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Statement of

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Administrator

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

before the

Committee on Science and Astronautics
House of Representatives

Mr. Chairman and Members of the Committee:

Thank you for permitting less than the normal 48-hour requirement for advanced submission of prepared statements in the case of my statement today and Dr. Seamans' tomorrow. This has given us an opportunity to have these statements reflect the present status of the preliminary findings and recommendations of the Board investigating the Apollo 204 accident. We appreciate the consideration of the Committee on this and other matters related to the accident. It is our understanding that when the Apollo 204 Board has made its findings, it is your purpose to have your Oversight Committee examine in detail all matters related to its work and findings. We will cooperate fully in that examination.

A year ago, as we appeared before you to present President Johnson's FY 1967 budget request, we pointed out that the estimates did not allow for failures; that there were many difficulties ahead, and that the margins

between success and failure were very thin. We also pointed out that crucial decisions on the elements of the post-Apollo space program had been deferred, but could not be delayed beyond the FY 1968 budget. Your actions in support of the President's plan for FY 1967 permitted us to procure the long lead-time items and to continue to plan the most effective uses for post-Apollo funds.

During the past year we have finished the Gemini program in which we sent into space and brought back safely 20 men in 20 months. Three successful unmanned flights in the Apollo program demonstrated the performance of the Up-rated Saturn I launch vehicle, the Apollo heat shield, and the Apollo propulsion and navigation systems.

Surveyor I made a successful soft landing on the moon and sent back data of great importance.

We have obtained Apollo landing site pictures from each of our first three Lunar Orbiters.

We have taken the first pictures of the earth from the moon and also from synchronous earth orbit.

We have successfully tested the NERVA I nuclear rocket engine at full power and had successful firings of the half-length 260-inch large solid rocket motor.

We have played a major role in advancing aeronautical research and development.

In manpower and expenditures, our program has passed its peak.

Manpower peaked at about 420,000 during the third quarter of FY 1966, and is now down to about 350,000. It is expected to drop to about 300,000 by the end of FY 1968 under the President's Budget. Expenditures also peaked in the 3rd Quarter of FY 1966 at an annual^{rate}/of about \$6 billion dollars. They have been declining at an annual rate of about \$300 million during FY 1967 and will continue at about this rate during FY 1968. We have succeeded, I believe, in bringing together a first-class team, planning and carrying out a very large and difficult undertaking, and then phasing out each project as it approached completion. Our work force in FY 1968 will average 100,000 less than in FY 1966, and our expenditures \$700 million dollars less. At the same time, our work will be very much more complex.

Not all our efforts have been successful. We have had our difficulties and failures -- most of them of the kind which it has proven almost impossible to eliminate in very advanced developments in aviation and space. We do all we can to avoid them, and when they happen, they bring home the need for a large measure of technical and management strength, as well as flexibility in our planning and use of resources to permit corrective actions and find ways to work around the problems. For example:

-- We encountered unforeseen problems with extravehicular activity (EVA) in the Gemini program. By making new plans for Gemini XII, we were able to conduct experiments which have given us know-how and consequent confidence that we can move ahead to use EVA in future missions.

-- We have had problems with the large hydrogen-fueled S-II

stages of the Saturn V launch vehicle. These have now been largely overcome, we believe, but the first Saturn V launch has been delayed about four months.

-- One S-IVB stage exploded while undergoing test with serious damage to the test stand.

Our most serious setback has been the tragic Apollo 204 accident and fire four weeks ago in which Astronauts Grissom, White, and Chaffee lost their lives. We do not yet know the full effect this will have on Apollo, but by the time you reach the testimony of Dr. George Mueller, I believe he can give you the boundaries of the broad pattern of additional work we will have to undertake.

All in all, during the past year, events have continued to show that success in manned space flight involves a large capability to overcome very great difficulties, as we were able to demonstrate in Mercury and Gemini. Faced as we are with even greater difficulties in Apollo, I have complete confidence that we will also overcome all difficulties in the way of success.

Since 1961 we have many times informed this Committee and stated to public that the risks we were facing were large and that the thin margins between success and failure in these flights justified more budgetary flexibility and support. Some have regarded these statements as unduly pessimistic, and some as merely a stratagem calculated to support our

budget requests. The plain fact is that we are in a business that is both hazardous and highly experimental. We have to do, and to the best of our human, and therefore limited, ability are doing, everything we can to reduce the hazards, particularly to human life. We have seen in Apollo 204 that even small accumulation of additional risk factors when added to the basic and unavoidable risk base can produce catastrophe. But in a highly experimental undertaking, where every step involves new equipment, new conditions, new procedures, new skills, or new unknowns, we can never be entirely sure in advance that we have anticipated all contingencies or have eliminated all possibilities of error or failure. The concentration of explosive power in our larger rockets, when fueled for launch, is awesome to contemplate except in terms of a built-in capability to direct it and control it.

Our whole method of operation is to develop fully integrated systems, to test them thoroughly and to learn from experience. We carefully consider the results of every test -- all the way from laboratory tests of the tiniest components to full-scale flight of our largest and most complex vehicles and spacecraft -- and assess with great care every instance of both success and failure. Our constant effort is to determine what changes in concept, design, or procedures should be made. The process of investigation, assessment, corrective action, and program adjustment we are now going through in the case of the Apollo 204

accident is, in essence, an enlarged and expanded version of the same process that we follow on a day-to-day basis in moving ahead with our work.

This brings me to the most important recent development in our space program -- the fact that in his FY 1968 budget recommendations the President urges that this Nation move forward in 1970 and beyond with a strong program that will meet the Nation's needs in aeronautics and space, that will take advantage of the large investments we have made and the momentum we have gained, and that will continue to give us in increasing measure the scientific advances, the new technologies, and the practical applications that emerge from research and development in the air and in space.

The President's recommendations, in brief, are:

1. To carry the Apollo program through to completion. We cannot now state whether we will be able to meet the goal of a manned lunar landing before 1970. But the decision in this budget -- and this is not changed by the Apollo 204 accident -- is that we will press forward with Apollo and achieve the capabilities for men to operate in space which have been the goals of the Apollo program from the beginning.

2. To follow up the Apollo program, without loss of continuity, with a program to apply and expand the knowledge gained through continued use of the Saturn V, the Saturn I-B, and the Apollo spacecraft. This is called Apollo Applications and its goal is to:

-- Develop the capabilities for long duration manned space flight which are fundamental to the effective use of manned operational systems. With the further development, use and reuse in orbit, of equipment developed in the Apollo program, we believe that we can extend the useful life of some components to achieve mission durations of up to one year or more.

-- Experiment with manned scientific observations from space vehicles of the sun, the stars, and of the earth itself to give us unique information of scientific and practical value.

-- Continue the exploration of the moon after our first Apollo landings.

3. To press forward in the further development of practical applications of our space know-how -- in meteorology, in communications, and in other earth-oriented applications, using the capabilities of the Apollo Applications Program as well as those of advanced unmanned systems like the ATS-4.

4. To proceed with the next major step in the exploration of the planets, through the Voyager program, with the first objective of unmanned landings on Mars in 1973 and 1975.

5. To begin development of the NERVA II nuclear rocket engine which offers the possibility of doubling the capabilities of the Saturn V launch vehicle. This will insure that our future propulsion technology and capabilities will be equal to our future needs.

6. To increase our efforts in aeronautical research to deal effectively with emerging problems of civil as well as military aviation.

A year ago we could only say that the FY 1967 budget would hold open possibilities for the future, and that the program after 1970 would depend on the decisions in the FY 1968 budget. This year the President's recommendations show the way to our future goals.

This budget, in my opinion, represents a turning point in the Nation's space program as important as the decision in 1958 to establish NASA, and the decision in 1961 to seek pre-eminence in space with a broad and expanded program including the goal of a manned lunar landing and return by the end of the decade. In his FY 1968 budget, President Johnson has placed before the Congress a program which says that this Nation must go forward in space and not call it quits at the end of this decade. The President says in this budget, that a continuing vigorous space effort is essential to our national interest, and he shows that the Nation can continue to develop and use its hard-won space capability within the framework of total national needs and resources.

I cannot say that this budget or this program will give us pre-eminence in all major aspects of space and aeronautics. As I have testified before, an annual budget level of at least \$5.5 to \$6.0 billion will be required for this. The FY 1968 budget before you leaves

our margins thin for the work to be accomplished. It does not permit us to move toward important goals as fast as we could or with as much assurance as we would like. But it is a budget which clearly establishes a forward-looking course for the future. It will enable us to do the most important things, and will provide a strong base on which the country can decide at some future time to build additional strength should it be required.

The details of our programs and budget estimates will be presented to the Committee over the next several days by Dr. Seamans, Dr. Mueller, Dr. Newell, Dr. Adams, Mr. Buckley and others according to the plan and schedules which the Committee has established. I believe it will be most useful to you if I do not attempt to cover fully the points to be made in the days to come by these men. Rather I would like to address myself to the topics in which you have indicated a special interest, including our plans to adjust the organization of NASA to the new pattern of work, the treaty on the peaceful uses of space, and to certain other matters of policy.

First, as to NASA organization, my basic thought is that this budget is intended to set the future course of our program. With Apollo and other current programs moving toward completion, we are now considering carefully how best to adapt our organization and management

structure to best accomplish our work load in the new situation. We do not have in mind any sweeping reorganization. We do plan a steady evolution that will enable us to anticipate and meet the organizational needs that arise as the character and content of our program change.

At present, our main job is to make sure the development of new programs does not interfere with the effort required to carry Apollo and our other current programs to successful completion. I believe our present organization pattern is sound and have full confidence in the system under which our government-industry-university teams are now at work.

As we complete programs like Gemini, however, or as we advance from the completion of a major technology program like NERVA I, to the initiation of an even larger program like NERVA II, we will take steps to evaluate the capabilities of successful project leaders, engineers, and managers, and take advantage of their talents and experience to strengthen our current programs and to organize new ones. With this in mind, we have assigned Mr. Charles Mathews, who distinguished himself as the Project Manager for Gemini, to serve as Program Director for the Apollo Applications Program.

From our experience with our lunar vehicles like Ranger, Surveyor

and Orbiter; and our planetary and interplanetary vehicles like Pioneer and Mariner, we have learned a great deal about how rocket-borne scientific instruments can be used to yield large increments of new knowledge about the earth and its place in the solar system. As we make our plans to use the Apollo Applications missions to play a large role in the further development of this effort, we need an organizational arrangement that facilitates the closest relationships between those responsible for the development of an increasing base of manned-flight technology and those responsible for increasing scientific knowledge and its rapid use by engineers and others. Also, since Voyager is a Space Science and Applications project, but will fly on the Saturn V which was developed and tested by the Office of Manned Space Flight, the same kind of close working arrangements between various parts of NASA are very important.

A certain amount of organizational autonomy was undoubtedly needed to get the Apollo project under way, but to continue too much of it into the arrangements for the new programs would not be wise.

For this and other reasons we have assigned Mr. Harold Finger, who has been responsible for the joint NASA-AEC work on nuclear propulsion and nuclear power, to head a task force which is now examining in detail the elements of NASA's present organization and analyzing possible actions which would strengthen them. In the long run, the strength and quality of an organization like NASA depends on advancing and broadening the specialized knowledge and administrative experience of its best people and assigning them to positions that will make the most of their abilities. As we carry out our current programs and plan for those recommended in the FY 1968 Budget, we are also creating a strong reservoir of talent which appreciates and can deal with the total range of problems on which the success of the agency depends, including those related to science, technology, engineering, and management.

We also recognize the need for the introduction from time to time at key management levels of a number of officials with broad experience outside NASA. In this regard, I am glad to say that we have succeeded in securing the services of a number of these, including Mr. Bernard Dorman, who has had a distinguished career with the Aerojet General Corporation. He has joined us as Assistant Administrator for Industry Affairs. General Jacob E. Smart, USAF (Ret.), who has rendered outstanding service in a long series of important assignments in the Air Force, including that of Vice Chief of Staff, is serving as a Special Assistant to the Administrator and, on a temporary basis, as Acting

Assistant Administrator for Administration. Mr. William Rieke, who rendered outstanding service in these positions, has left us to return to private industry.

In organizing the effort required to carry out the new programs proposed in the FY 1968 Budget, we recognize the need for some departures from the pattern of the past. In our major programs we are in a period when the primary emphasis is shifting from the development of capabilities to that of using these capabilities to meet national needs. With the new potentials of manned space flight coming into being, we will no longer have as clear a requirement for the division between manned and unmanned space programs as in the past. Further, in undertakings like Apollo Applications and Voyager, and with the prospect of even larger space scientific undertakings in the future, we have to consider carefully how the pattern of relationships between industry, universities, government, and the scientific community which we have followed can be adapted to best meet the new conditions.

The Apollo Applications Program will be headed by Mr. Charles Matthews and will be under the direction of the Office of Manned Space Flight, but new patterns of working relationships have been developed under which he and Dr. Mueller will work very closely on a continuing, almost day-to-day basis, with Dr. Newell, Mr. Cortright, Dr. Seamans, and myself, in developing the administrative and science and applications aspects of the program. This arrangement will make sure all phases of

AAP are responsive to the needs of our total technology development and science and applications program. In the applications area, including the programs planned for AAP, we are devoting special attention to working relationships with other departments and agencies, including Commerce, Interior, and Agriculture, who have important interests as current or potential users of the new kinds of data that can be obtained from instruments flown in space. At the field level, the work on the AAP program will be handled primarily by the Manned Spacecraft Center at Houston and the Marshall Space Flight Center at Huntsville.

For the Voyager program, we are establishing a new program management office within the Office of Space Science and Applications at NASA Headquarters. Mr. Oran W. Nicks will head this office and the program will be carried out through three field organizations: the Jet Propulsion Laboratory, which will be responsible for the surface laboratory and for tracking and data acquisition, the Marshall Space Flight Center, which will be responsible for the Saturn V launch vehicle and the spacecraft system; and the Langley Research Center, which will be responsible for the landing capsule. The arrangements are designed to make the best utilization of the proven capabilities of the Jet Propulsion Laboratory and of our field centers and laboratories. A close day-to-day relationship with the Saturn V program area in the Office of Manned Space Flight will be maintained.

On the new problems caused by the very large payloads required for the scientific space projects we will be carrying out, we have been considering with the National Academy of Sciences and other scientific and university groups how we can best work with universities and the many scientific researchers who must be involved. One of our first steps is to establish a new Directorate of Science and Applications at the Manned Spacecraft Center at Houston, which will be responsible for the national program of experiments to be carried out by many university scientists working in a number of laboratories in many states utilizing the samples of lunar materials brought back by the astronauts. This new office will also be responsible for the program through which we will work with the many scientists all over the country who will want to participate in the Apollo applications and other programs in the field of surveying earth resources from space. We are endeavoring to work out arrangements so that scientists from universities in various parts of the country and some from abroad can supplement or augment the work they do on their home campuses through periodic use of the facilities of the Lunar Receiving Laboratory at the Manned Spacecraft Center.

Looking ahead to the likelihood that our experiments with the Apollo Telescope Mount will lead to larger manned or manned-serviced systems of astronomical viewing and measuring equipment in orbit, we are considering with the Nation's leading astronomers how best to organize the long-term cooperative effort that will be necessary to derive the

most benefit from such facilities and the data they can obtain.

In the field of international cooperation in space activity, we have continued to make progress within the established pattern of our joint activities with some 70 nations. In addition, we have initiated efforts to extend the scope and character of that pattern to comprehend the kind of larger projects and deeper involvement which will be necessary if interested nations are to continue effective patterns of work with us as we move into the new and more complex programs required to take the next steps in space exploration.

For example, in 1966 we reached a new agreement with the French National Space Commission for the launching of a satellite for balloon tracking which can make a real contribution toward the concept of a World Weather Watch. We also made new cooperative arrangements for providing launching services to ESRO on a reimbursable basis for standby tracking support for Japanese satellite launchings, and for testing Argentine and Japanese meteorological sounding rockets at our Wallops Station. The cooperative satellite projects we are carrying out with the European Space Research Organization (ESRO), the United Kingdom, the Federal Republic of Germany, and Italy continued toward their launch dates in future years.

Our bilateral agreements with the Academy of Sciences of the Soviet Union, negotiated in 1962 by Dr. Dryden, have finally produced the first exchange of meteorological data from satellites over the communications link between Washington and Moscow. This began in

September and continued through most of October. We do not know when the Soviets will be prepared to resume this exchange on an experimental or operational basis. Some small progress was also made during the year under our agreement for the preparation of a joint review of space biology and medicine. Members of a Joint Editorial Board were selected and a detailed outline of the contents of the work was agreed on.

In the calendar year 1967, four international satellites will be launched. These include the Italian San Marco satellite, to be launched from a platform in the Indian Ocean directly into the equatorial plane, ESRO I, ESRO II, and UK III. Five individual foreign experiments are scheduled for flight as parts of the payloads in our own satellites during 1967. Thirteen new proposals for further experiments of this type are under consideration, and we have given tentative approval to 27 specific proposals received in response to our invitation to scientists around the world to propose experiments that would make the most out of our first lunar surface samples.

The task of extending the character and scope of international cooperation in space is becoming one of opening new opportunities to prospective partners. In the future many such opportunities will involve cooperative work in the development and use of large payloads. Whether such opportunities are in fact taken up by the other countries must be their decision. They will have to overcome many of the same

kind of difficulties which will face us in finding ways and means to get the greatest return from these large payloads.

As I reported last year, in December 1965 on the occasion of Chancellor Erhard's visit to Washington, President Johnson made public his strong interest in a major new opportunity for advanced cooperative activity in space if the European nations were prepared to take it up. The President invited European countries to pool their resources in a major spacecraft project as an advanced technological undertaking of significant scientific merit. Possible examples included both a major solar probe and a Jupiter probe. We have explored this proposal with the Germans and other nations, but the European nations have a considerable distance to go in their decision-making processes before they will be able to undertake the allocation of resources required to develop and use the advanced technology which the kind of projects President Johnson had in mind could yield.

It is important to recognize, however, that the President's suggestion has been of great importance. European participants in space research have been stimulated to reassess their programs and interests. It has served also to make clear the continued United States' willingness to participate in major cooperative programs. Perhaps most important of all, in view of European concern over dropping behind us in advanced technology, it has made clear our

readiness to work very closely with the nations of Europe in highly advanced areas from which many benefits and transfers will accrue to them.

In the larger international sphere, following the President's earlier initiative in the recent United Nations session, the United States has completed the negotiation of a treaty on the peaceful uses of outer space. As you know, the treaty is now before the Senate for ratification.

In my view, the treaty places no obligations on the United States which are inconsistent with our interests or which will pose special problems for us in our efforts to explore space for peaceful purposes. We are already more than meeting the treaty requirements for conducting space programs and reporting on them. We, as well as all other nations, will benefit from the treaty obligations to assist astronauts in distress and return them to their home countries, and those relating to responsibility for damage caused by space vehicles.

It is likely that one of the important factors that has led other nations, including the USSR, to sign this treaty and accept the obligations it carries, has been that our successes in space have made it clear that space would not be permitted to fall under the dominion of any single power and that space is a region of much interest and real benefit to all. A prompt approval and execution of the programs

recommended by the President in this 1968 Budget are one of the best guarantees we can have that other nations will find it in their interest to abide by this treaty. If we continue to pursue a strong and continuing national program on a scale and pace that will keep this country at or near the forefront of space science and technology, the treaty can be an important step in the direction that it is in our interest and the interest of all mankind to go. What we continue to do in space and what other nations see that we can do is the most effective means we have to protect these interests.

We have no reason to believe that the Soviets have abandoned their stated goals of preeminence in space or the strong views they have expressed as to its importance in building Communist power. All available evidence continues to make it clear that the USSR has made a major long-term commitment to large-scale operations in space, including manned operations.

During 1966, the USSR carried out five unmanned lunar missions, including the first soft landing on the moon, another soft landing which tested the lunar surface, and the first spacecraft in orbit around the moon followed by two others. They launched two meteorological satellites, and with their two new communications satellites, they are in a position to provide world-wide communications. They announced the launching of a total of 34 Cosmos satellites during the year.

There were no Soviet manned flights in 1966, but a number of their launchings were undoubtedly related to a continuing manned space flight program. Two dogs were placed in a long elliptical orbit and were recovered after 22 days. One Cosmos satellite tested spacecraft maneuverability and another appears to have been an unmanned test of a new space capsule for manned flight. The launching of Proton 3 with a 27,000-pound payload shows that development work on large boosters is continuing in a pattern that can lead to an early capability for the use of large spacecraft for advanced manned missions. The fact that there have been no manned Soviet flights since March of 1965 is what might well be expected if the Soviets are, as I believe, in the process of developing and introducing a new and larger manned spacecraft and booster system for future missions.

In the fall of 1967, the Soviets will celebrate the 50th anniversary of their Revolution as well as the 10th anniversary of their entry into space with Sputnik 1. They may decide to make these important events the occasion for a spectacular demonstration of national prowess in many fields, and they have it well within their capability to include in their total effort such a demonstration in space. Starting with the first Sputniks in 1957, the Soviets have used their space program as a principal vehicle for establishing a strong world-wide image of national technological power, as well as for a rapid strengthening of

their total educational, scientific and technological competence. Their large investments, which have gone on for almost 20 years, and their pronouncements show that they continue to regard their space effort as a national endeavor of great importance to their future. There is no reason for complacency on our part.

I should be very clear on the subject of risks. In moving ahead to utilize the resources made available to us, we have had to take technical risks in the development of our equipment and in establishing our schedules. These have included risks that a particular design or line of development would not succeed in meeting the specifications; risks that schedules might not be met; and that we could not recover from a serious setback because we did not have parallel or back-up developments. But we have not knowingly accepted a higher level of risks in order to meet our manned flight schedules. In our specifications, trade-off studies, test criteria, or mission plans, we have taken no risks to the lives or safety of the astronauts that we could find a way to avoid.

As this Committee knows, we have had a virtual moratorium on the initiation of follow-on space projects for almost four years. In research and development for space systems there is a lead-time of many years between the decision to start a project and the time that the launchings occur. Unless decisions on the Voyager and Apollo Applications

Program are made this year, we will find ourselves with a large gap in our launch capability and our spacecraft development capability. The dispersal of the know-how that we have built up in government, industry, and universities that has already begun will accelerate.

It is my view that with the world situation what it is, and with clear indications that the Soviets are going ahead with a large-scale long-term program in space, it is important that the United States let the world know that we can and will also go forward. Failure to approve new programs this year will be a signal to the world that we are not in space to stay.

In the case of Apollo Applications, we are faced in FY 1968 with the decisions on whether we will continue production, beyond the Apollo program, of the Uprated Saturn I, the Saturn V, and the Apollo spacecraft. Failure to proceed this year is equivalent to a decision to stop production.

In the case of Voyager, the special need for starting this year is to take maximum advantage of favorable opportunities for flights to Mars in 1973 and 1975, and to avoid the technical risks and increased costs of a schedule even tighter than the one we can establish this year.

In the case of NERVA II, the special importance of starting this year is that in doing so, we can take the best advantage of the gains

from work on NERVA I, now being successfully completed, and that we can have the development well under way by the early 1970's when we will need a base of knowledge on which to make decisions on its use.

President Johnson has submitted a forward-looking, but austere and limited aeronautical and space budget for FY 1968. We will do our part, in the days to come, to establish a base of testimony that will merit the kind of support this Committee has given the program in the past.