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N80F

NEWS NASA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

TELS. WO 2-4155
WO 3-6925

FOR RELEASE: Upon release of President's Budget Message Noon EST Tuesday 24 January 1967.

Background Briefing

NASA FY 1968 Budget

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Hold for release at 12:00 Noon EST Tuesday, 24 January 1967.

NOTE: This statement relates to the 1968 Budget and is subject to the same conditions. There should be no premature release of this statement nor should any of its contents be paraphrased or alluded to in earlier stories. There is a total embargo on the Budget until 12:00 Noon, January 24, 1967, which includes any and all references to any material in the Budget or the Budget Appendix, or supporting statements.

Background Material used in this briefing follows the transcript.

SCHEER: Ladies and gentlemen, we will get started now. You know Dr. Seamans. Mr. Webb and Dr. Newell and Mr. Buckley, Dr. Mueller and Dr. Adams will be available at the conclusion of Dr. Seamans' presentation.

Dr. Seamans would like to go through the charts as rapidly as possible with as few interruptions as possible. Of course there will be questions for clarification, but he will answer questions at the conclusion of his presentation, and Mr. Webb and the program managers will also be available.

The transcript will be ready Wednesday morning. If you sign an envelope before you leave it will be mailed to you or you can pick it up here in the newsroom on Wednesday morning.

I think that is all we have to say, and we are ready to go.

SEAMANS: Good evening.

In 1961 we set our sights on a greatly expanded capability in aeronautics and space, including a manned expedition to the moon in this decade. This is still a difficult challenging undertaking, occupying the attention of many people in and out of the Government.

However, as we have said before, our course for the period beyond this decade must now be set, or we must commence to abandon the capability that we have created.

In this context, the 1968 budget is particularly important. It reflects the fundamental decision to move ahead in continued space exploration and application with a well-conceived program of manned and unmanned systems.

Specifically, FY 1968 budget reaffirms the decision to keep the Apollo program on schedule, with the twelve Saturn IB's and fifteen Saturn V flights occurring essentially as we have discussed them here last year.

The 1968 budget also provides for a continuation of missions already under way such as the unmanned earth orbiting satellites and observatories, lunar orbiters, Surveyors, deep space probes, as well as important ground based scientific and technical effort.

In addition the budget reflects the decision to continue the production of Saturn IB, Saturn V and Apollo hardware and to utilize the fabrication tests and optional complexes that support them at a rate of about eight major Saturn launch missions per year, following accomplishment of the Apollo lunar objectives.

These missions will make imaginative and flexible use of the Apollo systems. Hence their name, Apollo applications. Including a 10,000 cubic foot workshop in orbit, a manned astronomical and solar telescope, very long duration manned orbital flights, allowing for physiological and biological experimentation, manned meteorological and earth resource investigations and extended lunar exploration and analysis.

The budget reflects also the decision to explore our neighborhing planets more intensively with unmanned spacecraft. Funds are included for a 1961 Mariner, with atmospheric probe, as well as a Saturn V launch Voyager.

Funds are also included for a new type application technology satellite, with a large directable antenna, for a new scientific satellite for close-in observation of the sun called Sunblazer, for increased aeronautical research in support of both civilian and military developments, and more increased capability at the Electronic Research Center.

Now, many of you familiar with our program will recognize that there are potentially useful projects that are not included. Decisions on these missions are always difficult. I can assure you they have been arrived at thoughtfully.

For example, this budget does not contain funds to institute development of a nuclear propulsion system, which we have called Nerva II. However, the President's contingency budget will permit consideration of such a development in FY 1968. If it is decided to go ahead, of course a supplementary budget will have to go up, which will include both the AEC and NASA fund requests for this purpose.

Now, referring to the budget material, each one of you I believe have available to you the budget figures contained on thirteen pages stapled together. I am going to refer primarily to these pages in discussing with you the budget here this evening. The charts will also be available to look at and will be useful primarily I believe in the question period.

The top of the first page which is the information contained on this chart on your left shows that the 1968 budget requests for new obligational authority is $5.05 billion. Now, in discussing this figure I would first like to note that also included on the page, but not on the chart, are the expenditures under research and development, construction of facilities, administrative operations by these fiscal years.

I would like to take a minute to discuss with you the expenditure levels in our budget. However, most of the talk here tonight will involve obligational authority.

First let me say that we estimate that the manpower, both Government, university and industry, reached its peak on our program in the third quarter of FY 1966, that is, about one year ago, and we believe we reached a level of about 420,000 people.

By the end of fiscal 1966, this figure was somewhat below 400,000, and during FY 1967 we estimate that some 40,000 people will come out of our R&D program, some 23,000 out of our construction and facilities program, administrative operations will remain essentially constant.

This means that we will end the fiscal year with on the order of 340,000 people.

Now you will note that the expenditure figure for 1966, '67 and '68, are above the new obligational authority. I think you also recognize that we had a period during the buildup of the program when the reverse was true, the new obligational authority was ahead of the expenditures.

The best way to relate costs, if you will, with manpower on the job is to really not look at either obligational authority or at expenses. Actually, these go in sequence. First the Government obligates the funds. The next step is to actually carry out the job, and this is when the costs are incurred, and finally the Government is charged for the work and this is when you end up with expenditures. But the expenditures technically today are running fairly close to the work done, and for that reason the reduction you see in expenditures follows rather closely the reduction in manpower that I have just described to you.

As a consequence, you can see that the expenditures in research and development are falling off, that the construction of facilities expenditures are falling off even more rapidly, and actually the administrative operation is increasing slightly, and I will discuss this in more detail in the latter part of this talk.

The next item that I would like to mention here briefly relates to the situation last fall when the President was concerned about the total Government expenditures. He requested that NASA reduce its expenditures approximately $30 million below the figure that we would have had had we not made adjustments in the program, and as a consequence, since we were already well into the fiscal year, we reduced the new obligational authority by $60 million.

This was discussed at the time the decisions were made. I don't propose to discuss this in detail except to say that the reductions occurred in part in administrative operations, namely, $8 million, and this resulted directly from the personnel freeze, and overtime reductions that were made. The freeze was as of July 20.

Also, we reduced the new obligational authority in our university program by $10 million. We reduced the Voyager program by $8 million down to the level that the President had originally requested.

We reduced the Apollo application program by $8.5 million, and the supporting research and technology program by $13 million.

Now, the $60 million reduction that was made in 1967 shows up as a carryover into fiscal 1968. For that reason you will note that the total for 1967, that is the $4.967 billion is reduced in our budget plan to $4.907 billion and the $5.050 billion, new obligation authority in 1968 provides us in 1968 with a working plan of $5.110 billion, and this $60 million finds its way entirely into research and development.

I would like to also say at this time that there is in the program as I have already mentioned some new starts. These represent the very significant decisions that I have already referred to in my opening remarks. And if you add up, in research and development, the funding that we are requesting in 1968 for Apollo application, Mariner 71, Voyager, the new ATS as it is called, the Sunblazer and the increase in aeronautics, it comes to a figure of around $580 million, or stated another way, without the new starts this year, our budget would fall in 1968 to $4.5 billion.

Now, at the time these decisions are made, as I indicated, they have to be looked at from many angles, and one of the most important concerns is not only what the budget will be in 1968, but what it will be in follow-on years. And we do review carefully the run-out costs.

I would just like to emphasize that our present indications, our present estimates show that if the Congress decides to proceed with these new missions, the run-out costs will not increase in subsequent years, but if there are no additional new starts in subsequent years, we will actually be slightly reduced each year.

Now the next chart that I am going to get to, just refer to briefly, on page 2, shows the total research and development program. There are two new line items shown here. The Apollo applications program is one and the Voyager program is the other new line item. I will, of course, discuss these in more detail as we proceed.

I would like to note that the greatest increase in any program area is in Space Science and Applications, an increase of over $87 million, an increase in advanced research and technology of about $50 million, an increas in manned space flight of $45 million, and in tracking and data acquisition an increase of $27 million. This to me is most significant, especially when it is realized that the experimental equipment for Apollo applications as well as the experimental equipment, scientific instrumentation for Apollo, is contained within the Apollo budget.

What this means is that we have reached a maturing point in '68 where the actual hardware developments for our launch vehicles and our spacecraft are falling off and we are more and more in a position to use this new capability.

I am now going to turn to page 3 and discuss with you each of the line items contained on that chart.

You will note that the Gemini program requires no funding in '68. As a matter of fact, in fiscal '67 last year we were discussing with you an estimate of $40.6 million for Gemini. Some very able leadership in the program, and some very hard work by many people brought in this program, with all of its flights, on an earlier schedule than we targeted and the costs were down by some $19 million. The program is now in its final phase. We are having a final conference early next month in Houston, and we have been for some time in the process of seeing that the most able people who worked in the program have equally challenging jobs on Apollo, Apollo application and other projects, and we are transferring the hardware into our other programs, as well as into DOD programs where this hardware will do the most good.

Coming down to the Apollo project, it shows a reduction of $310 million. The items are broken out into the spacecraft, the Saturn, two Saturn vehicles and engine development, all of which show a reduction, as well as mission support, which obviously will require an increase due to the increased activity we are now getting into on Apollo.

Under the spacecraft line, we included of course the development of such items as the command and service module, the lunar module, guidance and navigation, the liability and check-out equipment, and a most important item, spacecraft support. This item includes such things as the development of the Astronauts' suits, the bio-instrumentation, the food, and scientific equipment, and it is this item that provides the funds for analysis of the lunar sample, for the cartographic work that is required to map out the possible Apollo landing sites, and for the instrumentation that will be implanted on the moon by the Astronauts during their landing period.

The uprated Saturn I includes the development of two stages, S-I-B, S-IV-B, the instrument, ground support equipment and the two engines, H-1 and J-2.

Saturn V includes, of course, the three stages, S-I-C, S-II and S-IV-B, as well as the instruments, the GSE, the F-1 and J-2 engines that are procured for the flights and also includes whatever static and dynamic tests are required to completely prove out the hardware.

Under the engine development line we are now in the process of completing the work on the H-1, J-2 and the F-1. As of the end of this year we have completed qualification testing on all three of these engines.

The mission support includes work that is carried out at Houston in the mission control center. It includes the costs of the new computers that will be installed there, the 360-75s that will replace the 570-94s. It includes the mission planning, Astronaut training, mission simulation.

At Kennedy we have the costs of check-out, launch and the instrumentation facilities. We have the reimbursement for the DOD recovery operations. We also include the system engineering, the trajectory analysis and technical documentation in this item.

Now the new line item that I referred to, and which I have already briefly discussed, is the Apollo application program. We have two major objectives with the Apollo application. We believe that there are unique contributions to practical application, operational capability, science and technology, that we can make with this program and, in addition, that we can place the nation in a position to assess on the basis of valid experimentation and experience the value and feasibility of future space flight and the interrelated roles of manned and unmanned systems in order to get the best cost trade-off in the future for ultimate operational systems.

The program includes the conversion of the spin S-IV-B stage into a workshop with an air lock to permit experimentation in long duration flights of up to one year. It includes the command service module modifications for this type operation, including development of a six-man ferry supply and resupply and development of landing capability for the command module.

It includes the use of a manned solar telescope during the peak of solar activity toward the end of this decade. It includes specialized payloads, including multi-spectral earth, weather sensors, biological and biomedical experiments. It includes use of the lunar mapping and survey system to complete the cartography of the moon. It includes modification of the lunar module for a 14-day or up to a 14-day lunar stay time.

Now the funding that we show in fiscal '67 is $80 million. Since we did not have a line item last year, this funding was drawn from the Apollo, where there was an Apollo application sub-item. It was drawn also from the space science and application program, where under both physics and astronomy and lunar and planetary there were items for the development of instrumentation.

The schedules that we have laid out, first for the Apollo, are that Saturn I-B Apollo has planned for it four flights in '67, five in '68 --

QUESTION: Calendar?

SEAMANS: Calendar.

(Continuing) -- and Saturn V Apollo has scheduled three flights in calendar '67, four in '68, six in '69 and two in '70.

I am sure you realize when we talk about these target dates that these are on the presumption that we do not run into development problems that require long duration special testing.

I am sure you recognize that last Friday afternoon we did have the explosion of an X-4-B stage that destroyed not only the stage, but did damage to the test stand and this of course could affect these schedules. But according to the plans on which this program was put together, we would have, if we are to continue, and a decision is made we will continue with the flight program in '69, calendar '69, there would be three Saturn I-B Apollo application flights and three in '70 and four in '71, with the first Apollo application flights in the Saturn V occurring in '71.

Now the line item that you see or sub-line item under Apollo application, calls for $263.7 million in fiscal '68. This provides a commitment, contractual commitment for four S-I-Bs, and two command and service modules, with long lead items for three additional Saturn I-Bs, two Saturn Vs, and three command and service modules.

It is interesting to note that in '68 we do not have even long lead items for the lunar module. This is because in the Apollo application program at this budget level we found that it was best to place a lunar module in orbit around the earth and to use it on a reusable basis and consequently rather than supplying a new one for additional follow-on missions, to be able to come back to it and obtain results over a long period of time.

The experiment sub-line item under Apollo application shows an increase from 35.6 to 140.7 million dollars. This item covers both the experiment definition as well as development, design, fabrication and test, and it includes such items as the telescope mount on which will include then the solar experiments, pointing them at the appropriate part of the sun in order to obtain data during the height of the solar activity.

Mission support, 50.3, covers the same kind of items contained under Apollo mission support.

The time has come when we must detail the plans, when we must integrate the total program together with the operational phase in order to carry out these significant missions.

Under advanced mission studies we show $8 million in fiscal '68. These cover earth orbital studies. We are looking at space station modules for large astronomical observatories, and looking at a variety of earth application.

We are looking in our lunar studies at shelters and ways and means for extending mobility on the lunar surface.

We are looking also in this item at longer term, further away missions, Mars Fly-By and Lander, and we are also including some studies of our launch vehicles, particularly with an eye to improving Saturn and four reusable re-entry vehicles.

Now turning over to the space science and applications, first is physics and astronomy. The work under physics and astronomy includes a study of the space environment about the Earth, of the Sun and its relation to the Earth, of the total interplanetary medium and of the fundamental physical nature of the universe.

The first -- first let me say the physics and astronomy program shows an increase in 1967 from $130 million to $147 million. This is broken down into supporting research and technology and advanced studies. This permits us to go out on grants and contracts to experimenters in universities and elsewhere, to look at the data that is already obtained, to consider what might be done in the future with the opportunities that are evolving, to come in with a definition of experiments, and in turn to develop breadboards of the required instrumentation, this being done prior to actual acceptance of an experiment into a flight mission, at which time the funding shows under the particular sub-break that includes all of the costs of that mission.

The solar observatories, the OSO has already given us three launches, two of these were highly successful, and we are planning in 1967 to have two additional launches and then one each calendar year in 1968, 1969, and 1970.

As you know, the first astronomical observatory did not operate successfully. We had a number of difficulties with the power supply, the stablization control system, to mention two. This particular program has undergone intensive review by the contractors and by NASA. We are making major design modifications and we will carry additional testing before proceeding with the flight missions that are now planned.

The next flight will be in calendar '68, it will be primarily an engineering flight. We have loosened up the tracking requirements for this flight to plus or minus one minute of arc, which will still give us useful scientific data. But the next two flights, in '69 and '70, will have large apertures for astronomical purposes and will require that we have tracking accuracies in '69 of one second of arc, and in 1970 of a tenth of a second of arc.

The geophysical observatories to date are three in number, two elliptical and one low Earth polar. Two of these did stabilize the way they were intended. All three, however, are still giving useful information, they are all now in a spin mode, and of the 61 experiments installed on these three observatories, 47 are now useful to the experimental.

We have planned in the future three more flights and that will terminate the program. There will be two polar and one elliptical in calendar year '67, '68, and '69, one each year.

The Pioneer program is for the investigation of the interplanetary medium. The first two are still working. There are three more planned, one to go out roughly 20 percent further away from the Sun than the Earth is, one to go about 20 percent closer and one to be at about the same radius from the Sun.

The Explorers include our small scientific satellites, which go into a variety of orbits, as you know, as well as our so-called in-program, as well as many of our international programs carried out with United Kingdom, the Italians and the Germans. There are eight planned this year and six in subsequent years.

Sounding rockets provide a very great opportunity to place into orbit newly engineered and designed experimental hardware as well as to carry out observations that cannot all be made from space. We are planning to continue that program at 100 a year.

The sunblazer is a new project. This project will permit us to go within about four-tenths the distance of the Sun measured from the Earth, and by transmitting from the other side of the Sun to obtain electron density and other features of the solar corona. This will use a five-stage Scout. One is planned in '68, two in '69 and '70.

Finally we show data analysis. We have at Goddard our National Space Science Data Center where we collect, catalog, store and disseminate scientific information, and the $2 million shown here is to support that effort.

As you scan down the various budget items, you can see that the significant increase in the budget does come from the astronomical observatory, and we found we had to make the very difficult decision as to whether we should really move in and core out the necessary design changes, and the additional testing required, and we felt that with the tremendous scientific interest in astronomy, because of the things or the work that can be done outside of the atmosphere, that cannot be done within the atmosphere, that we should proceed.

Next, the lunar and planetary exploration. This shows a reduction from $169 million to $142 million in '68.

The Ranger is no longer under consideration. We show Surveyor and Lunar Orbiter both at less than 50 percent or thereabouts of the '67 figure. These two projects are in part in support of Apollo to gather the data needed to land the men on sites that will be satisfactory as well as for the gathering of scientific data. And the extent to which we can gather data will depend on our success in the next few firings of Surveyor and Lunar Orbiter.

We are in any event gathering very significant data. But depending on how the program goes, will depend whether we can explore some areas other than the landing sites.

We have four Surveyors planned this year, two Orbiters this year, one each of Surveyor and Lunar Orbiter next year.

The Mariner program shows roughly a doubling of effort, going from '67 to '68. We have in this calendar year the Venus flyby and then we have in '69 a Mariner flyby that will use the Atlas Centaur. We will have for that reason a larger payload capability, we will be able to have improved TV equipment for picture taking, as well as IR and UV measurements.

Then in calendar '71 we will have two additional Mariner shots, each one of which will carry a scaled down Voyager entry capsule, which will provide us important data from within the Martian atmosphere.

Nest we come to the other new line item that I mentioned, the Voyager. I might say at this time that we agreed with the committees of Congress that at such time as we were recommending that we proceed with the actual development and flights in both Apollo application and in Voyager, that they would be included as line items. We show an increase from 10.4 to 71.5 for Voyager. The

10.45 comes from the $10 million that the President requested for this year, plus $450,000 for the automated biological laboratory that previously was contained in the bioscience line item.

I am sure you are aware that the purpose of the Voyager is to survey from orbit, as well as obtain detailed information from the surface on Orbiter, as well as a lander, and this way to improve our knowledge of the physical and biological properties of first Mars and then other planets, including their origin, and apply both to a better understanding of our own environment here on Earth.

The Voyager program will include both the spacecraft bus as well as a capsule, two of these combined modules will be launched on one Saturn V. Then as the bus or spacecraft, while it is orbiting around the planet, the lander will be relaying information back to it and thence back to Earth.

The sustaining university program shows a decrease in '67 and still a further decrease in '68. I indicated that we reduced the budget from $41,000 to $31,000 in 1967, in connection with our $60 million reduction. However, let me say at this point that there are other funds in our budget which are part of our university program, the research grants and contracts that I have already referred to, and we estimate these to be $85 million in 1967, and $90 million in 1968, so that the combined totals, the total university effort for NASA, will be dropping off by about $6 million as we go from 1967 to 1968.

Now the training program shows the greatest drop. It had been our plan prior to 1966 to build up to a thousand graduates a year with doctoral degrees. On that basis we added 1,300 students in Fy 1966. In fiscal 1967 we will be able to add approximately 800 and in 1968 on this basis we will be able to add about 350.

I would like to point out, however, that the grants go to the colleges on a three-year basis, so that no student who has actually started the program will find that the university cannot provide the agreed-upon fellowship before he finishes his training.

We also include under this line item a sub-line item, faculty summer training programs and items of this sort. The research facilities are provided on campus. It is our feeling that if we are going to tie the research and education together, it should be on campus where there is a variety of work under way in support of aeronautics and space, where we feel that multidisciplinary activities will be beneficial and where the space is not available.

We also in some cases provide facilities for unique and highly specialized laboratories. The research program is running approximately at the same level. This is also multidisciplinary in nature, where we have a variety of work going on in a given univeristy, we feel by adding some additional funds, it is possible to give the university more flexibility and they can accomplish much more for the Government dollars invested.

We have at this time research programs under way in 48 universities on this basis.

The launch vehicle development item shows no funding in 1968. This past calendar year we completed the development of Centaur, and consequently since we have no vehicles under development other than Saturn I-B and Saturn V, we do not request any additional funds.

However, the supporting research and technology item of $4 million is shown henceforth under launch vehicle procurements. This item which shows up at the top of page 5 is extremely important. It gives flexibility to the launch vehicle people to work out trajectories and consider missions for the scientific and technical people.

You will note that the Scout, the Delta, and the Centaur all show a funding increase as we go into fiscal '68. We made a decision, a short while ago, that we would phase out the use of the Atlas Agena and that we would use the Atlas Centaur in the future for the Mariner flights, for the OAO and for the new application technology satellites.

We will, however, continue to use the Thor Agena from the Western Test Range.

Bioscience is the area that permits us to carry out research and developments related to exobiology environmental behavioral and physical biology and also do the work required in the quarantine area, to be sure we don't contaminate the planets when we land there with spores from Earth or that we don't back contaminate as we bring samples back from the

Moon or planets back to Earth.

The biosatellite program, a total of six flights, the first one a three-day flight was unsuccessful in that the retro motor did not fire and the payload is still orbiting the Earth.

The purpose of the three-day flight or two of these, one coming up fairly soon, is to determine the effect of weightlessness and radiation on plant cells and insects. The next two flights are for 30 days and are to determine the effect on primates of weightlessness, particularly with regard to metabolic behavior and cardiovascular and the nervous systems. Following that we have two, 21-day flights of more general biological interest.

Next coming to the space application area, we show an increase from 71.3 to 104.2 million dollars, as we go into fiscal 1968. We are including the geodetic satellite program in here for the first time. It was previously contained under physics and astronomy.

I might say a word about supporting research and technology in this case. We are carrying out studies of navigation systems, communication systems, a variety of studies of studies of the technology of erecting antennas in space, and we are also containing within the $16.6 million our Earth resource studies, and the cost of the two NASA aircraft that are based at Houston that have a variety of sensors that we are using to check the results of the sensors, the sensor information against the ground truth at a variety of sites in this country, sites of geological interest, sites of interest to the Department of Agriculture, and other measurements of this type.

The Tiros/TOS improvement shows a rough doubling from 3.1 to 7.5. We have had 10 successful Tiros launchings. The new item is a launching in 1968 of what sometimes is called the Tiros M, a modified Tiros, which the Weather Bureau is extremely interested in for operational purposes and we have agreed to develop it. It will contain, part of it will be a platform, part of it a spinning gyro wheel. The platform will point at the Earth and contain two Vidicon cameras, two automatic picture transmitters and two high resolution infrared cameras.

Next we show Nimbus increasing from 23.4 to 34.5, with flights scheduled one in calendar '68 and one in calendar '70. We feel that the Nimbus is extremely important for research, for its long haul, to give us the data from within the atmosphere, either by direct measurement from space or indirect, that will truly permit us to understand the total environment in which we live, and to eventually provide weather predictions of up to one to two weeks.

Meteorological soundings are important. We have 50 per year, in addition to the 100 per year I already mentioned. We need these both for development purposes, as well as for actual meteorological measurements.

The French satellite, FR 2, we are in a supporting role to the French Government. They have a program that involves balloons, that will float in the atmosphere, that will have transmitters on them, as well as a satellite to be in space to pick up the data from the baloons and relay the information back to Earth and in this way to determine wind velocity, among other things. We have agreed to launch their satellite, using a Scout vehicle.

We show $2.3 million in 1968 to initiate study of a voice broadcast satellite that would have sufficient power and appropriate antenna that it could broadcast directly into AM-FM radio. We are not considering under this item, however, TV broadcasts. But then under the application technology satellite, we have had one most successful flight, we have another one scheduled in 1967 for 6,000 miles altitude, to do work on gravity gradient stabilization. Then we have the rest scheduled for synchronous orbit, to do further work on gravity gradient stabilization and as I already indicated to include a new configuration that will have a large directable antenna.

The geodetic program is part of a national geodetic satellite program in which we, the Department of Commerce, and the Department of Defense participate. We have already launched Pageos, we have already launched Geos that has a flashing light, beacons, a _______________ _______________ transponder.

In the future we are planning to have additional Geos satellites, one in 1968, one in 1969 and one in calendar 1970. These will be quite similar to the past Geos I, but will also include reflectors so we can test out laser techniques.

End#3

Now coming to advanced research and technology, basic research is, of course, germane to many of the things we are doing, laying the groundwork in such fields as fluid physics, electrophysics, materials, and applied mathematics.

The space vehicle system program shows a modest increase. This is really entirely in the supporting research and technology item. Here we are providing a foundation for a launch vehicle and spacecraft design. It involves the use of high-speed, high-temperature wind tunnels, arc jets, vacuum chambers, and so forth. In this item we are including work that we are carrying out on various reentry designs and also are carrying out some flight tests of new types of parachute, parasail, and parawing configurations, which will be done in context of the Apollo Applications Program. The Apollo Applications Program, however, will carry the actual cost of the hardware and parachutes and so on that are eventually utilized.

The lifting-body flight and landing tests are for the M-2 and HL-10 vehicles that are now out at Edwards at our Flight Research Center. We have already carried out a successful drop test and flare tests and landing of both of these shapes and we are now in the process of putting enough propulsion into each one of these shapes that we will be able to accelerate, after we drop from the B-52, through the transonic region, and gain transonic experience with these special shapes that are designed, of course, primarily to get through the very high speed, very high altitude reentry, but they must also have the capability to travel transonic, subsonic, and land.

The other item I might mention is the small space vehicle flight experiments. One example of this is the work we are doing with balloons, where we send up a package to a very high altitude, as far as the balloon will go, we fire a rocket to accelerate this package up to planetary landing speeds, and then at the atmospheric density that roughly corresponds to the Martian atmosphere we can determine the performance of these shapes.

Electronics systems include work in guidance control, communication, tracking, data acquisition, data processing. We are looking here for long-life attitude control, for improved avionics. We are looking at radio attention measurement problems during reentry. We have work going on in the horizon definition area, looking at the Earth's horizon radiation profile as a function of the season of the year and the latitude and geography, which is important if we are to properly stablize as we travel around the Earth's surface. We are also, of course, in this area carrying out an effort to improve the reliability of components and to provide properly qualified hardware for some of the long-duration flights that we are planning, both manned and unmanned.

The human factor systems work I might say shows an increase from $14.6 million to $19.5 million under supporting research and technology because we are increasing the effort on life support systems for periods up to a year's time or longer. We know we must get into two gas systems; we know we must study the effect of the environment on human beings; and the basic fundamental work will be done as part of this program.

Space power and electric propulsion systems shows a slight increase. It is here that we do work on solar cells, we are interested in the effects of radiation, we are also interested in flexible substrates that permit us to deploy very large areas of solar cells. We are interested in batteries, particularly from the standpoint of high temperature performance. Fuel cells, we want to improve reliability and we are also, of course, working on isotope power supplies and reactor systems.

The SNAP-8 effort is a joint one with the AEC. We show an increase to $9.7 million; their budget shows an increase to $4.5 million. We are working on various pumps, alternators, power conversion systems, and so forth, both as subsystems and when combined into total systems, and running life tests to determine not only how the components interact but how long they will last.

On the nuclear rockets, as I already mentioned, we are not including at this time the NERVA 2. We are, however, carrying out an active program that includes under supporting research and technology $16.5 million of effort where we in NASA are developing jet nozzles and turbopumps and feeds and providing the fuel so that in consert with the AEC, that has the responsibility for the Phoebus 5,000-megawatt reactor that would be required in NERVA 2, if we go ahead, we also show the cost of the nuclear rocket development station operation at Jackass Flats, as well as the cost of continuing, although phasing out of the NERVA 1, where we have two, I believe, additional runs scheduled, and where we are also activating the engine test site No. 1.

In the chemical propulsion we show a total increase from $33.6 million to $38 million. This is entirely within supporting research and technology. The M-1 is phased out, and the large solid motor is also going to be phased out. We will have our third and final half-length firing in June of 1967, at a thrust level of about five million pounds. We believe this provides the necessary technological ground work for eventual use of large solids, but since we have no planned and immediate use, we do not see the necessity for carrying this any further in the budget at this time.

The supporting research and technology item includes both a liquid and solid effort. It permits us to carry out work in a wide variety of disciplines, including combustion instability, propellant injection, behavior of pumps and in particular we have in this item an increase due to emphasis on a toroidal type engine that we believe -- it is still somewhat in the conceptual stage, but enough components work has been done that we believe this effort should be intensified and it is our plan to do so. This is a program that has been coordinated carefully with the Department of Defense, they have an interest in such a potential system, and are also interested in the possibilities of high-pressure systems.

Aeronautics shows an increase from $35.9 million to $66.8 million of R&D.

Let me say, in addition, in our budget we have $3.2 million for facilities and we estimate our administrative operations to be $49.6 million, which if you add it up gives the total of $119.6 million contained in the President's budget under this item. We also estimate that there is $30 million of effort in other areas that is directly applicable to aeronautics and, as you know, there are many other things going on that will affect aeronautics for the long haul. So we have at least $150 million identifiable for aeronautics.

The supporting research and technology includes the items in structures, aerodynamics, propulsion, it includes the use of our wind tunnels and other facilities.

The X-15 program shows an increase from $878,000 to $4 million. This is a hypersonic flight vehicle, the only one of its kind. It gives us unique opportunities for tests at hypersonic velocity and also provides an opportunity for checking out instruments and obtaining scientific data essentially out of the atmosphere.

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We agreed jointly with the Department of Defense that in mid-Fiscal 1968 we would pick up the costs for the operation. They run about $8 million a year. So as of that time we p ick up the funds, they will phase out of the DOD budget, except insofar as they have special tests which they will then incrementally fund.

The supersonic transport area, we are providing very great technical support to the FAA and the industry. We had a large number of people, well over one hundred, in support of the FAA as they evaluated their proposals. We had already done substantial work on the various configurations that enter into the work done by the contractors. We are continuing with research on such things as sonic boom, stability and control, heavy emphasis in propulsion and studies of such things as the effect of dust and radiation at high altitude and also use of simulators, as well as a jet star, with the flight research laboratory, that has been fixed up to represent at landing speed the dynamics of proposed supersonic transports.

The XB-70 flight research program becomes active as a research tool in 1967. This is a joint program with the Department of Defense. We show $10 million in 1968, and the effort here will be devoted primarily to two things, one an investigation of the sonic boom, and secondly, an investigation of handling qualities where we will have the same pilots flying our simulator at Ames, our Jet Star, and the B-70, in order to correlate back and forth and be sure we have a good instrument, if you will, for predicting the future dynamics and flyability of the supersonic transport.

I purposefully jumped over V/STOL aircraft and hypersonic ramjet experiments, because the XB-70 is so close to the supersonic transport. The hypersonic ramjet experiment sub-line item, we include funds to develop a small ramjet that will be tested if it can be successfully developed under the wing of an X-15. As a part of the V/STOL program, we are flying a wide variety of configurations supplied to us by the Department of Defense and also we are working directly with a number of the contractors.

Aircraft noise reduction starts with a noisy engine, if you will, and see what can be done to contain the noise. We are working on sonic choking of the inlet, we are working on acoustical treatment of the discharge ducts, we are also working on flight path control to see if the noise on the ground can be abated by coming in at higher glide angles. The quiet engine development gets more at the source of the problem to see what can be done by making design modifications of various parts of the engine that will not substantially affect performance, but will have an effect upon the noise. This is work to be done at Lewis Center.

The Delta X-15 provides funding for a wing change configuration on the X-15 by changing the wing shape and then flying it. We believe we can obtain aerodynamic and structural data possibly up to Mach 8.

The F-111 aircraft, this includes funds for an F-111 aircraft being loaned to us by the Air Force for work out at our flight research center. This aircraft is now at the center.

The F-106 aircraft is not a check of the 106 itself, it is used as a test bed. We have a small jet engine with a cell that is similar in its inlets and exhaust to the SST and this will be flown under the F-106.

jonl

Now a few words about tracking and data acquisition. Obviously the operations will show an increase as we move into the very extensive flights for Apollo. The equipment, however, does show a decrease. The equipment, half of that is in support of the manned program, and we are putting into all of our major stations dual uniform S-bands that will permit us to operate with two spacecraft simultaneously at S-bands.

Under operations, we include of course manned space-flight network. Here we have five ships, eight instrumented aircraft that are coming on line. We have three 85-foot antenna systems, ten 30-foot antenna systems and three 85-foot antenna systems that are a backup mode used primarily for the deep space net.

We also include the satellite network, both the electronic and optical, the deep net operated by JPL, instrumentation at Wallops and Flight Research.

All of our communication, including the cost of the satellites in Telsat and the data processing including the real time control of space vehicles, as well as analysis of scientific data.

Technology utilization, $5 million. The primary objectives are to establish effective systems for evaluation, identification, and new scientific and engineering knowledge in the NASA program and also to carry out, if you will, a review of the success with which we are carrying this out and to carry out experiments with new techniques before so doing.

jonl

Page nine shows a summary of construction of facilities at each one of our centers. I will discuss this briefly, starting with page ten.

We show at Kennedy Space Center $24.8 million, 16.6 of this is for continuing construction and outfitting of Launch Complex 39. This includes activation of the third high bay area in the vertical assembly building.

We had also showing 5.7 for alteration and rehabilitation of Complexes 34 and 37, repairs need to be made, replacements made and some renovating needs to be done.

We show $2.3 million for alterations to Launch Complex 17 resulting from the introduction of the long tank Delta, which is launched from this facility.

At the Manned Spacecraft Center we are modifying environmental testing lab in two ways. We are putting double man locks in Environmental Chamber A for safety reasons, and we are also improving the solar simulators in both Chambers A and B.

The Jet Propulsion Lab shows two items. One, we believe it necessary in these critical long-range missions to have standby power in the case of any kind of emergency situation. That is the $1.9 million item. And we also show $1.2 million to add to the space flight operation facilities on Area 4 system development and for test-out test of automatic data processing equipment before actual introduction into the deep space net.

At Ames, two items of importance. One, a space science research laboratory, $2.2 million, where we will be able to bring together the space science division that has been responsible for the Pioneer, for example, and to consolidate the research equipment there.

We also show modification to the 3.5 hypersonic wind tunnel that will permit us to go from 3500 Rankine to 4500 degrees Rankine.

Electronic Research Center, we show a new laboratory for qualification and standards type work on components in order to get a better handle on reliable components for

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current and future electronic systems.

At Lewis in the past we have been renting 3000 acres in a buffer zone. The owner doesn't want to rent any longer and we feel it is necessary to procure this acreage in order to protect the area where we are carrying out the more hazardous work of the Lewis Center.

Finally let me say the phased array antenna system for Goldstone is important to the Sunblazer program. It is here that the signals from the Sunblazer will be received.

Finally we show the $3 million for final design of facilities that may be presented in the 1969 budget, as well as preliminary design of items that might be presented in the 1970 budget.

Now just a word or two about manpower. On the last page, page 13, it shows the manpower at all of our centers at the same level in 1968 as in fiscal 1967 excepting the Electronic Research Center, which shows an increase of 300 personnel. In order to permit us to continue with the growth of that center we need these people.

We also show an increase of 100 at Langley. This is because of the load they are carrying in aeronautics, as well as the work they have been doing in Lunar Orbiter, as well as a role that we intend to have them play in the Voyager program.

If you look back at page 12, and run down the line, you see there is an increase of roughly $24 million for administrative operations going from 1967 to 1968. The major increases are at Kennedy, where we show an increase of 6.9, Manned Spacecraft Center , 2.7, an increase of 7.3 at Electronics Research Center and 4.9 at Langley Center.

In view of the load that you all know is being carried out at these centers, in view of what I have said, I think the reason for this can be discerned.

Looking at the administrative operations budget in toto, you find that the increases are really in two primary areas. One, salary increase, due in part to an increased number of people, and in part to increases in individual salaries, and secondly, in the increased requirement for data processing equipment, both its lease and its purchase.

And this is all I intended to say about the details of the budget. I would like to ask Mr. Webb if he would like to make a few remarks.

WEBB: Ladies and gentlemen, I know it is sort of late and you have had a long day. I will not take more than two or three minutes to try to set this program of the National Aeronautics and Space Administration into a little perspective insofar as the President's total budget is concerned.

I would like to point out to you that if you will examine at page 19 of the budget message itself you will find that the President mentions the inclusion of the nuclear space rocket and prototype supersonic air transport in his contingency funds.

If you turn on over to page 21, then, the specific section on space research and technology indicates the President's view in these words, "In 1961 this nation resolved to send a manned expedition to the moon in this decade. Much hard work remains and many obstacles must still be overcome before that goal is met. Yet in the last few years we have progressed far enough that we must now look beyond our original objective and set our course for the more distant future. Indeed" -- and these are the President's words "-- we have no alternative unless we wish to abandon the manned space capability that we have created."

Two more paragraphs. "This budget provides for the initiation of an effective follow-on to the manned lunar landing. We will explore the moon. We will learn to live in space for months at a time. Our astronauts will conduct scientific and engineering experiments in space to enhance man's mastery of that environment.

"The Surveyor and Orbiter projects, in photographing the moon, have demonstrated dramatically the value of unmanned spacecraft in investigating other objects in the solar system. Accordingly we are proceeding with the development of the Voyager system for an unmanned landing on Mars in 1963. We

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will also continue other unmanned investigations nearer the earth."

I thought you might like to have those references to the specific language.

In recent years, he points out, the work on the nuclear rocket propulsion technology has given indications enough that we should decide whether to go ahead and that this money is in the budget, in case a decision is affirmative.

Then he adds these words, "These new ventures are the result of careful planning and selectivity. We are not doing everything in space that we are technologically capable of doing. Rather, we are choosing those projects that give us the greatest return on our investment."

Now, if I could just give you one word of my own view, I believe that on this budget we can build an excellent foundation for the work that we as a nation will need to do in 1970 and beyond.

I believe it is a balanced program that makes the best use of the resources that we have created since 1958. I believe it includes those items that enable the Congress and the country to clearly see and judge the issues which are basic to our future in space.

I believe it assumes success. That is, that it is a minimum budget for the work that is required and does not provide for losses of stages or for unexpected catastrophes such as are always a possibility in this program.

Now, finally, I believe that this budget indicates that the President knows or believes that we have proven in the National Aeronautics and Space Administration that the space capability of this nation can be developed, that this job he is putting in this budget can be done, and I believe it indicates clearly that he believes it is important that we continue to develop our national space capability.

Now, with respect to manpower, I would like to add one word to what Dr. Seamans has said. In the third quarter of FY 1966 our manpower appears to have peaked somewhat lower than we had previously estimated. We thought it would be up

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to about 460,000. It actually peaked out at 420,000. It is down. It will be down by the end of this fiscal year. Well, it is down now by more than 60,000 from that peak, and by next July 1 it will be down another 25,000 from the present. And in this 1968 budget that Dr. Seamans has described for you, it will go down another 40,000. So in two years' time there will be between 125,000 and 130,000 people extruded from this program and we will end 1968 under our present estimates at a level of about 290,000. That is about a one-fourth to a one-third reduction in those two years.

Now, in the special analysis section of the budget there are a couple of items that I think may be important for perspective. If you will turn to page 123, Special Analysis I, which covers Federal research, development and related programs, you will find the Federal obligations for research and development are estimated at $17.3 billion in 1968, which is down $200 million from the 1967 estimate of 17.5.

Expenditures will go up somewhat, from $16.5 billion in 1967 to 17.1 in 1968.

Now, a very important estimate that relates to NASA's work is in the fourth paragraph on this page. The analysis from the President's office, the Budget Bureau, says this "research and development in the Federal Government is supported to advance major governmental functions which require a high level of technical support such as national defense, space exploration, utilization of atomic energy and the improvement of public health," and these words, "To a growing extent research also is being persued in the context of social problems, such as education, transportation and urban life. A good deal of work is being done to translate what we have been able to accomplish in these very complex systems into those areas."

Turning to page 125, you will find Table I-1, which shows that out of a total of $10,195,000 for development for the Federal Government, the budget breaks it down into two sections and NASA has $3.5 billion out of 10.1, about one-third, and our development obligations are going down. We have gone down from $3.7 billion in 1966 to $3.5 billion in 1968.

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Turn to the expenditures for research and you find just the opposite. NASA's obligations for research go up from $1.3 billion in 1966 to 1.5 in 1968, and the total in 1968 is about one-fourth of that of the Government.

But a very important figure, perhaps the most important one here, is found on the next page, 127, Table I-3, which shows that NASA's obligations for basic research have gone up from $598 million in 1966 to $858 million in 1968, and that NASA, under this budget in 1968, will be spending about one-third of the total funds of the Federal Government for basic research.

Lastly, the facilities for research, page 128, show that our obligations are going down from $277 million to $95 million. That is facilities for research and development.

I think, ladies and gentlemen, those are some of the prospective items you might want to consider as you decide how you will portray this budget to your various audiences.

Thank you very much.

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SCHEER: We are open for questions to Mr. Webb or Dr. Seamans.

WEBB: Or Dr. Mueller or Dr. Newell or Dr. Mac Adams or Mr. Buckley. These are the four program managers under which this work is done.

QUESTION: Early in your discussion, Dr. Seamans, you mentioned some of the operations or plans for Apollo application -- you mentioned the telescope and two or three other items, including something to which you gave the cubic feet, and I didn't get it down. Can you repeat it?

SEAMANS: I was referring there to the 10,000 cubic feet that will be available in what we call the workshop. This involves the use of the S-IVB stage, after we get into orbit, and this stage will be pressurized; it will have an air lock, and the astronauts will be able to use it for experimental purposes.

QUESTION: Have you defined any missions for the first Apollo application's hardware that you are funding in this budget?

SEAMANS: Yes, we have worked out the missions for the immediate program, and it might be well for Dr. Mueller to say a few words about that.

MUELLER: In terms of the first Apollo application, if you are thinking of the use of the alternate Apollo missions, then, yes, the air lock is the first of these, and that will be flown somewhere in the middle of 1968, the mid half, if you will.

QUESTION: Calendar '68?

MUELLER: Yes. And the next will be the Apollo telescope model, the solar observatory, and that will be towards the end of 1968 or early in 1969.

QUESTION: If they didn't go as alternate Apollo, you would use the hardware that you are funding for Apollo application?

MUELLER: Exactly.

mbb2 QUESTION: If they did go as alternate Apollo, have you any backup programs yet defined for the hardware you are acquiring?

MUELLER: In particular the plans are to utilize the air lock workshop and the solar observatory during '69 by revisiting it, and this of course then does not require the implementation of new hardware unless something goes wrong with it.

WEBB: I think you ought to say one more word about that, because this budget makes the transition from the time when we had to count on sending up things, and using them once, to where we expect basically to park large systems in orbit and go back and use them time after time. The work expected under this budget could not be accomplished under the traditional patterns of previous years. It can only be accomplished in some new way like this.

MUELLER: I guess that is a good point --

WEBB: That is what he told the President he could do.

MUELLER: You know we get so engrossed with these things, we don't recognize we really are taking a rather major step. And it is possible to live within a relatively restricted Apollo applications budget, because we are taking advantage of the fact that we can make multiple use of hardware.

QUESTION: Would you tell us a little about the ferry service that you intend to set up for the re-supply and re-manning of these very long duration missions?

MUELLER: Basically we plan to use the command and service module on the Saturn I for those missions in lower earth orbit. And to carry up along on the same flight the expendables for the duration. It would seem that there is an adequate payload capability there to carry both the expendables and those additional experiments that are worthwhile carrying up for the use of the air lock workshop and solar observatory.

QUESTION: Typically, just to follow up, if I might, the President mentions flights of a year's duration.

Typically how long would a crew go up for, and how much of a re-supply would there be from ground up to lower earth orbit in the course of a one-year mission?

MUELLER: Our planning is not complete. We are thinking in terms though of a three-months re-supply venture, although in general we would like to extend our understanding of what the effects of long duration flight are on the crews, and so we would anticipate at least some of the crew members staying up for a year.

WEBB: I think you ought to point out, George, that the basic situation here is that we are stabilizing at a rate of production of eight Saturns a year, four of the little ones, four of the big ones, and we will continue to use those to develop increased capability, and the Apollo hardware will fly on these rockets in the best possible pattern that we can develop to continue to extend this capability. There is no plan at this moment to immediately go up to a one-year capability with present equipment, but to develop the kind of experience that will permit us in the future, using these Saturns we will be producing, to do this.

QUESTION: The $10 million for the B-70, Dr. Seamans, what fraction of the B-70 will NASA own?

SEAMANS: As you probably know, the development of the B-70 was financed by the Department of Defense. We in NASA have been funding for instrumentation for the B-70 program, that is the only hardware involved that has come out of our budget. The $10 million funding has added to it funding from the Department of Defense that is primarily used for fuel and for the various kinds of special instruments that have to be added, and for the data processing afterwards. It is primarily, however, operational funding.

QUESTION: How much time will NASA fly it, roughly?

SEAMANS: There won't be NASA flights and DOD flights. They are going to be NASA-DOD flights. So we will be directly involved in all of the flying of the B-70, starting next fiscal year.

QUESTION: Will somebody elaborate on the decision to phase out solid fuel rockets?

SEAMANS: I believe that I did cover this in my presentation by saying that we have viewed the solid program as a technological development. We didn't know when we started a great deal about ways and means for casting the solids, for developing the nozzles. We didn't know you could take care of the temperature problems, the pressure problems. We now have had two good flights. We have a third one to go which will get us up to very high thrust levels.

We believe that now we have laid the groundwork so that at some subsequent time if there should be a decision to build a new launch vehicle, where the large solid might be, say, the first stage, why we could then proceed on a time scale that would be compatible with integration with the second stage.

We believe that ultimately there may be a launch vehicle that uses the large solid in clusters, or first stage. We believe again the technology is far enough along that we could plan such projects in the future without the technology being a stumbling block. As a consequence, we feel that since there is no approved mission in site that uses the 260 inch solid, that we should terminate the effort and not carry the additional expenses along in fiscal '68.

WEBB: Now there is one other factor, ladies and gentlemen: With a production rate of four Saturn Vs per year established in this budget, the decision as to how to get heavier payloads in orbit would come with the nuclear stage riding on the first stage of the Saturn V in the nearest time period, that is, before we would develop another first stage to leave the ground.

So you do see here a capability under consideration and in the contingency funds of the President to add a nuclear stage as a third stage on a Saturn V. That would give us substantial increases in the Saturn V capability and appears to be a better way to spend our funds, that is, to maintain the production rate on the Saturn V and look carefully into the nuclear stage to get our heavier payloads.

QUESTION: Mr. Webb, we were given to understand at the AEC briefing a few hours ago that there was no vehicle money involved in these nuclear contingency funds.

WEBB: That is right. But you have a good deal of work to do with a 5,000 megawatt reactor and Nerva II even before you come to design and contract for the flight stage. The funds there are to proceed at an expeditious rate to get to a point where you can go to a split stage.

QUESTION: Mr. Webb, do you have any projections on industry employments beyond this 290,000 at the end of '68?

WEBB: No, my assumption is we are going to have a great many issues brought up, and I hope we will have a thorough consideration and debate and when we come out of this Congress, I think that will be time enough to make further projections.

QUESTION: How far in the future can you project this eight Saturn launching, how far in the future, and could I get a check-out again on the $263,700 appropriated for--

WEBB: The 1968 budget includes the money to start the actions to stabilize eight Saturns a year, four of the Saturn I-B, four of the Saturn Vs. We will not be buying four a year in the period immediately after the present fifteen Saturn Vs. We will buy enough to stablize the rate of production and launching at eight per year. So I think you cannot establish any extended period for this until we get through Congress and find out if they will accept this recommendation of eight per year.

SEAMANS: I might add to that when we funded our launch vehicles, you did not fund all of the funds in any one year. We fund for that obligational authority we need that one year. Hence we are buying, with the $263 million ht3

you mentioned, parts of a variety of vehicles which I mentioned in my talk.

QUESTION: Is that Saturn V Nerva combination you just described equal to a manned Mars mission? Is it enough for a manned Mars mission?

WEBB: Yes. The estimates are at the present time that you could make a Mars Fly-by at least with the nuclear stage riding on the Saturn V. With some up-rating of the Saturn V, which as you know is always a possibility in these as we learn to fly these vehicles, there is a possibility of a manned -- maybe I better let you say that, Bob.

Is there any possibility of a man landing or not?

SEAMANS: It does not look as though there would be.

QUESTION: Could you give me a few more details on the S-IV-B you want to remodel into a workshop, how much money you have in the budget, how many units you would buy and is Douglas going to continue as the contractor for that?

SEAMANS: Douglas is the contractor for the S-IV-B. We have McDonald, who was the contractor on the air lock. It appears this will be even more closely coordinated in the future. And I don't have the break-out of the funds with me here to tell you exactly what part of the job, how many of these are included in the $140 million, except to add to what Dr. Mueller said, that we are going to continue using this hardware in orbit for protracted periods of time as soon as we can, but we have to work our way into it.

MUELLER: I can give you at least part of the answer. The air lock itself, that is just the basic air lock without the provisions for expendables, power supply and so on, is about $10 million. Now there are three of these contemplated in the budget.

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QUESTION: I would like to come back to Rudy's subject, if I may. You have expenditures going down, you have somewhere around 120,000 fewer people working on these programs at the end of this. We have got NASA personnel going up by 400. Why does it take 400 more people to oversee the work of 120,000 fewer people?

WEBB: You have got a tremendous amount of equipment that has come out of the work of over 400,000 people flowing toward our installations where many of the environmental test facilities and the final proof of concept work is done, and then parts of that only will flow on to the Cape for launch. A great deal of work has been done by a large number of people on equipments to prove all you need to know to make a flight article.

Now our work load in NASA is increasing very much as a result of this flow. The cost per scientist or engineer is going up by something like 8 percent a year. So in a sense we are getting caught in a very tight squeeze here. We have a very real problem to maintain enough capability with 35,000 people to handle this very, very large operation.

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SEAMANS: In addition, we are working more and more with other agencies, and with the private sector. We are working, as I mentioned, with FAA on such things as supersonic transport and noise abatement. We are working more and more with Commerce, not just in meteorology, but in other areas. We are working with Interior, with Agriculture, with AEC, we have extensive coordination with DOD; we are working with Comsat. And this takes a good many people and fairly sizeable numbers of people to do this effectively.

QUESTION: What is happening to your traditional 80 percent of your money spent with industry? Will we find a shift in that figure now?

SEAMANS: That will shift. It has been slightly over 90 percent; it will come down to the order of 85 percent.

WEBB: Bear in mind 300 of these people go to the electronic research center to build it up from 700 to a thousand. But this is a new kind of undertaking, to do in electronics much of what we have done in high temperature work in propulsion, basic research in electronics.

QUESTION: I didn't quite understand you when you said the track-out costs of these programs you have outlined.

SEAMANS: Run-out costs?

QUESTION: I never caught the figure. Is that the $5 billion level?

SEAMANS: No, if you look at the program plan for '68 it is 511, and the next two years, '69 and '70 show run-out costs between $5 and $5.1 billion, falling off slightly each year. I don't remember the exact numbers. I don't have them here.

WEBB: If you add nothing to the current programs that are now put in the '68 budget, it would take a little over $5 billion to finance them. If you add anything new, you have to go above that figure.

QUESTION: Your downturn in Apollo spending would pick up the slack?

MBB2 SEAMANS: That is correct. We are taking into account the run-out costs on Apollo, on all of the present unmanned programs, as well as the increasing costs in Apollo application and Voyager.

QUESTION: What about your new starts? In future years, aren't they going to add a lot more to the costs?

SEAMANS: That is the reason these run-out costs are so important, that even though they will increase, because we are reaching the conclusion in some programs, like we have just finished Gemini, we will finish out other programs, so the total resource requirement will not increase.

QUESTION: So you are going to hit a plateau for a number of years then?

SEAMANS: It hits a plateau at about $5 billion on the basis of this program we are talking about. Obviously if we start other programs, this causes us to go over the $5 billion.

WEBB: If the work Dr. Mueller is going to do with Apollo application proves that a manned space station carrying a crew of, say, 12, is worthwhile and needed, then you will have to start another project and this expense will have to be added. But as the present programs, like Apollo, run down, these new ones will come up and stabilize, until you add some new projects in future years.

QUESTION: How many new Saturns are in this budget? Could you describe the first flight of Saturn V in 1971 under the Apollo applications program?

SEAMANS: I indicated in this budget we make a major commitment, but that is not full funding, and a large percent of the funds for IV is IB's and two command and service modules and long lead items for three additional IB's and two Saturn V's and three command and service modules and this is --

QUESTION: Just a minute. You have lost us.

SEAMANS: All right. We have twelve Saturn IB's and 15 Saturn V's under the Apollo line item of which we have already launched three Apollo Saturn IB's, so we have nine to go. That is all taken care of under Apollo. Then mbb3 under Apollo application we have a commitment, that is, major funding for four Saturn LB's, and two command and service modules. Then in addition, we have funding for the long lead items on three Saturn IB's, two Saturn V's and three command and service modules.

QUESTION: Would you describe the first flight of the Saturn V under the Apollo applications program? That would be 1971, I think.

SEAMANS: I think we are getting into quite a bit of detail here.

WEBB: We have to fly the first one yet, and if you say what is going to be in Apollo applications before we have flown a single test spacecraft, I think you are asking us to project quite a ways. We do certain planning. But to describe a flight I think is asking quite a lot.

QUESTION: Will it be a landing on the Moon or an earth orbital under the present plan?

SEAMANS: The present plan would call for either a Lunar orbital flight for camera work in order to get additional mapping data of the lunar surface, or for lunar landing where we would be working toward either additional data at other sites or where we would be working towards more mobilities on the surface, more time on the surface at one site.

QUESTION: One more question on Saturn VA, and I am finished.

Saturn V is to be the launch vehicle for Voyager under the landing program for '73. Could you describe the size of the payload?

SEAMANS: Homer, do you want to comment on the weight of the payload?

NEWELL: Well, the entire payload will be about 20,000 pounds, maybe a few thousand pounds more than that. Two payloads, two Voyager payloads, complete payloads, would just about make up the total launch capability to Mars of the Saturn V. Then those break down into subsystems, the major fraction of which is for getting the spacecraft mbb4 to the planet and retroing the system into the atmosphere. At the end of the mission, something like a thousand pounds of scientific equipment could be operable on the surface in the later missions. On the first mission, we would probably have something between 500 and 700 pounds.

QUESTION: I want to ask about this appropriation for the electronic center. You are adding 300 employees there and going up $7 million on your administrative appropriation. This sounds like an awful vulnerable item in this year's climate. I would like to hear a little more about what the center is up to.

SEAMANS: First, let me say the increase appears to be more because of the fact that all the people were not immediately brought on at the beginning of this year, so the funding this year has to take into account the lapse rate for fiscal '67. Now a harder problem, of course, is what important things are we going to do there; are we doing, and what are our plans for the next few years? I believe that one of the most important things for the Electronic Research Center is to better understand component failure of electronic parts, to provide by this understanding and by components redesign and qualification testing to the industry, as well as to the Government, equipment that can take out, take care of such missions as the Voyager, which will last several years, as an Apollo that we wish to fly for over a year's time. We will also be looking at the components reliability under extreme condition, the high vacuum conditions, high temperature conditions, radiation conditions and so forth. In addition we will be getting into certain of the subsystem work on elements for guidance. We have a program now planned with the instrumentation laboratory under Dr. Draper to look at long life gyros of much higher performance, to look at longer life accelerometers of high performance, we are looking at electronic techniques for data processing to see how much more we might put in the spacecraft to relieve the data load and the ground environments. And we are also getting heavily into the use of lasers for a wide variety of purposes.

WEBB: Let me give you a slightly different point of view.

When we started this program in 1961, about 35 to 40 percent of the expenditures at that time went into the aerospace side of the industry, pumps, valves, tanks, engines mbb5 and so forth. Now we are up to about 50 percent going to the electronics industry. By 1970 it is estimated that 60 percent of all of our funds will go into electronic components. A vast amount of materials research has to be done, basic materials research, in 17 research centers. Now we need very much to pull this question of the electronic side together with all of the rest, because the efficiency of the total system is now dependent on the efficiency of the electronic system. So with 60 percent of our expenditures going in -- and this I believe is also roughly equivalent to the DOD side. So the U.S. Government has a tremendous stake here in finding ways for the electronics industry to upgrade their capability and reliability as the space -- aerospace industry has already done. By far the larger part of our failures are in electronics, rather than the other. Dr. Seamans didn't mention ground equipment. We have basic problems in ground equipment to increase reliability of the total systems.

QUESTION: I wonder if by talking about your run-out costs, you are saying that you can live with the $5 billion budget for fiscal '69 and fiscal '70?

SEAMANS: No. We are saying the commitment in '68 does not have any sleepers in it, it will not mean that suddenly the country is committed to much greater budget levels in subsequent years unless there is a decision made to take on new major developments.

QUESTION: How long in the spent stage are you planning a mission; how long duration; and secondly, if the alternate Apollo program goes, freeing the procurements of the Apollo application boosters, would these then be used for revisit to the station, or do you have other missions planned for them?

SEAMANS: We are first of all saying we are working towards a lifetime with the S-IVB of up to a year.

QUESTION: Your first flight?

SEAMANS: No, we are not saying necessarily on the first flight. Our plan does not even call for anything like that period of time to begin with. We are thinking in terms of 30 to 45 days to begin with. Then the order of 90 to 100. Then possibly getting to as much as a year. We feel that roughly doubling the time on each series of flights is a mbb6 reasonable way to go. And will not lead to unexpected physiological or other problems. As to the phasing of the Saturn equipment, the first priority, of course, is for the lunar landing. We feel that with problems such as the blow-up of an S-IVB stage, with the problems we have had on the S-II stage, we must consider the total twelve IB's and fifteen Saturn V's for the lunar landing. However, we are bringing along certain of the experiments, including the air lock and the telescope mount in time that if all of this hardware is not used, we can fly it on alternate Apollo hardware. But this I mean some of the heardware that is now scheduled for the manned lunar landing.

End#8

QUESTION: Could you, Dr. Seamans, elaborate a bit on the Sunblazer shot? For example, when would the first shot come and what would you envision in the way of a spacecraft?

SEAMANS: This is a very simple spacecraft. It weighs on the order of forty pounds. This is based on work that has been going on for some time at NIT. It would involve flying the Sunblazer around the sun, in obviously a different orbit from the earth, to the point where it will be opposite the earth when it is within about four-tenths the distance of the earth to the sun. In other words, it will be in around 35 million miles, while we stay out around 90 million miles.

As it goes behind the sun, with the transmitter that can be carried on it, we will pick up the signals at Goldstone on an experiment somewhat like the one we ran in connection with Mars with the Mariner IV. However, we believe that there is much more that can be learned in regard to the sun, even than we learned about the planets with this technique.

We believe that we can get a great deal of useful scientific data about the sun and the sun's corona by this process.

The first flight I believe is in 1968. There are four scheduled in the program.

QUESTION: Is the 1971 Mars Mariner going to be justified as pure science or in support of the 1973 Voyager?

SEAMANS: Well, you can't distinguish really between the two, because in part we will gain additional information of scientific interest about the planetary atmosphere, for example, but we will use to the best of our ability a scaled-down verion of the capsule so we will be learning about the technology of that capsule entering that particular environment. So, like the Surveyor and Lunar Orbiter, it cuts both ways.

QUESTION: Does that give you enough time to make configuration changes in Voyager, or wouldn't it be frozen by 1971?

SEAMANS: Homer can answer that further. But the Voyager goes at '73 and '75 and we anticipate we will know enough about the atmosphere that there will not be required, but -- Homer?

NEWELL: The basic Boyager design is evolving from two sets of previous technologies, one for the orbiting vehicle, from Mariner and the OGO spacecraft and secondly from the Surveyor lander and those technologies. The Surveyor part, of course, is for the landing capability.

Now, using the Surveyor technique, the Surveyor and LEM technique one can land the spacecraft even if there are winds, there is a weather cocking capability that will be taken account of as the spacecraft lands.

Now, also, you can enter an atmosphere and by using the drag of the atmosphere reduce the speed of the entering vehicle. Now there is a question as to how much the drag will take out of the flight and what one has to do is to design the spacecraft so that between drag capability and the propulsion terminal landing capability you can cover a wide range of possibilities.

We know we can quite easily cover a wide enough range to fit any atmosphere that we are likely to find on Mars.

Now, the 1971 Mariner flight will give us the data to tell us where, within the range, to finally set the mission profile. But we will have designs so we can set it.

QUESTION: Dr. Newell, can you estimate at this time the total cost of getting Voyager to Mars in 1973?

NEWELL: The total cost of the Voyager program for four shots, two in 1973 and two in 1975, including the launch vehicles and operations, is on the order of $1.8 billion, our present estimate.

SEAMANS: We are talking about two launches, one in 1973, one in 1975, with two spacecraft on each. In other words, four spacecraft, without the Saturn, I believe, is estimated at $1.8 billion, or a total with the Saturn V of slightly in excess of $2 billion.

QUESTION: Mr. Webb commented on the President's message. At page 22 of the contingency funds there are two sentences that are very interesting. The first says "We are now considering whether that effort" -- discussing nuclear rocket technology -- "should be expanded to the development of the rocket itself." And he goes on to say "The overall budget allows for the possibility, if an affirmative decision is reached." Do you expect that decision to be reached soon, and if so, when?

WEBB: I expect the decision to be reached and I hope very much it will be affirmative, to authorize the expenditure of the funds now in the contingency funds during fiscal year 1968 to proceed with the next steps toward the reactor and the NERVA II engine. That work will have to proceed before the next decision, which is to build a flight article.

The work that goes on in 1968 will not be to design a flying rocket, but it must be done before you can make the rocket as the President has I believe correctly stated.

QUESTION: Will that be in calendar 1968, when the decision is reached?

WEBB: The decision as to whether to spend the money in fiscal 1968 will have to come from this Congress. The President will send another message and say, "I now recommend we take the money out of the contingency funds," and then the Congress will act on it.

QUESTION: I would like to come back to Dr. Newell and ask if the situation on the decline in funds on Orbiter and Surveyor represent a decision that the major post-Apollo exploration of the moon will be by men rather than some of the unmanned plans that existed before.

NEWELL: No. What that represents is leaving the decision on that until we have more information available.

SEAMANS: But it does mean termination of those two projects. This is one of the tough decisions we had to make in the program. As to how they might be reactivated, we can only guess at this time.

WEBB: Did you want to say something more about Sunblazer, Dr. Newell?

NEWELL: No. Bob covered that very completely.

QUESTION: I would like to find out what are the types of factors being considered to get to that decision on NERVA 2. Are these financial factors or are they scientific and technological, because Milt Klein has indicated repeatedly from a scientific or development standpoint they seem to be ready.

WEBB: There is no problem in the technology. We are sure we can do it. The question relates to the paragraph I read you, saying we have had to be very collective. We can do many more things than we have the resources to do or wish to apply resources to at this time. I think the decision will relate to the total evaluation of our position in space and whether we feel we must start the development of that program this year, which means a possible flight in 1977. So you are not talking about something that is going to fly in the next three or four or five years. So I think the question will be an evaluation of whether we really need to substantially increase the weight lifting capability of the Saturn V and then the question, if so, when.

QUESTION: Mr. Webb, earlier today Dr. Hornig commented that so far as the contingency money for NERVA 2 is concerned, if a decision weren't made by spring, we could pretty much count that out for the upcoming budget.

Would you care to comment on that?

WEBB: Well, there are many ways that you have to think of the budget. I mean the President has put it in the funds to indicate that if it is authorized, it will not add to the present budget.

Now he can send up a message requesting the Congress, or Congress can take the initiative and say we think it ought to be in, and increase the amount the President recommended or write it in the law. There are many ways this can be done. I don't believe I want to forecast any date at which it could be done. It could be done at any time Congress wants to put it in the budget and approve it.

QUESTION: Has anybody gotten an overall ball park guess of what it would cost to develop the NERVA flight vehicle, and if so, if there are enough missions in the future, manned missions in the planetary system that you could feasibly amortize this vehicle then?

WEBB: Shall we let Dr. Adams take the quest of the cost? I hate to start estimating costs on something that will run to 1977, where we haven't yet made a decision. You see, you can stop at any year, and if the costs continue to go up as they have in recent years, any estimate you give could be wrong by a good amount. I think the real question you need to think about, and consider very, very carefully is the fact that we have developed a technology that will give us a specific impulse of about twice what we are able to get from conventional fuels. With nuclear capability, we can almost double the capability of the Saturn V for most missions.

Do we need to do that, to develop the capability and make a flying prototype which is in the general area of let us say $2 billion? But now to produce and go into production and operation with such a vehicle is quite a different matter. That decision certainly wouldn't be made for several years. So I don't want to forecast it.

Do you want to add to that, Mac? Is that out of order? I don't want to be too inaccurate about it.

ADAMS: That number is very much in order.

Regarding the question of amortization, I think it is a most important one, if you consider the cost of carrying payloads to high orbits, to a planet, or to the Moon, one can show a very favorable trade-off, the nuclear rocket can be amortized after a relatively small number of flights.

SEAMANS: It is important to recognize the nuclear rocket, with the much higher specific impulse is very valuable on a Saturn V when we wish to put very large changes in velocity into very large payloads. And this does not necessarily involve going to planets, as Dr. Adams indicated, there are Earth orbital missions that might require this, either large plane changes or going into synchronous orbit, for example.

End310

WEBB: And logistic systems to the Moon.

Let me say one other thing about this. We have developed the technology to move ahead into these new areas. We are dealing with an unlimited medium, not limited like the oceans or like the air. It is going to be a predominant factor in the power relationships among nations for an unlimited time. While the technology of the sea lasted about

400 years, the air technology was dominant for 60 years, two generation, here you are dealing with an unlimited thing. I, myself, cannot conceive of any situation within which the need, the essential requirements for both the security and welfare of this nation will be limited to what the Saturn V can carry. You can make rendezvous with two Saturn V payloads or more. You can also make a nuclear stage to double the capability. But the nuclear stage is an efficient way to get propulsion in space. And we are dealing with a basic problem of power relationships and forward thrusting technology where the knowledge gained of how to use materials and energy in very sophisticated ways comes from a nuclear development of quite a different order of magnitude than it does from any other type of conventional fuels.

So you have several different factors urging the development of this stage. I for one am very strongly in favor of it and recommend it.

QUESTION: You mean it has a military capability, is that what you are saying, sir?

WEBB: What I am saying is we have built in the Tital III a rocket that the military believe is very useful to them and is doing useful work for them. Saturn I-B and Saturn I-V have capabilities beyond the Titan III, or by that capability.

We have also got in Huntsville, New Orleans, Mississippi, Houston and the Cape investments of almost $2-1/2 billion that give us a capability to operate for 50 to 100 years. I am saying all of these things can carry civilian payloads or military payloads or any other kind of payload you can conceive of.

The policy, the law gives the President the opportunities to work in the civilian field for peaceful purposes for the benefit of all mankind, it gives him the ability to work on the military side when and if this is required and he stated it better than I can his policy which is to stay with the civilian side, with the development of this arena free of military weapons of mass destruction, to the fullest extent he can, but always ready to use any of this capability in whatever say is required for the benefit of the country.

So you have to look at nuclear rocket along with all of the others, in terms of what the nation may need.

QUESTION: Mr. Webb, twice you have mentioned the date 1977 for nuclear rockets, yet in an address delivered a few weeks ago by a high official of Douglas Aircraft he said it was doubtful the nuclear rocket could be ready for 15 years. This is a difference of five years.

SEAMANS: I would say the date of 1977 could be met for a test flight of an experimental engine if we proceeded in fiscal 1968. The actual operational use of a nuclear rocket, I doubt could occur before early around

End #12 1980.

QUESTION: As long as we have been talking about nuclear so much, I wonder if we could turn for a moment from the very, very expensive programs to a more modest one. We have come across in the past couple of years a couple of small studies funded by NASA, of $25,000 or $30,000, on shielding for nuclear engines for aircraft. Can you tell us what NASA's interests in and intentions are with respect to this?

SEAMANS: Yes. Several years ago we had a very careful review with the size systems command under General Shafer of this project forecast and at that time also reviewed with them work that we had under way in NASA, very long leading kind of work.

QUESTION: This is after cancellation?

SEAMANS: This is after cancellation of the nuclear plan, yes.

WEBB: But after the forecast had been completed indicating a projection of Air Force needs.

SEAMANS: And Air Force felt and does still feel they have a great interest in a plane of long endurance, long duration for logistic purposes and other purposes, and it was agreed at that time we would carefully study, with the Department of Defense, certain of the known technological problems in a nuclear plane, and to do this in the context that planes are getting larger and this might give some relief, but also recognizing the shielding problem, some of the thermal problems and other matters of that sort. And the studies that you are referring to were about ten in number, in different disciplines, carrying out at a low level to better understand what would be involved if a decision was made even to go to experimental hardware.

WEBB: Let me add one thing from the policy side. It is not a bit unusual. If a successful airplane comes out and is going into production, we still follow the development of that. We want to test-fly the airplane to make sure the final flight article, we learn as much from that as we can to help develop the process.

If a project has had a substantial investment and is cancelled, we also will look at the technical fallout of this project and how to put it into the bank of technology for the future. So this is not a bit unusual, and in my opinion does not indicate anything except we are continuing to add to the bank of our technology and are trying to make sure the expenditures are not wasted even if a project is cancelled.

QUESTION: Have you made any decision for 1972 and 1973 Mariner flights to Venus?

SEAMANS: No. We have not. There is nothing in our budget for Venus flights beyond this year. We of course, in our long-term planning, have considered this, but no decisions have yet been reached.

WEBB: But there is an increasing interest in Venus, and I think you are going to see a good many people interested in having some flights added to those now projected.

THE PRESS: Thank you very much.

(Whereupon, at 9:00 p.m., the briefing was concluded.)

NEWS

NASA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

TELS. WO 2-4155
WO 3-6925

FOR RELEASE: Upon release of
President's Budget Message
Noon EST Tuesday
January 24, 1967

Background Material

NASA FY 1968 Budget Briefing

HOLD FOR RELEASE AT 12:00 Noon EST Tuesday January 24, 1967

NOTE: This statement relates to the 1968 Budget and is subject to the same conditions. There should be no premature release of this statement nor should any of its contents be paraphrased or alluded to in earlier stories. There is a total embargo on the Budget until 12:00 Noon, Jan. 24, 1967, which includes any and all references to any material in the Budget or the Budget Appendix, or supporting statements.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

APPROPRIATION AND BUDGET PLAN SUMMARY

(In thousands of dollars)

New Obligational Authority and Expenditures:		FY 1966	FY 1967	FY 1968
Research and development........	NOA	4,502,164	4,235,100	4,324,500
	EXP	4,741,128	4,680,800	4,470,000
Construction of facilities......	NOA	60,940	85,000	54,200
	EXP	572,446	280,000	160,000
Administrative operations.......	NOA	611,820	647,483	671,300
	EXP	619,415	639,200	670,000
TOTALS........................	NOA	5,174,924	4,967,583	5,050,000
	EXP	5,932,989	5,600,000	5,300,000

Budget Plan (Amounts for Actions Programed):	FY 1966	FY 1967	FY 1968
Research and development........	4,483,011	4,175,100	4,384,500 a/
Construction of facilities......	58,208	85,000	54,200
Administrative operations.......	611,186	647,483	671,300
TOTAL........................	5,152,405	4,907,583	5,110,000 a/

a/ Includes $60 million of prior year funds applied to FY 1968 budget plan.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

RESEARCH AND DEVELOPMENT PROGRAMS

BUDGET PLAN

	(In thousands of dollars)		
	FY 1966	FY 1967	FY 1968
MANNED SPACE FLIGHT	3,199,507	3,024,000	3,069,200
Gemini	197,275	21,600	---
Apollo	2,940,985	2,916,200	2,606,500
Apollo applications	51,247	80,000	454,700
Advanced mission studies	10,000	6,200	8,000
SPACE SCIENCE AND APPLICATIONS	759,093	607,100	694,600
Physics and astronomy	142,753	129,800	147,500
Lunar and planetary exploration	204,300	169,400	142,000
Voyager	17,097	10,450	71,500
Sustaining university program	46,000	31,000	20,000
Launch vehicle development	57,790	31,200	---
Launch vehicle procurement	178,700	122,400	165,100
Bioscience	34,400	41,550	44,300
Space applications	78,053	71,300	104,200
ADVANCED RESEARCH AND TECHNOLOGY	288,596	268,150	318,000
Basic research	22,000	21,465	23,500
Space vehicle systems	35,000	33,935	37,000
Electronics systems	32,300	33,597	40,200
Human factor systems	14,900	16,175	21,000
Space power and electric propulsion systems	45,200	40,440	45,000
Nuclear rockets	58,000	53,000	46,500
Chemical propulsion	39,700	33,638	38,000
Aeronautics	41,496	35,900	66,800
TRACKING AND DATA ACQUISITION	231,065	270,850	297,700
TECHNOLOGY UTILIZATION	4,750	5,000	5,000
TOTAL	4,483,011	4,175,100	4,384,500

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MANNED SPACE FLIGHT

BUDGET PLAN

	(In thousands of dollars)		
	FY 1966	FY 1967	FY 1968
GEMINI	197,275	21,600	---
Spacecraft	98,872	9,150	---
Launch vehicles	72,900	2,900	---
Support	25,503	9,550	---
APOLLO	2,940,985	2,916,200	2,606,500
Spacecraft	1,233,800	1,250,300	1,036,300
Uprated Saturn I	274,786	236,600	156,200
Saturn V	1,134,871	1,135,600	1,108,500
Engine development	133,200	49,800	24,500
Mission support	164,328	243,900	281,000
APOLLO APPLICATIONS	51,247	80,000	454,700
Space vehicles	8,500	38,600	263,700
Experiments	40,347	35,600	140,700
Mission support	2,400	5,800	50,300
ADVANCED MISSION STUDIES	10,000	6,200	8,000
TOTAL MANNED SPACE FLIGHT	3,199,507	3,024,000	3,069,200

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

SPACE SCIENCE AND APPLICATIONS

BUDGET PLAN

	(In thousands of dollars) FY 1966	FY 1967	FY 1968
PHYSICS AND ASTRONOMY.................	142,753	129,800	147,500
Supporting research and technology/ advanced studies..................	20,594	19,900	19,900
Solar observatories.................	19,052	9,800	11,900
Astronomical observatories..........	22,300	27,700	40,600
Geophysical observatories...........	28,215	24,000	20,000
Pioneer.............................	12,700	7,200	7,500
Explorers...........................	18,592	19,200	21,600
Sounding rockets....................	19,300	20,000	22,000
Sunblazer...........................	---	---	2,000
Data analysis.......................	2,000	2,000	2,000
LUNAR AND PLANETARY EXPLORATION.......	204,300	169,400	142,000
Supporting research and technology/ advanced studies..................	23,000	20,900	20,900
Ranger..............................	1,000	---	---
Surveyor............................	104,634	84,500	42,200
Lunar orbiter.......................	58,081	28,800	10,000
Mariner.............................	17,585	35,200	68,900
VOYAGER...............................	17,097	10,450	71,500
SUSTAINING UNIVERSITY PROGRAM.........	46,000	31,000	20,000
Training............................	25,290	16,000	7,000
Research facilities.................	7,850	4,000	3,000
Research............................	12,860	11,000	10,000
LAUNCH VEHICLE DEVELOPMENT............	57,790	31,200	---
Supporting research and technology/ advanced studies..................	4,000	4,000	---
Centaur development.................	53,790	27,200	---

SPACE SCIENCE AND APPLICATIONS (Continued)

	FY 1966	FY 1967	FY 1968
LAUNCH VEHICLE PROCUREMENT.............	178,700	122,400	165,100
Supporting research and technology...	---	---	4,000
Scout................................	11,700	9,400	16,800
Delta................................	27,729	20,900	32,600
Agena................................	70,669	37,100	24,700
Centaur..............................	65,000	55,000	87,000
Atlas................................	3,602	---	---
BIOSCIENCE............................	34,400	41,550	44,300
Supporting research and technology...	11,100	11,550	14,300
Biosatellites........................	23,300	30,000	30,000
SPACE APPLICATIONS....................	78,053	71,300	104,200
Supporting research and technology...	10,839	11,630	16,600
Tiros/TOS improvements...............	2,500	3,100	7,500
Nimbus...............................	22,560	23,400	34,500
Meteorological soundings.............	2,730	3,000	3,000
French satellite (FR-2)..............	---	100	100
Voice broadcast satellite............	---	---	2,300
Applications technology satellites...	34,431	28,470	35,500
Geodetic satellite...................	4,993	1,600	4,700
TOTAL SPACE SCIENCE AND APPLICATIONS....................	759,093	607,100	694,600

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ADVANCED RESEARCH AND TECHNOLOGY

BUDGET PLAN

	(In thousands of dollars)		
	FY 1966	FY 1967	FY 1968
BASIC RESEARCH (Supporting research and technology)......................	22,000	21,465	23,500
SPACE VEHICLE SYSTEMS..................	35,000	33,935	37,000
Supporting research and technology...	26,450	26,635	29,000
FIRE..................................	50	---	---
Lifting-body flight and landing tests	1,000	1,000	1,000
Scout re-entry........................	3,000	4,050	4,500
Project Pegasus.......................	1,500	---	---
Small space vehicle flight experiments........................	3,000	2,250	2,500
ELECTRONICS SYSTEMS....................	32,300	33,597	40,200
Supporting research and technology...	29,848	31,797	39,200
Flight projects.......................	2,452	1,800	1,000
HUMAN FACTOR SYSTEMS...................	14,900	16,175	21,000
Supporting research and technology...	13,000	14,675	19,500
Small biotechnology flight projects..	1,900	1,500	1,500
SPACE POWER AND ELECTRIC PROPULSION SYSTEMS.............................	45,200	40,440	45,000
Supporting research and technology...	38,200	34,940	34,200
Space electric rocket test (SERT)....	3,000	---	1,100
SNAP-8 development..................	4,000	5,500	9,700
NUCLEAR ROCKETS........................	58,000	53,000	46,500
Supporting research and technology...	20,644	16,506	16,500
Nuclear rocket development station operations........................	2,000	3,000	4,000
NERVA................................	35,356	33,494	26,000

ADVANCED RESEARCH AND TECHNOLOGY (Continued)

	FY 1966	FY 1967	FY 1968
CHEMICAL PROPULSION....................	39,700	33,638	38,000
Supporting research and technology...	32,950	30,138	38,000
M-1 engine project...................	2,000	---	---
Large solid motor project............	4,750	3,500	---
AERONAUTICS..........................	41,496	35,900	66,800
Supporting research and technology...	10,186	9,582	18,600
X-15 research aircraft...............	883	878	4,000
Supersonic transport.................	12,331	11,090	11,100
V/STOL aircraft......................	3,200	5,550	7,100
Hypersonic ramjet experiment.........	5,000	2,000	7,000
XB-70 flight research program........	9,896	2,000	10,000
Aircraft noise reduction.............	---	4,800	3,500
Quiet engine development.............	---	---	2,000
Delta X-15 aircraft..................	---	---	1,000
F-111 aircraft.......................	---	---	500
F-106 aircraft.......................	---	---	2,000
TOTAL ADVANCED RESEARCH AND TECHNOLOGY......................	288,596	268,150	318,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

TRACKING AND DATA ACQUISITION

BUDGET PLAN

	(In thousands of dollars)		
	FY 1966	FY 1967	FY 1968
TRACKING AND DATA ACQUISITION..........	231,065	270,850	297,700
Operations............................	127,510	197,400	228,800
Equipment.............................	89,755	59,650	55,100
Supporting research and technology...	13,800	13,800	13,800

TECHNOLOGY UTILIZATION

TECHNOLOGY UTILIZATION.................	4,750	5,000	5,000

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

BUDGET PLAN

	(In thousands of dollars) FY 1966	FY 1967	FY 1968
INSTALLATIONS			
MANNED SPACE FLIGHT	13,350	45,558	30,190
John F. Kennedy Space Center, NASA	6,917	35,758	24,885
Manned Spacecraft Center	4,180	9,100	2,425
Marshall Space Flight Center	1,956	---	870
Michoud Assembly Facility	297	700	2,010
SPACE SCIENCE AND APPLICATIONS	4,388	1,265	4,430
Goddard Space Flight Center	2,400	710	565
Jet Propulsion Laboratory	940	350	3,125
Wallops Station	1,048	205	740
ADVANCED RESEARCH AND TECHNOLOGY	16,866	29,600	13,700
Ames Research Center	2,749	---	5,365
Electronics Research Center	5,000	7,500	6,220
Langley Research Center	8,250	6,100	---
Lewis Research Center	867	16,000	2,115
VARIOUS LOCATIONS	19,376	3,577	2,880
FACILITY PLANNING AND DESIGN	4,228	5,000	3,000
TOTAL	58,208	85,000	54,200

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1968 CONSTRUCTION OF FACILITIES PROGRAM

BUDGET PLAN

	(In thousands of dollars)
PROJECTS BY INSTALLATION	
JOHN F. KENNEDY SPACE CENTER, NASA	24,885
Launch Complex 39	16,660
Alteration and Rehabilitation of Launch Complexes 34 and 37	5,725
Alterations to Launch Complex 17	2,290
Utilities Installation	210
MANNED SPACECRAFT CENTER	2,425
Modifications to the Environmental Testing Laboratory	1,900
Center Support Facilities	525
MARSHALL SPACE FLIGHT CENTER	870
Water Pollution Control	350
Fire Surveillance System	520
MICHOUD ASSEMBLY FACILITY	2,010
Extension of Saturn Boulevard to State Road System	1,130
Repair, Rehabilitation and Improvements	880
GODDARD SPACE FLIGHT CENTER	565
Utility Modification and Installation	565
JET PROPULSION LABORATORY	3,125
Standby Power Plant for Space Flight Operations Facility Deep Space Network	1,930
Space Flight Operations Facility Systems Development Laboratory	1,195
WALLOPS STATION	740
Power and Steam Distribution System Renovation	740

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FISCAL YEAR 1968 CONSTRUCTION OF FACILITIES PROGRAM

BUDGET PLAN

(In thousands of dollars)

PROJECTS BY INSTALLATION	
AMES RESEARCH CENTER	5,365
Space Sciences Research Laboratory	2,195
Heater Replacement, 3.5 Foot Wind Tunnel	3,170
ELECTRONICS RESEARCH CENTER	6,220
Qualifications and Standards/Components Technology Special Purpose Laboratory	4,200
Center Support Facilities III	2,020
LEWIS RESEARCH CENTER	2,115
Land Acquisition (Plumbrook)	2,100
Land Acquisition (Cleveland)	15
VARIOUS LOCATIONS	2,880
Phased Array Antenna System (Goldstone)	2,880
FACILITY PLANNING AND DESIGN	3,000
TOTAL	54,200

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ADMINISTRATIVE OPERATIONS

BUDGET PLAN

INSTITUTIONAL DIRECTOR AND INSTALLATION	(In thousands of dollars) FY 1966	FY 1967	FY 1968
MANNED SPACE FLIGHT	296,936	315,400	323,500
John F. Kennedy Space Center, NASA	81,952	92,658	99,575
Manned Spacecraft Center	86,543	94,989	97,636
Marshall Space Flight Center	128,441	127,753	126,289
SPACE SCIENCE AND APPLICATIONS	73,702	81,222	82,428
Goddard Space Flight Center	64,365	71,211	72,240
Wallops Station	9,337	10,011	10,188
ADVANCED RESEARCH AND TECHNOLOGY	180,671	187,100	200,200
Ames Research Center	33,211	33,739	33,954
Electronics Research Center	6,346	12,252	19,264
Flight Research Center	9,380	9,485	9,630
Langley Research Center	63,529	63,302	68,265
Lewis Research Center	66,383	66,283	66,996
Space Nuclear Propulsion Office	1,822	2,039	2,091
NASA HEADQUARTERS	59,877	63,761	65,172
TOTAL	611,186	647,483	671,300

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

ADMINISTRATIVE OPERATIONS

TOTAL NUMBER OF PERMANENT POSITIONS

INSTITUTIONAL DIRECTOR AND INSTALLATION	Fiscal Year 1966	Fiscal Year 1967	Fiscal Year 1968
MANNED SPACE FLIGHT..................	14,597	14,384	14,384
John F. Kennedy Space Center, NASA	2,589	2,720	2,720
Manned Spacecraft Center..........	4,737	4,634	4,634
Marshall Space Flight Center......	7,271	7,030	7,030
SPACE SCIENCE AND APPLICATIONS......	4,230	4,300	4,300
Goddard Space Flight Center.......	3,712	3,782	3,782
Wallops Station..................	518	518	518
ADVANCED RESEARCH AND TECHNOLOGY....	12,505	12,431	12,831
Ames Research Center..............	2,223	2,171	2,171
Electronics Research Center.......	510	741	1,041
Flight Research Center............	603	590	590
Langley Research Center...........	4,233	4,136	4,236
Lewis Research Center.............	4,819	4,676	4,676
Space Nuclear Propulsion Office...	117	117	117
NASA HEADQUARTERS..................	2,592	2,611	2,611
TOTAL.........................	33,924	33,726	34,126