6.9	6.9	6.9	.0	46.6
BIOSATELLITE	.0	27.7	6.0	1.5	.0	.0	.0	.0	.0	35.2

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
LAUNCH VEHICLES	(.0)	(1.2)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(1.2)
BIOSATELLITE/DELTA	.0	1.2	.0	.0	.0	.0	.0	.0	.0	1.2
OMSF	(.0)	(14.4)	(35.5)	(41.5)	(48.8)	(68.7)	(98.3)	(140.2)	(.0)	(447.4)
ONGOING 1970	(.0)	(14.4)	(35.5)	(32.1)	(15.5)	(7.4)	(.0)	(.0)	(.0)	(104.9)
LIFE SCIENCES APOLLO	.0	5.7	7.4	6.0	6.0	4.0	.0	.0	.0	29.1
LIFE SCIENCES AAP	.0	8.7	28.1	26.1	9.5	3.4	.0	.0	.0	75.8
NEW STARTS 1971	(.0)	(.0)	(.0)	(9.4)	(33.3)	(61.3)	(98.3)	(140.2)	(.0)	(342.5)
SP STA EXPER LIFE SCI	.0	.0	.0	9.4	33.3	61.3	98.3	140.2	.0	342.5

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	RTC	TOTAL ALL YEARS
7 SPACE APPLICATIONS	(.0)	(109.5)	(138.8)	(244.3)	(207.5)	(169.6)	(139.0)	(89.2)	(.0)	(1097.9)
OSSA	(.0)	(109.5)	(138.8)	(242.8)	(199.5)	(154.6)	(117.0)	(69.7)	(.0)	(1031.9)
ONGOING 1970	(.0)	(109.5)	(138.8)	(223.8)	(161.2)	(106.5)	(73.0)	(55.7)	(.0)	(868.5)
EARTH SURVEYS	(.0)	(21.4)	(41.1)	(69.6)	(51.9)	(44.9)	(35.3)	(29.6)	(.0)	(293.8)
APPLIC SRT/ADV STUDIES	.0	9.2	13.3	13.3	13.3	13.3	13.3	13.3	.0	89.0
ADV APPLIC FLT EXPER	.0	1.0	1.8	1.8	3.3	3.3	3.3	3.3	.0	17.8
ERTS AIRCRAFT PROGRAM	.0	8.9	11.0	13.0	13.0	13.0	13.0	13.0	.0	84.9
ERTS A+B	.0	2.3	15.0	41.5	22.3	15.3	5.7	.0	.0	102.1
METEOROLOGY	(.0)	(45.8)	(44.2)	(62.8)	(37.4)	(24.2)	(17.6)	(14.7)	(.0)	(246.7)
APPLIC SRT/ADV STUDIES	.0	5.1	5.9	5.9	5.9	5.9	5.9	5.9	.0	40.5
TIROS/TOS IMPROVEMENTS	.0	5.8	3.7	3.2	2.6	2.6	2.6	2.6	.0	23.1
NIMBUS A-F	.0	31.8	27.3	33.4	19.6	9.5	3.0	.1	.0	124.7
SYNCHRON MET SAT A+B	.0	.0	2.7	15.6	3.1	.1	.0	.0	.0	21.5
METEOROLOGICAL SOUNDINGS	.0	3.0	3.0	3.1	3.1	3.1	3.1	3.1	.0	21.5
ADV APPL FLT EXPER	.0	.0	1.5	1.5	3.0	3.0	3.0	3.0	.0	15.0
COOP APPLIC SAT	.0	.1	.1	.1	.1	.0	.0	.0	.0	.4
COMMUN. + NAVIG.	(.0)	(31.5)	(43.1)	(67.6)	(52.9)	(34.3)	(20.1)	(11.4)	(.0)	(260.9)
APPLIC SRT/ADV STUDIES	.0	5.3	5.7	6.7	6.7	6.7	6.7	6.7	.0	44.5
ATS A-G	.0	23.7	33.8	55.5	38.7	22.2	8.0	1.0	.0	182.9
ADV APPLIC FLT EXPER	.0	.0	1.9	1.9	3.7	3.7	3.7	3.7	.0	18.6
GEOS A-C	.0	2.5	1.7	3.5	3.8	1.7	1.7	.0	.0	14.9
LAUNCH VEHICLES	(.0)	(10.8)	(10.4)	(23.8)	(19.0)	(3.1)	(.0)	(.0)	(.0)	(67.1)
TIROS/DELTA	.0	1.4	.2	.0	.0	.0	.0	.0	.0	1.6
NIMBUS/THOR/AGENA	.0	5.8	1.6	.0	.0	.0	.0	.0	.0	7.4
SMS A+B/DELTA	.0	.0	1.1	2.6	2.3	.0	.0	.0	.0	6.0

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
NIMBUS E-F/DELTA	.0	.0	1.2	1.5	3.6	.9	.0	.0	.0	7.2
ATS/CENTAUR	.0	.6	.0	.0	.0	.0	.0	.0	.0	.6
ATS F-G/TITAN III C	.0	3.0	3.7	14.7	9.9	1.8	.0	.0	.0	33.1
ERTS A-B/DELTA	.0	.0	.0	3.9	2.1	.4	.0	.0	.0	6.4
GEOS C/DELTA	.0	.0	2.6	.0	.0	.0	.0	.0	.0	2.6
CAS/SCOUT	.0	.0	.0	1.1	1.1	.0	.0	.0	.0	2.2
EXTENSIONS 1971	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)
NEW STARTS 1971	(.0)	(.0)	(.0)	(19.0)	(38.3)	(48.1)	(44.0)	(14.0)	(.0)	(163.4)
EARTH SURVEYS	(.0)	(.0)	(.0)	(11.0)	(14.5)	(4.5)	(1.0)	(.0)	(.0)	(31.0)
SATS PHASE B	.0	.0	.0	1.0	.0	.0	.0	.0	.0	1.0
ERTS C-D	.0	.0	.0	10.0	14.5	4.5	1.0	.0	.0	30.0
METEOROLOGY	(.0)	(.0)	(.0)	(1.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(1.0)
WWW /GARP/ PHASE B	.0	.0	.0	1.0	.0	.0	.0	.0	.0	1.0
COMMUN. + NAVIG.	(.0)	(.0)	(.0)	(7.0)	(19.0)	(38.0)	(40.0)	(14.0)	(.0)	(118.0)
NAV/TRF CTL A-B	.0	.0	.0	7.0	19.0	38.0	40.0	14.0	.0	118.0
NAV/TRF CTL A-B/DELTA	.0	.0	.0	.0	.0	4.0	3.0	.0	.0	7.0
ERTS C-D/DELTA	.0	.0	.0	.0	4.8	1.6	.0	.0	.0	6.4
OMSF	(.0)	(.0)	(.0)	(1.5)	(8.0)	(15.0)	(22.0)	(19.5)	(.0)	(66.0)
NEW STARTS 1971	(.0)	(.0)	(.0)	(1.5)	(8.0)	(15.0)	(22.0)	(19.5)	(.0)	(66.0)
SP STA EXPER EARTH SURV	.0	.0	.0	.0	1.0	5.0	10.0	15.0	.0	31.0

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
SP STA EXPER COMMUN	.0	.0	.0	1.5	7.0	10.0	12.0	4.5	.0	35.0

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	RTC	TOTAL ALL YEARS
8 SPACE TECHNOLOGY	(.0)	(169.5)	(158.6)	(198.9)	(248.6)	(284.9)	(254.1)	(217.9)	(.0)	(1532.5)
OART	(.0)	(167.1)	(158.1)	(195.5)	(248.6)	(284.9)	(254.1)	(217.9)	(.0)	(1526.2)
ONGOING 1970	(.0)	(167.1)	(158.1)	(188.8)	(231.3)	(258.9)	(224.1)	(195.9)	(.0)	(1424.2)
SPACE ADV RESEARCH	(.0)	(19.3)	(18.8)	(16.0)	(16.0)	(16.0)	(16.0)	(16.0)	(.0)	(118.1)
ADVANCED RESEARCH	.0	19.3	18.8	16.0	16.0	16.0	16.0	16.0	.0	118.1
SPACE VEH TECH	(.0)	(114.3)	(102.8)	(115.8)	(141.3)	(162.9)	(145.1)	(127.9)	(.0)	(910.1)
TRANSP VEH	(.0)	(24.3)	(31.2)	(49.6)	(70.3)	(86.8)	(66.3)	(55.3)	(.0)	(383.8)
SHUTTLE TECH	.0	14.3	27.0	46.0	67.0	83.5	63.0	52.0	.0	352.8
ADV LAUNCH VEH TECH	.0	10.0	4.2	3.6	3.3	3.3	3.3	3.3	.0	31.0
NEAR SP VEH	(.0)	(49.2)	(42.6)	(41.0)	(42.9)	(43.5)	(46.2)	(40.0)	(.0)	(305.4)
SPACE STA/BASE TECH	.0	19.0	19.0	22.5	20.5	19.1	20.3	14.1	.0	134.5
NEAR SP VEH APPLIC/SCI	.0	30.2	23.6	18.5	22.4	24.4	25.9	25.9	.0	170.9
DEEP SPACE VEH	(.0)	(40.8)	(29.0)	(25.2)	(28.1)	(32.6)	(32.6)	(32.6)	(.0)	(220.9)
ADV MND/UNMND TECH	.0	40.8	29.0	25.2	28.1	32.6	32.6	32.6	.0	220.9
NUCLEAR ROCKETS	(.0)	(33.5)	(36.5)	(57.0)	(74.0)	(80.0)	(63.0)	(52.0)	(.0)	(396.0)
NERVA ENGINE	.0	27.5	28.5	49.0	66.0	72.0	55.0	44.0	.0	342.0
NUCLEAR RKT SRT	.0	6.0	8.0	8.0	8.0	8.0	8.0	8.0	.0	54.0
NEW STARTS 1971	(.0)	(.0)	(.0)	(6.7)	(17.3)	(26.0)	(30.0)	(22.0)	(.0)	(102.0)
SPACE VEH TECH	(.0)	(.0)	(.0)	(3.7)	(17.3)	(26.0)	(30.0)	(22.0)	(.0)	(99.0)
NEAR SP VEH	(.0)	(.0)	(.0)	(3.7)	(17.3)	(26.0)	(30.0)	(22.0)	(.0)	(99.0)
100 KW PWR SUPPLY	.0	.0	.0	3.7	17.3	26.0	30.0	22.0	.0	99.0

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
NUCLEAR ROCKETS	(.0)	(.0)	(.0)	(3.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(3.0)
NUCLEAR STAGE STUDIES	.0	.0	.0	3.0	.0	.0	.0	.0	.0	3.0
OSSA	(.0)	(2.4)	(.5)	(3.4)	(.0)	(.0)	(.0)	(.0)	(.0)	(6.3)
ONGOING 1970	(.0)	(2.4)	(.5)	(3.4)	(.0)	(.0)	(.0)	(.0)	(.0)	(6.3)
LAUNCH VEHICLES	(.0)	(2.4)	(.5)	(3.4)	(.0)	(.0)	(.0)	(.0)	(.0)	(6.3)
SERT/THOR/AGENA	.0	.8	.2	.0	.0	.0	.0	.0	.0	1.0
REENTRY/SCOUT	.0	.2	.3	2.3	.0	.0	.0	.0	.0	2.8
METEOROID BUMPER/SCOUT	.0	.0	.0	1.1	.0	.0	.0	.0	.0	1.1
RAM/SCOUT	.0	.3	.0	.0	.0	.0	.0	.0	.0	.3
OFO/SCOUT	.0	1.1	.0	.0	.0	.0	.0	.0	.0	1.1

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
9 AVIATION TECHNOLOGY	(.0)	(94.7)	(100.1)	(125.0)	(142.5)	(142.7)	(134.2)	(128.5)	(.0)	(867.7)
OART	(.0)	(94.7)	(100.1)	(125.0)	(142.5)	(142.7)	(134.2)	(128.5)	(.0)	(867.7)
ONGOING 1970	(.0)	(94.7)	(100.1)	(125.0)	(142.5)	(142.7)	(134.2)	(128.5)	(.0)	(867.7)
AVIATION ADV RESEARCH	(.0)	(27.6)	(34.6)	(39.0)	(39.0)	(39.0)	(39.0)	(39.0)	(.0)	(257.2)
ADVANCED RESEARCH	.0	27.6	34.6	39.0	39.0	39.0	39.0	39.0	.0	257.2
AVIATION VEH TECH	(.0)	(59.6)	(56.4)	(74.1)	(87.6)	(87.7)	(79.7)	(73.7)	(.0)	(518.8)
GENL AVIATION	.0	.5	.5	.9	1.2	1.4	1.5	1.6	.0	7.6
V/STOL	.0	9.8	12.3	17.8	29.3	33.1	26.2	19.6	.0	148.1
SUBSONIC	.0	19.3	16.0	22.1	22.1	15.6	10.3	7.6	.0	113.0
SUPERSONIC	.0	20.3	20.4	26.0	26.2	28.2	31.0	33.0	.0	185.1
HYPERSONIC	.0	9.7	7.2	7.3	8.8	9.4	10.7	11.9	.0	65.0
AVIATION SYSTEMS TECH	(.0)	(7.5)	(9.1)	(11.9)	(15.9)	(16.0)	(15.5)	(15.8)	(.0)	(91.7)
NAV/CONTROL	.0	4.9	5.5	4.6	6.2	6.2	6.2	6.2	.0	39.8
OPNL HAZARDS	.0	2.4	3.3	5.6	7.3	7.4	6.9	7.1	.0	40.0
ENVIRONMENTAL HAZARDS	.0	.2	.3	1.7	2.4	2.4	2.4	2.5	.0	11.9
NEW STARTS 1971	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)	(.0)

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	BTC	TOTAL ALL YEARS
10 SUPPORTING ACTIVITIES	(.0)	(348.1)	(358.0)	(444.3)	(426.1)	(397.1)	(387.7)	(381.0)	(.0)	(2742.3)
OTU	(.0)	(3.8)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(.0)	(33.8)
ONGOING 1970	(.0)	(3.8)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(5.0)	(.0)	(33.8)
OFF. OF TECH UTIL.	.0	3.8	5.0	5.0	5.0	5.0	5.0	5.0	.0	33.8
OUA	(.0)	(9.0)	(9.0)	(26.0)	(26.0)	(26.0)	(26.0)	(26.0)	(.0)	(148.0)
ONGOING 1970	(.0)	(9.0)	(9.0)	(26.0)	(26.0)	(26.0)	(26.0)	(26.0)	(.0)	(148.0)
SUST UNIV PROGRAM	.0	9.0	9.0	26.0	26.0	26.0	26.0	26.0	.0	148.0
OTDA	(.0)	(279.7)	(278.0)	(318.0)	(306.5)	(310.8)	(309.5)	(306.8)	(.0)	(2109.3)
ONGOING 1970	(.0)	(279.7)	(278.0)	(317.6)	(302.0)	(298.9)	(262.8)	(218.4)	(.0)	(1957.4)
OTDA SRT	.0	11.1	12.4	13.1	12.4	12.4	12.4	12.4	.0	86.2
OTDA NETWORK OPERATIONS	.0	229.4	233.4	235.4	237.1	243.7	216.9	176.5	.0	1572.4
OTDA EQUIP. + COMPONENTS	.0	39.2	32.2	69.1	52.5	42.8	33.5	29.5	.0	298.8
NEW STARTS 1971	(.0)	(.0)	(.0)	(.4)	(4.5)	(11.9)	(46.7)	(88.4)	(.0)	(151.9)
TRKNG 71 SCI/APPL PROG	.0	.0	.0	.4	1.5	1.2	7.2	10.9	.0	21.2
TRKNG 71 LUNAR/EO/	.0	.0	.0	.0	3.0	10.7	39.5	77.5	.0	130.7
OSSA	(.0)	(55.6)	(66.0)	(95.3)	(88.6)	(55.3)	(47.2)	(43.2)	(.0)	(451.2)
ONGOING 1970	(.0)	(55.6)	(66.0)	(95.3)	(88.4)	(54.2)	(41.9)	(38.0)	(.0)	(439.4)
BASE SPT + PRODUCT IMP.	(.0)	(51.2)	(62.0)	(91.3)	(84.4)	(50.2)	(37.9)	(34.0)	(.0)	(411.0)
TITAN/CENT INTEGRATION	.0	.1	3.8	15.1	18.2	.8	.0	.0	.0	38.0
TITAN/CENTAUR PROOF FLT	.0	.0	2.9	10.3	4.7	.0	.0	.0	.0	17.9

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	FISCAL 1968 AND PRIOR	1969 PAST YEAR	1970 CURRENT YEAR	1971 BUDGET YEAR	1972	1973	1974	1975	RTC	TOTAL ALL YEARS
SCOUT	.0	8.7	9.0	9.8	9.1	8.2	8.0	8.0	.0	60.8
CENTAUR	.0	22.4	23.3	34.2	28.9	21.2	12.9	9.0	.0	151.9
DELTA	.0	15.4	19.3	20.8	17.0	17.0	17.0	17.0	.0	123.5
AGENA	.0	4.5	3.5	.0	.0	.0	.0	.0	.0	8.0
TITAN 111 C	.0	.1	.2	1.1	6.5	3.0	.0	.0	.0	10.9
L/V SRT/ADV. STUDIES	.0	4.4	4.0	4.0	4.0	4.0	4.0	4.0	.0	28.4
NEW STARTS 1971	(.0)	(.0)	(.0)	(.0)	(.2)	(1.1)	(5.3)	(5.2)	(.0)	(11.8)
TITAN 111 C SUPPORT	.0	.0	.0	.0	.2	1.1	5.3	5.2	.0	11.8

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1 EARTH ORBITAL MSF	10.5
MICHOUD ASSEMBLY FAC.	
REP REHAB AND IMPROVE	.4
MANNEDSPACECRAFT CENTER	
MOD ENV TESTING LAB	1.3
KENNEDY SPACE CENTER	
LAUNCH COMPLEX 39	5.3
UTILITY INSTALLATIONS	2.1
VARIOUS LOCATIONS	
REHAB VARIOUS LOCATIONS	1.4
3 PLANETARY EXPLORATION	17.0
VARIOUS LOCATIONS	
DEEP SP ANT 210 FT AUS	15.4
DEEP SP ANT 210 FT SP	1.6
5 SPACE PHYSICS	.6
KENNEDY SPACE CENTER	
LAUNCH COMPLEX 17	.6
10 SUPPORTING ACTIVITIES	4.0

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HEADQUARTERS NASA		
FAC PLANNING AND DESIGN	1.0	
VARIOUS LOCATIONS		
POWER PLANT REPLACEMENT	1.9	
AMES RESEARCH CENTER		
MOD WATER DIST SYSTEM	.4	
WALLOPS STATION		
BEACH EROSION PROTECTION	.5	
VARIOUS LOCATIONS		
AIR POLLUTION CON DOWNEY	.2	
TOTAL PROGRAM AREA FACILITIES		32.1

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1 EARTH ORBITAL MSF	14.2
MANNEDSPACECRAFT CENTER	
MCC POWER GENERATION FAC	1.7
KENNEDY SPACE CENTER	
UTILITY INSTALLATIONS	3.3
MANNED S/C FACILITY MODS	1.0
HI PRESS GAS MAINT BLDG	.2
MOD LAUNCH COMPLEX 34-37	8.0
3 PLANETARY EXPLORATION	17.0
VARIOUS LOCATIONS	
DEEP SP ANT 210 FT AUS	1.6
DEEP SP ANT 210 FT SP	15.4
5 SPACE PHYSICS	.4
VARIOUS LOCATIONS	
SLC 2 EAST MODS WTR	.4
8 SPACE TECHNOLOGY	8.1
ELECTRONICS RESEARCH CEN	
COMP/INSTR RES LAB	7.0
CTR SUPPORT FACIL III	1.1

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9 AVIATION TECHNOLOGY	4.8	
LANGLEY RESEARCH CENTER		
ACFT NOISE REDUCTION LAB	4.8	
10 SUPPORTING ACTIVITIES	13.7	
HEADQUARTERS NASA		
FAC PLANNING AND DESIGN	3.5	
VARIOUS LOCATIONS		
REPAIR AND MODIFICATIONS	9.0	
GODDARD SPACE FLIGHT CEN		
FIRE PROTECTION MODS	.7	
WALLOPS STATION		
FLT INFO CONT ANAL LAB	.5	
TOTAL PROGRAM AREA FACILITIES		58.2

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1 EARTH ORBITAL MSF	25.5
VARIOUS LOCATIONS	
RELOCATE MSF NET FACIL	.5
VARIOUS LOCATIONS	
SPACE SHUTTLE FACIL	25.0
3 PLANETARY EXPLORATION	14.0
VARIOUS LOCATIONS	
PWR PLNT ADDN GOLDSTONE	.7
JET PROPULSION LAB	
MODS/ 25 FT SP STMULATOR	.4
KENNEDY SPACE CENTER	
VIKING STERILIZATN ADDN	3.0
ALTERATIONS LC 41	9.9
5 SPACE PHYSICS	2.2
KENNEDY SPACE CENTER	
ALTERATIONS LC 17	2.2
7 SPACE APPLICATIONS	5.9
VARIOUS LOCATIONS	
RELOCATE ATS FACIL	.5
GODDARD SPACE FLIGHT CEN	
ERTS LAB ADDN TO BDG 23	2.1
VARIOUS LOCATIONS	
SLC 2 MODS	3.3
8 SPACE TECHNOLOGY	8.3
AMES RESEARCH CENTER	
POLYMER LAB	1.3

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SPACE NUCLEAR PROPUL OFF		
ENG/STAGE TEST STAND =2	6.0	
JET PROPULSION LAB		
RTG PWR APPLIC RES LAB	1.0	
9 AVIATION TECHNOLOGY	6.5	
ELECTRONICS RESEARCH CEN		
AVIONICS SIMUL FACIL	6.5	
10 SUPPORTING ACTIVITIES	27.8	
HEADQUARTERS NASA		
FAC PLANNING AND DESIGN	7.2	
VARIOUS LOCATIONS		
MODIFICATIONS & REHABS	15.0	
LANGLEY RESEARCH CENTER		
PROJ DIRECTION/MGMT FAC	3.6	
MARSHALL SPACE FLGHT CEN		
PHOTO SCIENCES LAB	.5	
MANNEDSPACECRAFT CENTER		
CALIBRATION LAB	.9	
KENNEDY SPACE CENTER		
ALTERATIONS LC 39	.2	
ADDN/MODS COMMUN CTR	.4	
TOTAL PROGRAM AREA FACILITIES		90.2

FY 1971 NEW STARTS

	FY 1971	FY 1972	FY 1973	FY 1974	FY 1975
Space Station	98.0	348.7	651.3	946.8	960.2
Space Shuttle	170.0	696.0	975.0	1,115.0	1,032.0
Lunar Exploration - Phase II	60.0	214.0	250.0	200.0	120.0
High Energy Observatory	4.0	56.5	78.9	76.7	73.0
Navigation/Traffic Control	7.0	19.0	42.0	43.0	14.0
ERTS C-D	10.0	19.3	6.1	1.0	---
500-Day Life Support System	2.0	14.0	12.0	10.0	10.0
100 kw Power Supply	3.7	17.3	26.0	30.0	22.0
Phase B Studies (GARP & SATS)	2.0	---	---	---	---
Nuclear Stage Studies	3.0	---	---	---	---
Support for New Starts	.4	4.7	13.0	52.0	93.6
TOTAL	360.1	1,389.5	2,054.3	2,474.5	2,324.8

FY 1971 NEW EFFORT

PROGRAM: EXTENSION OF MANNED SPACE FLIGHT CAPABILITY

PROJECT: SPACE STATION

OBJECTIVES:

The Space Station represents the creation of a national capability to place and support a large group of men in Earth orbit for extended periods of time and to provide them with the means for performing complex tasks in space.

The Space Station will be of modular design, initially accomodating six to twelve men. Additional space station modules can be attached later and a 50 to 100-man permanent Earth Orbital Base assembled. The base would support a broad spectrum of scientific, technological, and applications activity, and could service other government agencies, and function as an instrument for international cooperation through the active use of these facilities by other nations.

The Space Station represents a major advance in manned space vehicle design providing both comfortable crew habitability and new long duration maintainable subsystems capable of five to ten years operation. The long-term objectives for manned space flight in Earth orbit will focus on extending man's capabilities and the methods for supporting him in space environment for extended periods of time, and the practical application of these capabilities.

The Space Station Module is conceived as being the basic element of future manned activities in Earth orbit, of continued manned exploration of the Moon, and of manned expeditions to the planets. It is expected that the long-duration subsystems developed for the space station will be applied and used for lunar orbit and planetary mission modules, and possibly adapted for use as systems for both lunar and planetary surface bases.

TECHNICAL PLAN:

a. The initial launch of a space station module is planned for 1976-1977, with a two-stage version of the Saturn V, the INT-21 launching the module.

TECHNICAL PLAN (Continued)

b. The Space Station and supporting systems will be designed to implement and support experiment programs over a wide range of scientific disciplines.
c. The station will be designed for continuous manned operations of up to ten or more years duration. By joining several modules together, the crew can be expanded from six or twelve to upwards of 100.
d. Operational altitude and inclination will be selected to optimize the usefulness of the station in the conduct of the experiment and operational program. An altitude of 200 nautical miles and an inclination of 55° is planned.

To obtain a high degree of program flexibility, modular features in the station will be required. Provisions must be made for delivery to the station of major new experiments and replacement subsystems during resupply operations.

SCHEDULES:

Program definition and experiment definition efforts on the station itself were initiated in FY 1969 and continued into FY 1970. Phase B work started in September 1969. The projected flight schedule provides for the first station module to be launched in 1976 or 1977. It will be logistically supported by the space shuttle. The first station will be activated by a six to twelve-man crew.

RESOURCES REQUIREMENTS:

($ In Millions)

	FY 70	FY 71	FY 72	FY 73	FY 74	FY 75
Experiment Definition	--	18.0	--	--	--	--
SSM Development	5.1	51.4	200.0	250.0	320.0	270.0
SSM Production	--	--	--	55.0	105.0	95.0
Operations	--	--	--	10.0	30.0	60.0
Experiments	.9	28.6	148.7	336.3	491.8	535.2
Space Physics	--	6.5	34.5	74.0	103.5	108.5
Life Science	--	9.4	33.3	61.3	98.3	140.2
Earth Observation	--	--	1.0	5.0	10.0	15.0
Communications	--	1.5	7.0	10.0	12.0	4.5
Astronomy	.9	7.2	35.4	131.0	191.0	178.0
Eng. & Tech.	--	4.0	37.5	55.0	77.0	89.0
	6.0	98.0	348.7	651.3	946.8	960.2

FY 1971 NEW EFFORT

PROGRAM: EXTENSION OF MANNED SPACE FLIGHT CAPABILITY

PROJECT: SPACE SHUTTLE

OBJECTIVES:

The space shuttle is conceived as a low-cost fully reusable transport system which will greatly decrease logistic costs as compared to existing expendable systems. The objectives of the space shuttle are to provide transportation to and from low Earth-orbit for: (a) Space Station Base logistics support, (b) rotation of scientific personnel, (c) placement and retrieval of satellites, (d) satellite servicing and maintenance, (e) delivery of propellants, (f) short duration orbital missions, and (g) delivery of propulsive stages and payloads for high energy missions.

TECHNICAL PLAN:

The space shuttle will be a versatile transportation system that can transport effectively and efficiently, a varying mix of personnel and cargo to low earth orbits and return. The vehicle will have a crew of two, a payload capability of up to 50,000 pounds, and approximately 10,000 cubic feet of internal payload volume. Although the baseline profile for the shuttle is designed to provide logistic support to the space station/base in 270 nautical mile circular orbit, the shuttle will be a versatile vehicle capable of accomplishing a variety of missions. With this capability, routine transportation of passengers, consumables, propellants, equipment, satellites, and propulsive stages from an earth base to low earth orbit and return will be both practical and economical. The shuttle is conceived as a fully reusable space vehicle configured for vertical launch, lifting reentry, and horizontal landings. Radiative type thermal protection systems will be used to the maximum extent to minimize refurbishment costs and recycle activities. The vehicle configuration will allow for docking with the space station/base to permit transfer of personnel and cargo without extravehicular activity, and for in-orbit placement and retrieval of satellites. The shuttle will be designed for a safe intact abort with payload in the event of major system failures. Dependence upon ground facilities and operations will be kept to a minimum; however, use of ground flight controllers for approach and landing will be a normal procedure.

Two propulsion systems which are under consideration, Aerospike and high pressure bell chamber, will utilize a liquid hydrogen/liquid oxygen engine

with a thrust level of approximately 500K pounds. The two engine concepts will be thoroughly investigated in Phase B definition studies prior to design selection. Ready maintenance and engine change capability will be a design requirement. All technical planning for the space shuttle will draw upon the developmental and operational techniques of the modern jet aircraft.

SCHEDULES:

The space shuttle is scheduled to become fully operational in the 1976-1977 time period and will perform various low Earth-orbit resupply missions for the forseeable future. Until the new space shuttle system becomes available, interim logistics systems will be utilized to resupply various low Earth-orbit and lunar missions. In the late 1970's and beyond, the space shuttle will be augmented by a nuclear shuttle for resupply and crew rotation of all operations beyond low Earth-orbit. Under this concept, the space shuttle will initially transport men and supplies to the low orbit space station where the cargo and personnel will be transferred to the nuclear shuttle for trips to other destinations.

RESOURCES:

	(Dollars in Millions)					
	FY 1970	FY 1971	FY 1972	FY 1973	FY 1974	FY 1975
Development	$36	$170	$646	$790	$890	$807
Production	---	---	50	185	225	225
Total	$36	$170	$696	$975	$1,115	$1,032

FY 1971 EXTENSIONS

PROGRAM: LUNAR EXPLORATION

PROJECT: APOLLO/LUNAR - PHASE 2

OBJECTIVES:

The general goal of a continuing program of lunar exploration is to explore and utilize the Moon for the benefit of mankind. As we are now capable of directly studying and exploring the Moon, the following scientific objectives are believed achievable during the 1970's:

1. Investigation of the Moon's surface features and rational relationships.
2. Understanding of the composition of lunar materials.
3. Determination of the Moon's internal structure and energy budget.
4. Understanding of the interaction of the Moon and the space environment.

Related technological objectives achievable in the same period are:

1. Extension of knowledge of man in space.
2. Extension of astronaut's staytime and mobility on the Moon.
3. Long-range surface traverses.
4. Extension of operation techniques.
5. Critical data for decisions on future uses of the Moon.

The preliminary investigation of the Apollo 11 surface samples indicates that the geochemistry of the Moon is quite dissimilar from that of the Earth, and that the Moon seems to be quite variable in terms of geology, chemistry, and dynamic processes. All the present theories as to the origin and evolution of the Moon are under intensive review as a result of the initial study of the scientific information provided by Apollo 11. Eight additional lunar missions are planned using spacecraft and launch vehicles procured under the Apollo program. Phase 2 as currently planned includes four additional missions using follow-on Saturn V launch vehicles. These missions will provide a continued flow of valuable scientific information about the nature of the Moon and at the same time furnish data which will provide a technical bridge leading to a solid foundation for the advanced lunar missions.

TECHNICAL PLAN:

The first four post-Apollo 11 missions will use basic Apollo equipment and experiments. The remaining Phase 1 missions and the four Phase 2 missions will carry improved payloads to enhance scientific data returns from both lunar orbit and the lunar surface. CSM's and LM's available from the Apollo program will be upgraded to increase mission duration and to carry improved scientific instruments and experiments. Follow-on production of uprated LM's and SM's, and refurbishment of and incorporation of extended systems into CM's previously flown will allow continued and coordinated exploration of the Moon through 1975 using Saturn V launch vehicles from the post-Apollo production.

LM capabilities will be upgraded to provide up to three days staytime, point landing, and delivery of approximately 1,000 lbs. of discretionary payloads to the lunar surface. This larger payload will allow increased mobility, including improved suits, life support systems, and a roving vehicle to extend the radius of operations around the landing site. With this equipment, broader scale exploration of lunar highlands and major craters will be initiated. In addition to sample returns, automated instrumentation will be implaced, and remote sensing and mapping of the surface will be accomplished from the orbiting CM. Correlation of scientific data obtained from lunar orbit and on the surface will vastly improve knowledge of the lunar resources and the potential for exploitation.

SCHEDULES:

The eight remaining launch vehicles procured under the Apollo program will support flights through 1972. Phase 2 will follow with a total of four missions in the 1973-1975 time frame.

RESOURCES REQUIREMENTS:

	FY 1970	FY 1971	FY 1972	FY 1973	FY 1974	FY 1975
Apollo/Lunar - Phase 2	---	$60	$214	$250	$200	$120

FY 1971 NEW EFFORT

PROGRAM: PHYSICS AND ASTRONOMY

PROJECT: HIGH ENERGY ASTRONOMY OBSERVATORY

OBJECTIVES:

The primary objective of the High Energy Astronomy Observatory is to obtain high quality, high resolution data on X-ray, gamma ray, and cosmic ray sources. These data should provide information on the structure, spectra, polarization, synoptic variations, and location of these sources, including the visual identification from ground-based observatories of the stellar objects emitting the high energy radiations.

The objective of the X-ray studies is a survey of the sky for X-ray sources down to about 10^{-6} times the intensity of the brightest known source, Sco X-1, as well as the investigation of the shape and structure of X-ray sources with high resolution instruments. It is expected that thousands of X-ray sources will be detected and that the aspect of the sky in X-ray light is quite different from that in visible light. Many X-ray sources show flares and "flickering" and the satellite project would permit monitoring of these intensity variations.

Gamma ray observations will concentrate on a broad survey of the sky, and on high resolution studies of individual sources. Gamma ray intensities are low, thus large area detectors and long observing times are mandatory. Several cosmological processes are known to produce gamma rays, generating line spectra from 50 keV to thousands of MeV. Of particular interest is the search for gamma ray lines in novae and supernovae.

Primary cosmic rays investigations will require large detector areas and long observing times, but high angular resolution is not important since cosmic ray particles are subject to magnetic deflection during their travel through the universe and have lost their original directionality. A survey of cosmic ray particles with statistically meaningful numbers even for the heaviest elements will be of utmost interest.

TECHNICAL PIAN:

To achieve these objectives, a major new National capability for continuing X, gamma, and cosmic ray observations is needed. Initially, a development program with four satellite flights is proposed. The first satellite to be launched in 1974 will be relatively simple using an inertia wheel and a reaction control system to slowly rotate and at

best crudely point the experiments. Depending on the requirements on the experiments to be selected, later satellites will possess more accurate pointing capability and may be more complex. Long-term observations are required; therefore, the satellites will be designed to operate in an automated mode. As appropriate, provisions will be made to utilize man in orbit for repairs, updating, and other functions. Launches would be roughly on one year centers using the Titan III-C vehicle from the Eastern Test Range (ETR) into a 200 nautical mile, 28° inclination orbit.

The first satellite will weigh on the order of ten tons and will be spin-stabilized. It will make an all-sky survey of both galatic and extra-galactic sources. This satellite will carry instruments of the following type: (1) a cosmic ray ionization calorimeter weighing about three tons with an energy range out to 10^{14} eV; (2) a 1 cubic meter digitized spark chamber for gamma ray studies in the 25 MeV to 10 BeV range; (3) a small low energy crystal gamma ray detector covering 15-300 keV; (4) a large X-ray detector with about 100 ft^2 frontal area operating in the range of 1-100 keV. Precise aspect information will be provided by an on-board sensor for data reduction. Satellite operation will be automatic and data will be telemetered to the ground.

Future satellites will have improved pointing capability. Detailed investigations of individual X-ray sources will be a priority objective. A typical X-ray telescope, as envisioned now, would have about a 1 meter aperture and a focal length of 20 feet. Such a facility would be necessary for the study of the images and structure of X-ray sources, and of the polarization and spectral composition of the observed radiation. This facility would be a National X-ray observatory in space where observing time would be available on a guest observer basis to all competent scientists.

PROBABLE FIELD CENTER: Marshall Space Flight Center

LAUNCH VEHICLE: Titan III-C

FUNDING REQUIREMENTS: $ in Millions

	FY 71	FY 72	FY 73	FY 74	FY 75	To Completion	Total
SC	4.0	50.5	62.5	60.0	57.2	65.0	299.2
L/V		6.0	16.4	16.7	15.8	14.8	69.7

MANPOWER:

FY 71	FY 72	FY 73	FY 74	FY 75
10	156	209	202	185

FLIGHT SCHEDULE:

A - CY 1974
B - CY 1975
C - CY 1976
D - CY 1977

OFFICE OF SPACE SCIENCE AND APPLICATIONS

FY-71 NEW EFFORT

PROGRAM: Communications

PROJECT: Navigation/Traffic Control Satellites A and B, Phase B and C

OBJECTIVES:

To develop space technology and demonstrate its application for:

a. Improving air traffic control services in over-ocean and transition-to-land areas.

b. Improving aircraft and ship telecommunications (voice and digital data) services to shore and return.

c. Providing navigation services to ships and aircraft.

d. Providing aids in search and rescue for a joint aeronautical/maritime safety program.

e. Providing aircraft collision prevention services and an independent altitude measurement.

These objectives are to meet the needs of the Department of Transportation's Federal Aviation Administration (FAA) and the U. S. Coast Guard.

TECHNICAL PLAN:

a. Background: Two advanced mission studies of an experimental/developmental navigation and traffic control satellite were performed by industrial aerospace contractors. Different approaches to the satellite system were recommended, but both stated that the concept was technically feasible. A phase A study report is under preparation to resolve the alternatives.

A study to produce an experimental satellite system description to meet the FAA and Coast Guard requirements is presently underway within NASA. The study will include feasible satellite concepts, aircraft and ship needs, ground station needs and a management plan. This study was requested by the FAA and Coast Guard (FAA and Coast Guard personnel are participating) for a "satellite system which would provide a one-ocean capability in communications and surveillance."

At present, a study for an aeronautical traffic control satellite system is underway between NASA and European Space Research Organization (ESRO) to determine if there exists a means for cooperation in this field. The FAA is a participant in this study.

b. Plan: A phase B/C effort is planned for [illegible]tion in FY-71 to meet a CY-74 launch date. This time period is [illegible] obtain experimental data for supersonic transport util[illegible] meet the expected aircraft traffic density in the oceanic and transition regions. Experimental data are needed to justify reduction of aircraft separation in the North Atlantic principal area routes from the present day 120 nm lateral and 15 minutes longitudinally, to 30 nm lateral and 5 minutes longitudinally. For example, FAA studies of aircraft flight operations in the North Atlantic for a nine-year period (1972-1980) show a potential savings of $196 million if the aircraft separation distances can be reduced to the above values.

Less tangible but certainly important benefits will accrue from the increased aircraft and ship safety which will result from improved navigation and traffic control systems. Delays in implementing this experimental satellite will result in continued dollar penalties to aviation in the Atlantic and the Pacific regions.

Upon completion and evaluation of the phase B and phase C efforts, it is planned to proceed with phase D development by contact leading to launch of two spacecraft in CY 1974.

PROBABLE FIELD CENTER: GSFC

LAUNCH VEHICLE: Delta - 9 Strap-on.

FUNDING REQUIREMENT: $ In Millions

	FY 71	FY 72	FY 73	FY 74	FY 75	To Compl	Total
Spacecraft and support	7	19	38	40	14	2	120
Manpower	10	20	35	50	25		

FLIGHT SCHEDULE: A and B - CY 1974

OFFICE OF SPACE SCIENCE AND APPLICATIONS

FY 71 NEW EFFORT

PROGRAM: Earth Observations

PROJECT: Earth Resources Technology Satellites (ERTS) C & D

OBJECTIVES:

To continue the investigation of all promising techniques for the acquisition of Earth Resources data from orbital altitudes. By comparing the results obtained it will be possible to determine which of the various methods used are likely to be most suitable for future operational systems.

These missions will have a well-defined, specific set of objectives.

a. To obtain hard film imagery of the Earth's surface for comparison with the video and scanner data obtained from ERTS A & B. It would then be possible to arrive at definite conclusions as regards the actual need for higher resolution, less distortion imagery for the several disciplinary purposes such as cartography.

b. The hard film imagery will be used to provide a geometrically accurate high-resolution record of the U. S. on which to plot additional ERS disciplinary data. This may be accomplished over the four seasons of the year. This imagery would become a standard for correlating the data from the various ERTS flights and for evaluating the quality and utility of the data from each technology flight (ERTS and SATS). The film record would also be useful as a standard for detecting later changes in the Earth's features.

TECHNICAL PLAN:

The spacecraft for these two missions will consist of a re-entry vehicle housing metric and stellar reference cameras and associated support systems. These missions will be conducted at low/medium orbits for approximately thirty days and will be capable of physically returning film and telemetry data. Specifically, the camera data will consist of photographic coverage of the conterminous United States, Alasks, Hawaii, and adjacent water areas which shall be used in the preparation of a complete and highly accurate photo-atlas of the United States.

PROBABLE FIELD CENTER: Manned Spacecraft Center

LAUNCH VEHICLE: Tat Delta (ERTS C & D)

FUNDING REQUIREMENTS: (In Millions)

	FY 71	FY 72	FY 73	FY 74	FY 75	TO COMPL.	TOTAL
S/C and Support	10.0	14.5	4.5	1.0	---	---	30.0
L/V	---	4.8	1.6	---	---	---	6.4
Total	10.0	19.3	6.1	1.0	---	---	36.4
MANPOWER:	15	15	15	5			

FLIGHT SCHEDULE:

ERTS C - CY 72
ERTS D - CY 73

FY 1971 NEW EFFORT

CATEGORY: SPACE TECHNOLOGY
PROGRAM : HUMAN FACTORS SYSTEMS
PROJECT : 500-DAY LIFE SUPPORT MODULE

OBJECTIVES:

Long duration manned flight involving planetary exploration will require non-resupplied life support. A ground test program is required to insure that in the late 1970's a practical regenerative integrated life support system, suitable for support of nine men for a 500-day non-resupply mission, is within the state-of-the-art for development and flight operations in the 1980's.

Technological extensions for application to resupplied earth-orbital missions are underway and will be supported in program addition to life support SRT program. For two years a life support module has been under study considering the requirements associated with missions of two years without resupply. The basic design is modular and provides module inter-support. Now it is necessary to examine in ground tests the technology problem areas. The extended duration and no-abort implication of the mission increases the emphasis on reliability and makes maintainability a necessity. The longer single-crew staytime requires new emphasis on personnel provisions. These unique requirements dictate an extensive ground experimentation program to advance the state-of-the-art and reduce the uncertainties associated with a 500-day non-resupply life support module.

An Advanced Integrated Life Support System will be developed and installed at Langley Research Center as a proof-of-concept facility based on a recently completed study by Hamilton Standard. The FY 1971 estimate covers design effort. Effort on experimental hardware and the ground test system will be initiated in FY 1972.

FUNDING REQUIREMENTS:

	FY 71	FY 72	FY 73	FY 74	FY 75	BTC
Design	2.0					
Experimental Hardware and Ground Test System	---	14.0	12.0	10.0	10.0	5.0

FY 1971 NEW EFFORT

CATEGORY: SPACE TECHNOLOGY
PROGRAM : SPACE POWER AND ELECTRIC PROPULSION
PROJECT : 100 KW PROOF-OF-CONCEPT POWER MODULE

OBJECTIVES:

A 100 KW power source is a requirement for long duration manned space flight and long range communication applications. A number of technical concepts show promise of filling such a need.

Solar Power Module
Uprated SNAP-8 System
Advanced Rankine
Reactor Brayton or SNAP-8 Reactor/ Brayton
In-Pile Thermionics

At present, it is evident that solar cells provide the least technical risk and earliest availability. However, the operational requirements associated with future missions such as space case, manned planetary exploration, etc., indicate a need for smaller area systems not constrained by solar orientation.

At the same time, the only nuclear systems for which reactors are now under way are SNAP-8 and In-Pile Thermionics. However, it is doubtful that the SNAP-8 reactor could operate at the thermal power level required for 100 KW without a serious lifetime degradation for an uprated SNAP-8 system (reactor and turbogenerator). The thermionic system offers considerable advantages (potential for even higher power and higher reliability) but involves higher risk and more costs and is a longer range technology. Considerable work has been done on the advanced rankine system, including rotating machinery component tests and some reactor design and development, but it too is a longer range technology. The reactor brayton system is nonexistent except for some studies and the experience developed in the isotope brayton system.

A logical synthesis of the current SNAP-8 and isotope brayton technology for an efficient system consistent with mid-to-late 1970's applications is the SNAP-8 Reactor/Brayton. A complete conceptual design will be

available in CY 1970. The planned effort will provide for experimental hardware in FY 1971 and a prototype ground combined system demonstration in approximately six years.

FUNDING REQUIREMENTS:

	FY 70	FY 71	FY 72	FY 73	FY 74	FY 75	BTC
Preliminary Studies	.5						
Experimental Hardware and Prototype System		3.7	17.3	26.0	30.0	22.0	7.0