

## REVIEW OF THE SPACE PROGRAM

WEDNESDAY, FEBRUARY 3, 1960

HOUSE OF REPRESENTATIVES,  
COMMITTEE ON SCIENCE AND ASTRONAUTICS,  
*Washington, D.C.*

The committee met at 10:10 a.m., the Honorable Overton Brooks (chairman) presiding.

The CHAIRMAN. The committee will come to order.

We are happy to acknowledge, as a gift to the committee, a very fine clock, Mr. Secretary, that we have here. I had it put on the lower counter. I don't think Mr. Moeller will object to having it near him where all the members can see it very readily. We appreciate it. It helps us keep up with the time, which goes by in a hurry when you are asking questions in which you are very interested.

This morning the members of the committee are happy to have the Secretary of the Air Force, the Honorable Dudley C. Sharp, who is well known to most all of us here on Capitol Hill, and accompanying him, the Honorable Joseph V. Charyk, Under Secretary of the Air Force. Both have statements, and they are excellent statements. Some of the members have asked for copies to read in advance and I suggest, therefore, to the committee that we allow the Secretary to proceed with his statement, then the Under Secretary with his; and, following that, we will ask our questions.

If there is no objection to that procedure, I think it would be more orderly and we will get along with our work more quickly. Without objection, it is so ordered.

I might say, too, before beginning, that our staff—Mr. Carstarphen, to be specific—undertook to find us a loudspeaker. I know some of the members of the committee undoubtedly have noticed a loudspeaker. It seems to be working very well. It was suggested that we simply have a loudspeaker for the witnesses. The room is small and most of the members can be heard without effort and without need of the loudspeaker. It worked very well yesterday and I think it will work well again this morning.

Mr. Secretary, in this hearing we are requiring all of the witnesses to be sworn and, if you and the Under Secretary would stand, I would like to give you the oath.

Do you and each of you swear that the testimony you will give before this committee in matters now under discussion will be the truth, the whole truth, and nothing but the truth, so help you, God?

Secretary SHARP. I do.

Dr. CHARYK. I do.

The CHAIRMAN. We are very happy to have you, Mr. Secretary. We know of the fine work you have done for many years over in the

Pentagon and I think we are fortunate to have a man of your caliber as Secretary of the Air Force.

Secretary SHARP. Thank you, sir.

The CHAIRMAN. You may proceed with your statement.

**STATEMENT OF HON. DUDLEY C. SHARP, SECRETARY OF THE AIR FORCE**

Secretary SHARP. Mr. Chairman and members of the committee, the Air Force welcomes the opportunity to appear before your committee once again to discuss our activity in the military exploitation of the area above the sensible atmosphere of the earth. We, of the Air Force, share your opinion that space is an important and critical area and that the manner in which we approach its use is vital to the future well-being of the Nation.

In our planning for future weapon systems, we do not differentiate between aeronautic systems and astronautic systems. We have but one purpose and that is to provide to operational commanders those weapon systems that have the capability of performing most effectively the essential military missions with which the Air Force is charged. As the natural consequence to this philosophy the choice of the weapon system to be developed and produced to satisfy a particular requirement is based on the relative effectiveness and cost of the various possible weapon systems whether they operate in the atmosphere or in space.

We are certain that the higher speeds and altitudes and longer flight duration that are characteristic of space vehicles will be just as significant as these same factors have been in the evolution of the airplane as a military vehicle. We are also certain that for the foreseeable future space systems will supplant neither the airplane nor the missile in our inventory of deterrent power but that each class of system will complement the others in the operational forces.

Military space systems have unique and valuable characteristics for certain military functions at the present time. For example, systems now under development can provide reconnaissance information and warning of ballistic missile attack far better than other known methods.

Therefore, we attach a high priority to the development of these systems. It is interesting to note that the first use of the aircraft was also in the role of a reconnaissance vehicle. We anticipate that as we learn more about space and the design of space vehicles they also will evolve into highly effective offensive and defensive weapons.

The Air Force is convinced that the military space vehicle will become increasingly important to our national defense. We are placing emphasis and priority on space weapon systems in our planning and development activities. We assure you that we will continue to do so.

We have within the Air Force a background of experience and knowledge that is directly applicable to the military space vehicle. There is such a close relationship between the intercontinental ballistic missile and space vehicles that the ICBM is, in a sense, a space system. Certainly the space vehicle is a direct descendant of the ballistic missile, just as the ballistic missile is a descendant of the airplane and the winged cruise-type missile. A high percentage of the re-

search and development which has provided the Nation with the capability to place operating payloads into orbit was performed in the pursuit of aircraft and missile programs. It is a source of considerable pride to the Air Force that this is so and that our accumulated knowledge and experience has proved so valuable in the exploitation of space in the interests of national defense.

Succeeding Air Force witnesses will cover the details of our programs for the military use of space. Therefore, I would now like to discuss the National Aeronautics and Space Act of 1958 and the relations between the Air Force and the National Aeronautics and Space Administration.

We consider the National Aeronautics and Space Act to be an adequate basic framework to govern the conduct of this Nation's space activities. We believe that the Congress clearly stated its intent to provide for both the national security and the scientific exploration of space while insuring the most efficient use of national resources. The experience gained in the past year indicates to us that the present legislation and organizations need but little change for the most effective exploitation of space in the national interest. The Air Force is of the opinion that changes such as those recommended in the President's message to Congress on January 14, 1960, are desirable and will attain the desired end.

We do not believe that it is in the best interests of the Nation to add any new organization or organizational superstructure to those now existing. Indeed the trend of the past year has been in the other direction. The number of organizations participating in the program has been reduced and hence the requirement for coordination has been reduced while the quality and timeliness of our coordination has improved. We are confident that this will result in a better national space effort.

There is a historic and traditional relationship existing between the National Aeronautics and Space Administration and the Air Force. The Air Force and the National Advisory Committee for Aeronautics worked together for many years in the solution of common problems and in the process developed a warm and close relationship at all levels. NASA was created from NACA and it was inevitable that these bonds would continue to hold the Air Force and NASA in an effective and desirable relationship. We are happy that this relationship continues to exist both in aeronautics and space activities.

Even though NASA has taken on the new mission of scientific exploration of space during this past year and has experienced a significant growth in both personnel and responsibility, the coordination of our programs has been effective and satisfactory. We are constantly coordinating at all levels and we expect that our coordination will become even more effective in the future.

In one other important regard the NASA and Air Force relationship has been most satisfactory. During the past year we have been able to assist NASA in the conduct of a number of their space programs. We anticipate that the two agencies will continue to assist each other where special capabilities exist in one agency to satisfy a requirement in the other.

To summarize the Air Force position on our national space program, we are convinced that space vehicles will be an important part of our

deterrent force in the future. Therefore, we are pursuing the development of these systems and the operational planning for their use in an aggressive manner.

We believe that the guidance given by the Congress to be effective and suggest that only minor changes be made on the basis of our experience. We are firmly convinced that the division of responsibility between the Department of Defense and NASA is proper and we know that we can continue to work with NASA for our mutual benefit and the benefit of the country.

In view of the importance we attach to our space programs we appreciate the efforts of your committee to insure that our national space efforts are effectively and expeditiously pursued, and we will be pleased to assist you in your most important task. Thank you.

The CHAIRMAN. Thank you very much, Mr. Secretary.

Now, Mr. Under Secretary, you have also a statement here and we would certainly appreciate your proceeding.

#### STATEMENT OF HON. JOSEPH V. CHARYK, UNDER SECRETARY OF THE AIR FORCE

Dr. CHARYK. Mr. Chairman and members of the committee, I am honored to appear before this committee to discuss the interesting and important subjects of aeronautics and astronautics. The Air Force appreciates the intense interest exhibited by this committee in these subject areas and is also appreciative of its concern relative to the enactment and implementation of the legislation which will insure the effective exploitation of programs related to these fields of technology in order to best serve the interests of the Nation.

The Air Force is proud of its history in the field of aircraft and missiles. Our present activities in research and development are geared to take full advantage of this background and experience in advancing the state of the art and in insuring the optimum development and introduction into the inventory of militarily significant weapon systems. It is the responsibility of the Air Force to pursue those avenues of technology which may have a major impact on the manner in which our mission responsibilities can be most effectively discharged.

In this endeavor, we also feel a responsibility to utilize to the fullest information being developed by other agencies and departments of the Government.

We endeavor to maintain, at all levels, close working relationships with such departments and agencies. In the area of interest to this committee, perhaps the most important of such relationships is that with the National Aeronautics and Space Administration.

The Air Force had a long and fruitful intimate association with the predecessor organization, the National Advisory Committee for Aeronautics, and these relationships have been broadened and intensified in the case of the present National Aeronautics and Space Administration.

We view our responsibilities to be the full exploitation of technology for the development of systems to enhance our military capability and strength. We do not view space to be a separate medium, but rather an extension of our previous horizons as a result of expanding

technology. It is our responsibility to exploit to the fullest whatever media will permit better, more efficient, more economical methods for carrying out our military functions.

The expansion of our horizons to include space also permits the development of a capability to carry out functions of military importance that could previously be done in no other way.

In our assessment of the types of activities that should be pursued, we must compare and evaluate other means for accomplishing the same ends. We do not feel that it is our function to explore and exploit the space medium for its own sake. Rather, it is our responsibility to utilize to the fullest whatever means are best for the fulfillment of our defense responsibilities. There will be much that will be learned from the NASA programs that will provide a better basis for our deliberations and decisions and we intend to exploit to the fullest the benefits in knowledge, in hardware, and in capability that will accrue from the existence of a vigorous and effective space exploration program on the part of the National Aeronautics and Space Administration.

The Air Force, for many years, has been interested in the potential that mastery of the space medium suggests for the accomplishment of certain important military functions that cannot be so easily or so effectively carried out in any other way. Perhaps the most significant example is the Air Force program which was initiated as far back as 1946 and which later was designated "weapon system 117-L."

This system was designed to be a basis for enhancing our capability in reconnaissance and warning through the use of families of satellites. The reconnaissance function, both photographic and ferret, was clear from the outset and a little later, the use of such satellites equipped with infrared sensors to serve as a warning system against ICBM attack became apparent.

By today's standards, these initial studies were very crude. However, we must remember that the ICBM, at that time, was but a visionary dream.

The important developments in propulsion, materials, guidance, control, photographic equipment, and infrared sensors that were necessary to make fancy into fact were still in a very early stage. Even so, it was apparent at that time that the successful exploitation of the space medium would have important implications in the reconnaissance area.

This successful exploitation, however, would have to depend on much research and much development in the critical problem areas that I have mentioned. With the advent of a vigorous ICBM program in 1954, these capabilities began to take on more realistic and more imminent possibilities and the effort in these directions was steadily stepped up. The management responsibility for weapon system 117-L was transferred to ARPA in 1958 and was broken down into three programs which were designated Samos, Midas, and Discoverer. The responsibility for these programs was returned to the Air Force about 3 months ago.

While the technology associated with the ICBM program has obviously been of tremendous importance to space exploitation, the effective use of the space medium to carry out military functions in a better fashion and to complement other means for doing a military

job demands certain capabilities which are of lesser importance in the case of missiles or in the case of programs for the scientific exploration of space.

In many instances, the requirements may be quite different. Probably the item of major importance in the use of satellite systems for carrying out military functions is that of reliability. If most of these systems are to be militarily effective, efficient, and economical a long lifetime is required.

Even the simplest systems involve payloads of considerable complexity and contain many active elements. Unusual demands on lifetime are imposed on the system by contrast with the type of lifetimes that are satisfactory for airborne systems or for ground systems. In most instances an improvement of at least one or two orders of magnitude is required to even make the system of potential interest. It means that our designs must be of a new type employing the proper balance between redundancy, cost, weight, and complexity and component selection must be based on extensive testing and developments that can help insure a long mean time to failure under the environment in which such components will have to operate.

Another area that I believe is of vital importance in determining the role that the space medium will play in military tasks has to do with the booster systems that are utilized. Our costs today for every pound placed in orbit are extremely high and if satellite systems are to provide the most economical solution for carrying out certain military jobs tremendous improvements must be made in regard to the booster systems that are used. Costs will have to be reduced in a major fashion and at the present time I believe that the most promising route is in the direction of simplicity, ruggedness, and physical recovery without the need for major reconditioning. It is noteworthy that these factors appear to be suggestive of booster approaches quite different from those for missile applications where performance is of the essence and the designs must be light and efficient.

The development of satellite payloads for the Samos, Midas, and Discoverer programs represents the prominent portion but only one element of the system. A useful system must include the associated ground-based environmental facilities for payload development and checkout, the associated launch sites, the ground stations, communication nets, data reduction and data display equipment and, of course, competent trained personnel equipped and able to operate the system and extract from it the necessary information on a continuous basis. These areas are essential to a useful system; they are elaborate and expensive; they require adequate time for full implementation and must be planned concurrently with the development effort on the satellite system per se.

The Air Force continues to explore, in a vigorous fashion other systems and other areas than can enhance its capability to carry out its military mission.

We are involved in the study of both polar and 24-hour communication satellite systems, in the study of satellite inspection systems, and in the development of a national space surveillance and control system, in the development of various types of auxiliary power systems, including nuclear, solar, and chemical types.

We have recently initiated the development of a vehicle that has been called Dynasoar. The Dynasoar is designed to furnish informa-

tion basic to the problems of controlled return and precise landing from orbital flight, a capability which we feel to be fundamental to practical militarily useful space flight.

The exploitation of the atmosphere for maneuverability and controlled landing will require the exploration of flight problems in the atmosphere at speeds up to orbital and altitudes up to the limit of the sensible atmosphere.

It is our belief that the knowledge gained through the Dynasoar program will provide a sound basis for the determination of the military importance of manned systems employing these principles.

I would like to dwell briefly on one additional point which I feel to be of very great importance in the understanding and appreciation of our various research and development and weapon system programs. I have endeavored to emphasize that the development of a complete operational weapon system involves many factors beyond the normal development programs. These include such things as personnel training, operational facilities, handbooks, spare parts, etc. The cost associated with these operational aspects generally are overwhelming as contrasted to development costs. Some or all of these operational aspects must be pursued as the development program proceeds if we are to expect operational employment at the earliest date.

Such a procedure, however, obviously involves major risks and uncertainties. Technical deficiencies and obstacles can and probably will arise and these will have a profound impact on the operational date.

In each case, therefore, a keen sense of judgment is required to balance the importance of the job, the technical risks involved and the associated costs. A maximum risk program in all cases would be prohibitively expensive, wasteful, inefficient and the economics in turn would limit the number of developments that could be undertaken. A minimum risk program, on the other hand, which would delay all operational aspects until the technical system was completely proven out would result in unacceptably late operational dates and limited military usefulness.

In each case, therefore, we must endeavor to balance all of these factors and to arrive at an optimum solution in consonance with the military threat, the military potential, the military function to be performed and the demands of other phases of our total military program.

I would now like to refer briefly to one last point made earlier by the Secretary and to reiterate my own earlier statement in regard to the importance of complete coordination and cooperation at all levels between the Department of Defense and the National Aeronautics and Space Administration in order to insure the maximum benefits to both organizations. The traditionally excellent relationships between the USAF and the old NACA have been continued and amplified during our 1-year experience in working with NASA. We have entered into informal and formal agreements as required at all levels to insure a total cooperative and effective program. We are sure that problems will arise in the future, but are confident that they can be resolved by these mechanisms and that they would only be complicated and magnified if we were to attempt to resolve these through formally constituted bodies outside of the NASA and the DOD as has been suggested by certain people.

An excellent example of the type of cooperation that exists and is effective is that associated with the Department of Defense support of Project Mercury. Interaction and assistance has been effected at all levels. Air Force management and technical personnel have provided NASA continuously with information and details on Air Force programs that would have applications to the Mercury effort. Air Force biomedical, technical, and parachute personnel have worked with NASA in project planning. Air Force aircraft have been either loaned to NASA or scheduled for its use in performing preliminary tests. A jointly prepared plan for the complete support by the DOD in the total program is in final stages of coordination and approval at this time.

In summary, the Air Force looks forward to the opportunity of continuing a vigorous exploitation of the fields of aeronautics and astronautics for the purpose of providing this Nation with the most advanced and effective tools for its defense. We are proud of the part which the Air Force has played in producing our present strength; the skills and the resources available within or managed by the Air Force we believe will continue to play a vital role in our national defense picture as we expand our activities toward the new horizons that have been opened up in the dawn of the space age.

The CHAIRMAN. Thank you both, gentlemen, for what I think are very fine statements. They are comprehensive, they are informative and they are very clear. It clears up in my mind some of the questions that I had thought that I would ask.

I will ask this: The Air Force is interested in how many space programs? I mean how many does the Air Force consider it has a mission to perform? You have the Samos, the Midas and the Discoverer. You also have the Dynasoar. That is four programs. Do you have any additional programs?

Dr. CHARYK. Mr. Chairman, we have various programs in the study phase. I indicated our interest in the communications satellite program, also in the satellite inspection program.

The CHAIRMAN. Are those under the Air Force as a special charge and responsibility of the Air Force?

Dr. CHARYK. No, these programs at the present time are under ARPA.

The CHAIRMAN. The ones that are directly under you are Samos, Midas, Discoverer, and Dynasoar?

Dr. CHARYK. That is correct.

The CHAIRMAN. Are there any others under you especially?

Dr. CHARYK. There are many minor programs relating to components and elements of the space mission but these are the major programs.

The CHAIRMAN. I will ask you as a general matter, do you have enough money to properly push the Samos, the Midas, the Discoverer, and the Dynasoar programs?

Secretary SHARP. I would say, Mr. Chairman, that we do have at the present time.

The CHAIRMAN. Do you have the amount of money which you requested initially, of DOD and the Bureau of the Budget, for those programs?

Secretary SHARP. I think we do. I think I might ask Dr. Charyk to elaborate on that a little bit since he was involved in this area primarily at the time of the formation of the budget.

Dr. CHARYK. The dollars requested in the budget by the Air Force for these programs are included in the budget submission which has been made to the Congress.

The CHAIRMAN. So your request was really fulfilled 100 percent?

Dr. CHARYK. That is correct.

The CHAIRMAN. Is the Air Force interested in the man-in-space program?

Dr. CHARYK. We are very much interested in Project Mercury. I did allude in my statement to our continuing contacts with NASA in regard to Project Mercury.

The CHAIRMAN. Is the Air Force sufficiently satisfied with the progress being made in that program, the Mercury program?

Dr. CHARYK. I think our general evaluation of the situation is that the program is proceeding at an optimum rate consistent with the technical risks involved.

The CHAIRMAN. Now, you are certainly interested in the one-and-a-half-million-pound thrust engine program, aren't you?

Dr. CHARYK. We are certainly interested in the development of the large booster. I should add, of course, although at the present time there is no military requirement for a booster of this size, I think it would be surprising if, as time went by, we did not actually develop a requirement for such a capability.

The CHAIRMAN. The potentialities are there?

Dr. CHARYK. I would certainly say so.

The CHAIRMAN. I think the additional funds allocated by the President would cover that program.

Dr. CHARYK. I think they would expedite the program to the maximum degree consistent with the technical problems involved in such development.

The CHAIRMAN. As I understand it, your relationships with NASA are satisfactory.

Secretary SHARP. Very satisfactory.

The CHAIRMAN. Let me ask you this, just to satisfy my curiosity: Were you personally, Mr. Secretary, or the Under Secretary, or, were Air Force representatives consulted in the preparation of the recommendations for revisions of the National Aeronautics and Space Act, and particularly the rewording of section 309? That is the part on coordination and cooperation.

Dr. CHARYK. I was personally involved in discussions with representatives of NASA in regard to this legislation.

The CHAIRMAN. You sat in on that?

Dr. CHARYK. There was a series of meetings with representatives of NASA which I attended and in which we suggested various suggested revisions.

The CHAIRMAN. Were the revisions which you have suggested placed in the measure presented to Congress?

Dr. CHARYK. Yes, sir.

The CHAIRMAN. Are you satisfied with the proposals in that bill?

Dr. CHARYK. I think that the bill, as submitted, is very satisfactory from our point of view.

The CHAIRMAN. Now, is that the view shared by the responsible officers generally in the Air Force?

Dr. CHARYK. I believe that there is general concurrence that the provisions of the act, as amended, are quite satisfactory. I am sure that various individuals might have some thoughts on minor rewording and so on, but I would say as far as basic principles are concerned there is general satisfaction.

The CHAIRMAN. The Project Dynasoar to which you have alluded, both of you, in your statements, is being developed by the Air Force. Would it be preferable for the early stages of that project to be handled by NASA rather than the Air Force?

Dr. CHARYK. Actually in this particular program we do have an agreement with NASA in regard to the program as a whole. NASA people are involved with us in the general planning of the program, and I feel that the relationship as it now exists is satisfactory from both sides.

The CHAIRMAN. Now as to the F-1 engine and the Centaur project, they were transferred to NASA. Was that agreeable to the Air Force that those projects be transferred to NASA?

Dr. CHARYK. I may say, Mr. Chairman, that in regard to the large engine, this certainly falls in a category where we did not have a military requirement, so I don't think that there was any concern about that transfer. There were certainly people in the Air Force who were less enthusiastic about the transfer of the Centaur project. The reason being that the Centaur as an upper stage on our present ballistic missiles provides a payload capability that is essential to certain military requirements.

So there were people who felt that in view of the military requirement for the capability that would be produced, for example, by Atlas-Centaur, that the program should continue to be controlled by the Department of Defense. This was certainly an issue upon which there was not unanimous agreement.

The CHAIRMAN. And there is no unanimous agreement as of this hour, is there?

Dr. CHARYK. I think that people are adjusted to the present situation. Actually we have a joint committee on Centaur with NASA. Air Force representatives sit on this committee. They continuously review the progress of the program, the funding, the development, so we feel that we have a satisfactory contact, and I personally am confident that our requirements will be adequately taken care of in the present arrangement.

I have no reason to object to the arrangements that now exist.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. I would like to yield my time since I might go over the 5 minutes. I will take mine later.

The CHAIRMAN. You mean at this time you will pass the five.

Mr. Anfuso.

Mr. ANFUSO. Mr. Secretary, I should like to get a yes or no answer from you on this question:

You have stated you see no military necessity for large boosters at this time. Wouldn't a landing on the Moon have military implications?

Dr. CHARYK. At the present time I don't think we could define a military requirement for a landing on the Moon. I think there are many more important military jobs.

Mr. ANFUSO. Do you foresee that large satellites in the future could be used as launching bases for attacks on the Earth?

Dr. CHARYK. That is conceivable.

Mr. ANFUSO. That would require large boosters; is that correct?

Dr. CHARYK. That is correct.

Mr. ANFUSO. Mr. Secretary, may I ask you if you agree with General Power's statement that we ought to keep our air bomber always aloft?

Secretary SHARP. Mr. Anfuso, I agree with him in principle. We are working toward the capability of having an airborne alert as we call it. I am inclined to believe that this will be necessary and an important part of our defense at some time in the future. It is a little hard to say at the present time accurately exactly when. I think we should go ahead vigorously in our preparation so we will have it available whenever we find that it is necessary.

Mr. ANFUSO. That doesn't coincide with the view of the administration, does it?

Secretary SHARP. Yes, sir; it does. We are preparing—

Mr. ANFUSO. I thought General Power was disagreeing with the administration in that respect.

Secretary SHARP. I think General Power would like to have a larger capability than the administration has announced it is in favor of at this time, or rather has budgeted for it.

We are studying the possibility of enhancing this capability within our present plans.

There are many things we think are possible to do such as better utilization of our overhaul facilities for, let's say, overhauling engines and overhaul them more quickly so we will be able to have more airplanes in the air.

We are investigating possibilities of enlarging our airborne alert capability.

Mr. ANFUSO. Mr. Secretary, I am not inclined to be critical, I am merely trying to get at the facts. I mean your statement and the statement of other witnesses who have appeared before this committee and before other committees of the Congress, I think have added to the confusion in which I find myself, and perhaps other members and people in general. Somehow there is no unanimity, there is no definite understanding of our goals. General Power and the White House disagree, and others outside the White House disagree.

We have two thoughts coming out here, one which says we are the strongest Nation in the world, and the other view is that we should tell all the people the facts.

I am inclined to believe we should tell the people the facts, because we are in serious danger; and if people know the facts I think they will press us here in Congress and press this administration or any other administration to make an all-out effort and the kind of an effort which Dr. von Braun testified here yesterday we are not making.

May I ask you this, sir: In order to get at these facts, at the present time do you think we are militarily stronger than the U.S.S.R.?

Secretary SHARP. I don't think there is any question about that.

Mr. ANFUSO. In giving that answer you are taking into consideration our air bombers, the Strategic Air Command, our Polaris submarine capability, as compared to what the Russians have in air power, submarines, and ICBM's; is that correct, sir?

Secretary SHARP. That is correct, sir.

Mr. ANFUSO. Will the situation in your opinion be the same in 1961?

Secretary SHARP. I think it will. I think it is quite possible that in 1961 there may be some numerical superiority in missiles alone between—

Mr. ANFUSO. On whose side?

Secretary SHARP. On the Soviet side.

Mr. ANFUSO. Tell me what will the situation be in 1962?

Secretary SHARP. I think in 1962 there may also be a numerical superiority. However, I don't think this offsets our superiority in other areas. In both those years, 1961 and 1962.

Mr. ANFUSO. You still think that in 1962 we will still have greater military strength in spite of the increase in the number of ICBM's which some persons have estimated may reach 1,000 in 1962 on the part of the Russians as compared to 150 or 300 on our part. Is that correct?

Secretary SHARP. Well, I have never heard those figures, but I would say that numerically there is a possibility that the Russians may maintain a numerical advantage which I don't think would be adequate to offset our other advantages, particularly in view of the fact that one item that General Power brought out but didn't stress was the fact of early warning. Now, we have two ballistic missile early warning systems in process of construction.

Mr. ANFUSO. Mr. Secretary, I don't like to interrupt you. I know about these early warning systems, but we won't have them in effect until about 1964.

Secretary SHARP. Oh, yes, sir, we will have—

Mr. ANFUSO. As far as ICBM's are concerned.

Secretary SHARP. Yes, sir; we will have one coming into effect this year. We have another one which will become operational next year. The third one which is going to be—

Mr. ANFUSO. We will have an effective antimissile missile by 1961?

Secretary SHARP. No, sir. I was referring to the early warning system. The ICBM early warning system known as the BMEWS, which will give us warning and which General Power said would be required before he would feel we could abandon an airborne alert.

Mr. ANFUSO. Which would be about 15 minutes, is that right?

Secretary SHARP. That is right. We have a standby capability of launching our bombers in 15 minutes.

Mr. ANFUSO. Supposing, Mr. Secretary, that our Air Force was not on the alert, was not in the air at a given time, and supposing at that time we had a surprise attack on the part of the Russians of, say, 300 ICBM's—like General Power mentioned, an attack of that nature—and our bombers were not in the air. Do you still think after the destruction which was meted out by these 300 ICBM's, that we would still be strong enough to retaliate and destroy Russia?

Secretary SHARP. I think we would be in a very vulnerable position if we allowed ourselves to be in a state where we were not on the

alert where we even suspected that the Russians had that many missiles and could possibly fire them all in salvo, which they would have to do.

I think if we allowed that condition to exist and were not on the alert and did not have a certain number of our bombers in the air, if we did not have ballistic missile early warning already in operation that we would be in very great danger.

Mr. ANFUSO. You recognize the danger of that kind of surprise attack. What are we doing to try to prevent that kind of surprise attack from crippling the United States? A retaliatory attack?

Secretary SHARP. In the Air Force we are building the ballistic missile early warning system, half of the North American portion of which will be available a little later on this year. We also have a 15-minute alert of our bomber force at the present time and we are laying plans to actually—we are actually flying at the present time—some of our bombers on airborne alert and training the whole fleet.

Mr. ANFUSO. I will finish now by saying, Mr. Secretary, I congratulate you for that effort. Would you agree with me that perhaps we ought to have other systems developed too by 1961 or 1962?

Secretary SHARP. I don't know what other systems it would be practical to develop in that time.

The CHAIRMAN. Mr. Bass?

Mr. BASS. I should like to pass for the present.

Mr. ANFUSO. I beg your pardon, sir.

Mr. BASS. I should like to pass for the present.

Mr. ANFUSO. I thought you said for the president.

The CHAIRMAN. Mr. Karth?

Mr. KARTH. Mr. Secretary, planning means careful calculation of first-strike capability and counterstrike capability, does it not?

Secretary SHARP. Yes, it does.

Mr. KARTH. Do we have a first-strike capability?

Secretary SHARP. I think it is our national policy that we will not strike first. I think there is no question but what we have a first-strike capability.

Mr. KARTH. My question is, Do we have a first-strike capability?

Secretary SHARP. I think we do, yes.

Mr. KARTH. In other words, do we have a first-strike capability where we can pinpoint and destroy all Russian targets from which they can retaliate; is that correct?

Secretary SHARP. I believe that is correct at this time; yes.

Mr. KARTH. Then we are not deterred in effect, are we?

Secretary SHARP. No, we are not deterred if you look at it that way. We are deterred by national policy but we are not deterred otherwise.

Mr. KARTH. This is something that possibly could be changed? At least it is the policy at this time and I am merely asking you whether or not we have this capability.

Secretary SHARP. Oh, yes.

Mr. KARTH. Do you think there is any possibility that our retaliatory power, such as has been suggested by General Power, could be destroyed on the ground within a 30-minute period?

Secretary SHARP. If all the hypothetical situations which General Power apparently outlined came to pass—in other words, if we had no warning, if the Russians had superiority in missiles while we had no warning and if at the time we had no airborne alert, I think that

mathematically that his calculations are probably correct. They do not take into consideration, as I say, the introduction of the ballistic missile early warning system in the latter part of this year and the other half of it next year, with a third foreign portion coming in later, and they do not take into consideration the airborne alert.

His argument was one in favor of having an airborne alert, with which we certainly agree, that this is probably going to be an important thing.

Mr. KARTH. When do we expect to do this?

Secretary SHARP. There hasn't been a decision made yet as to when we intend to put it in operation. This will depend upon our intelligence and the operational reliability of the ballistic missile early warning system when it comes into operation. These are matters that have to do with the overall national intelligence as it is given to us from time to time.

Mr. KARTH. From what I have read of General Power's speech I feel he has painted a rather drab picture. And from what testimony we have received from Secretary Gates I feel that he painted kind of a rosy picture. Which one of these two do you prefer to agree with, or would you strike someplace in between those two?

Secretary SHARP. Well, I certainly think that ordinarily, and as General Power has stated, it is the duty of a commanding officer of a force such as SAC, to look at the blackest side of the picture and try to be prepared to cope with it. He has made this statement. I think that he has done just that. I think he has offered the sensible solution to this possibility that he holds out, that such a situation could exist. I think he does take the gloomier side. He gives no credence to the ballistic missile early warning system working. We have these types of radars, long-range radars in operation now in other parts of the world observing satellites and observing ballistic missiles. We know that they will work. We have no reason in the world to believe that the early warning system will not work and will not be reliable.

So that I think from these various angles that he is a little pessimistic. I would be more inclined to agree with Secretary Gates that if we do the things that we are planning to do that we will not be in danger.

Mr. KARTH. Even though this is rather a gloomy picture I suppose this is a fairly good position for a military expert to take, isn't it?

Secretary SHARP. I would think so. And it is not any gloomier a picture than we in the Defense Department have known about for a long time. We built our plans on the fact that this situation might possibly exist. This is why we are training for the airborne alert right at the present time. A training airborne alert at the present time.

The CHAIRMAN. Will the gentleman yield right there?

Mr. KARTH. Yes.

The CHAIRMAN. It is a case of a burned child dreading the fire. We have been stung one time that way and General Power wants to make sure we are not going to be hurt again that way.

Secretary SHARP. That is right, and I think this is probably the right attitude for a commanding officer to take.

Mr. KARTH. You think the administration is treating it with the same sense of urgency that General Power is treating it with.

Secretary SHARP. I don't think we look at it in the administration from quite as gloomy—not quite as dark glasses as he does, but I think we must face the fact that we have to be prepared to take care of contingencies of this kind, and we are taking steps in that direction.

Mr. KARTH. Do you think there is a possibility of Russia having 150 ICBM's and 150 IRBM's by the end of this year?

Secretary SHARP. Well, there is no intelligence estimate that indicates anything like that, as far as the ICBM's are concerned. I think it is possible that in the IRBM area, they might have this many, but in the intercontinental ballistic missiles there is nothing that indicates such a thing at this time.

The CHAIRMAN. Mr. Baumhart?

Mr. BAUMHART. No questions.

The CHAIRMAN. Mr. Hechler?

Mr. HECHLER. Mr. Secretary, I want to congratulate you for having an able and effective Under Secretary like Dr. Charyk. I hope you can bring more people like that into the Government.

Did you approve General Power's testimony yesterday prior to its being submitted?

Secretary SHARP. I did not; no, sir.

Mr. HECHLER. Do you now approve of it?

Secretary SHARP. Do I approve of it?

Mr. HECHLER. Yes.

Secretary SHARP. I think he was very candid in his statement. I think that, as I have said before, he is taking the position of a commander who must look at the darkest possible side of things so that—

Mr. HECHLER. I just hope this doesn't conversely mean that the Secretary of Defense and our civilian officials must put on rose-colored glasses. You mentioned that he ought to put on—that it is right for him to put on dark glasses, but I certainly hope this doesn't mean that you should put on rose-colored glasses in viewing our situation because I think this would be disastrous for the American people.

Secretary SHARP. There is no question about that. I think our glasses should be very clear.

Mr. HECHLER. I want to help you clarify a little some of your answers to Congressman Karth about first-strike capability. You say we can use first-strike capability. You state that we are deterred by national policy but that could be changed. You are not suggesting, are you, that this should be changed?

Secretary SHARP. No; I am not suggesting it should be changed. I say we have first-strike capability. If we have the capability of striking Russia at all we obviously have the capability of striking them first if we felt that was the thing to do.

Mr. HECHLER. What situation could you conceive of our using that first-strike capability?

Secretary SHARP. I would rather not comment on that because these are policies which are set at a much higher level than I am and I would rather not comment on the possibility.

Mr. HECHLER. You would conceive, though, that there is such a possibility, is that correct?

Secretary SHARP. There are possibilities for all things I suppose, and this would be included in them.

Mr. FULTON. Would the gentleman yield?

Mr. HECHLER. Gladly.

Mr. FULTON. Don't you think we should take that up in executive session? I think even refusal to comment has a certain implication.

Mr. HECHLER. I appreciate the gentleman's comment.

The CHAIRMAN. We will leave that to the Secretary as to whether he wants to take it up in executive session or—

Secretary SHARP. I would much prefer to take it up in executive session because this question has many ramifications.

Mr. HECHLER. I notice, Mr. Secretary, in your testimony you mention the requirement for coordination has been reduced while the quality and timeliness of our coordination has improved.

Whenever we have two agencies, of course, we need certain mechanisms of coordination between them, and this committee has been given a number of examples of the committees and other coordinating devices between NASA and the Defense Department.

Yet, the Under Secretary mentions, we do not view space to be a separate medium but rather, an extension of our previous horizons as a result of expanding technology, and also said that we may develop a requirement, a military requirement for a booster in the future.

I can't quite get it through my thick head why we wouldn't move forward much faster in this country if the space and missile programs were under a central leadership where you wouldn't have to say, button, button, who's got the button, and pass the responsibility back and forth.

Wouldn't this provide a greater leadership for the entire program in the interests of our national security?

Secretary SHARP. I think it would be dangerous to have it under a single head because of the difference in the basic responsibilities between scientific space exploration as such and the military responsibilities of creating military weapons systems.

I am afraid if we had the whole of the project in the military, we probably would feel that our military portion of it was so important that we might neglect the scientific exploration and I think conversely it might be true if it were under some civilian agency that it might become so interested in the scientific exploration that they would ignore, or downgrade the requirements for military defense. I think it is a better apportionment of the plan the way it is.

Mr. HECHLER. I would not go as far as General Medaris does to say it ought to be in a single agency under military leadership, but I do believe we have some good examples in our history, and in current operations such as the Atomic Energy Commission with a military applications division, which I think makes a lot of sense.

Secretary SHARP. We have some examples of it having worked. In this particular case with the Air Force background, let's say the Defense Department background, that we already have developed and our capabilities that we already have developed in the area of space exploration, for military purposes, I think the situation is a little different.

With the Atomic Energy Commission no one else had the information. They had all the knowledge. In this case the military has a

large proportion of the knowledge and I think we should retain the active interest in following up the military programs because of this.

We might not put sufficient emphasis on the purely scientific ones if we had both those responsibilities as suggested by General Medaris.

The CHAIRMAN. Mr. Riehlman.

Mr. RIEHLMAN. No questions at this time.

The CHAIRMAN. Mr. Daddario.

Mr. DADDARIO. If the early warning is effective in 1961, what will it allow the Air Force to do?

Secretary SHARP. It will give us a 15-minute warning and allow our normal ground 15-minute alert to take effect and get our airplanes in the air before the missiles strike.

Mr. DADDARIO. And what happens to the civilian population during—

Secretary SHARP. The same thing that happens to them that would happen if we had no warning because we have no antimissile missile system yet that is satisfactory to stop a ballistic missile.

I suppose if we could get a little warning, maybe some people could take over. Fifteen minutes is not much time.

Mr. DADDARIO. But to all intents and purposes, the civilian population would be at the complete mercy of the missile attack?

Secretary SHARP. I would say so. I don't see how they can do anything but take the 15-minute warning period and try to take cover the best way they can.

Mr. DADDARIO. Then we would have a situation, would we not, with the Air Force being able to get off the ground, with the pilots knowing that the country would be pretty well destroyed, that they would be going off to retaliate against an enemy and probably have no place to come back to?

Secretary SHARP. You see, I think in this kind of talk we rather lose track of what the Strategic Air Command and the Defense Department as a whole is trying to do. It is trying to create a situation in which an enemy such as the Soviet Union might be, would not dare to strike us with their missiles because they would know that they were inevitably going to be hit so hard in retaliation that it would be suicide for them to try.

This is our whole principle of deterrents. Now, if the deterrent principle fails even though we convince them they are going to be destroyed, and if they take the irrational action to attack us, I think the consequences would be very dire, but there is not much that we can do about that situation at this time except to keep our deterrent strong enough so that we are convinced that no rational person would dare to attack us in view of the consequences to himself.

Mr. DADDARIO. Well, of course, we all understand, Mr. Secretary, that is the aim and objective stressed often enough, but it does not preclude the possibility, does it, that there are other alternatives in the minds of military people which could allow them to launch such an attack and if they felt that they could knock down enough of our aircraft by ground-to-air and air-to-air types of defenses which certainly we feel we have a capacity for, that it could minimize the blow, whereas missile for missile, we probably could not knock down one missile in 1961 and there would certainly be a given amount of attrition, would there not, to our attacking force?

Secretary SHARP. We know we haven't a capability of knocking down ballistic missiles coming in, if that is what you are referring to.

Mr. DADDARIO. How about the capacity of the Russians in 1961 insofar as their ability is concerned, to knock down attacking aircraft?

Secretary SHARP. General Power, who is, of course, the commanding officer of the Strategic Air Command, has stated unequivocally that his bombers can do their job if they get off. I can't go into details as to how he thinks this out at the moment, except perhaps in executive session, but he unequivocally states that he can retaliate if he gets his bombers off.

Mr. DADDARIO. And you will have your own ideas on that which you can give us in executive session as well?

Secretary SHARP. Yes, sir.

Mr. DADDARIO. One last question, Mr. Secretary. On your last page you say, "We are firmly convinced that the division of responsibility between the Department of Defense and NASA is proper and we know that we can continue to work with NASA for our mutual benefit," et cetera.

Do you also carry that out so that there is a proper division of responsibility between the various services within the Department of Defense, that they get along mutually as well and there is no conflict between them?

Secretary SHARP. Naturally in the various services each is a little bit prejudiced as to his own service. I think that unquestionably with the overall control under the new Reorganization Act, that we are progressing very rapidly and satisfactorily in the direction of a tighter unification of our efforts, let's say, rather than unification of our individual services. I think great progress has been made and is being made in this direction.

Mr. DADDARIO. You don't get along as well within the Department of Defense as you do with NASA?

Secretary SHARP. I think we get along very well in the Department of Defense. People have different ideas. Certainly we get along well with NASA because as I say, we have worked with that organization satisfactorily for a long time and we both have exactly the same objectives.

The CHAIRMAN. Mr. Chenoweth.

Mr. CHENOWETH. Mr. Secretary, you feel then that there is a pretty good balance between the civilian and military uses—space programs, today? That is the impression I get from your—

Secretary SHARP. I do, yes, sir.

Mr. CHENOWETH. You feel we are not devoting too much emphasis to one or the other?

Secretary SHARP. I feel that adequate emphasis is being devoted to both of them. Certainly we have adequate emphasis in the military on what we conceive to be the military hardware that we need at this time and I am sure that NASA feels satisfied with the emphasis that is placed on their scientific program. We hope, of course, that it develops rapidly so that if anything falls out of it that is useful to us in a military way, that we can take advantage of it, which I am sure we will.

Mr. CHENOWETH. What we are spending for NASA then is not retarding the military development of the missile?

Secretary SHARP. Not in the slightest. Not in the slightest and I would say, on the contrary, what we are spending with NASA will in the long run be very beneficial to the military.

Mr. CHENOWETH. This is a very controversial subject these days, as to just what our defense posture is.

Now, as Secretary of the Air Force, do you tell this committee that in your opinion, the Air Force is ready to do its part in the case of any emergency which should develop, that it will be ready to take care of itself?

Secretary SHARP. I can say that.

Mr. CHENOWETH. Without equivocation?

Secretary SHARP. Without equivocation or hesitation and I think the programs we are embarked on will assure us that this situation will continue to exist.

Mr. CHENOWETH. The Air Force has been developing this program over the years and you feel you will be capable of delivering the striking blow and retaliation which is probably holding the enemy off at this time because he knows of that force which we do have?

Secretary SHARP. I think our deterrent posture will continue to exist in adequate degree.

Mr. CHENOWETH. You don't subscribe to the theory, then, that we are a second-rate nation, today?

Secretary SHARP. I do not.

Mr. CHENOWETH. I am happy to hear you say that. Neither do I. Thank you, Mr. Chairman.

The CHAIRMAN. Mr. King.

Mr. KING. Mr. Secretary, under your early warning system which you say will be operational at least in part by September and further extensions of it later, under that we would have presumably 15 minutes warning?

Secretary SHARP. Yes.

Mr. KING. Would we be able to get an ICBM into the air within that 15 minutes?

Secretary SHARP. Yes, we will. We have plans to have a substantial portion of the ICBM force on 15-minute alert at all times.

Mr. KING. Would that be the Minuteman, essentially?

Secretary SHARP. Not only the Minuteman, but our Atlas and also our Titan that is coming in. The Minuteman is an easier system to keep on a very short alert. It can probably be kept on shorter alert time than either of the other two systems.

Mr. KING. Do you mean you can get Atlas and Titan into the air in 15 minutes?

Secretary SHARP. Yes.

Mr. KING. I thought it took hours to fuel them up?

Secretary SHARP. The part we keep on 15-minute alert can get into the air in 15 minutes.

Mr. KING. Do I understand a certain portion of them would be fueled at all times ready to go?

Secretary SHARP. Yes; this is the plan.

Mr. KING. Is it classified information as to just what number of ICBM's we have operational at this minute?

Secretary SHARP. I would say that this is classified information.

The CHAIRMAN. We will take that up in executive session.

Mr. KING. That is all I have.

The CHAIRMAN. Mr. van Pelt.

Mr. VAN PELT. No questions.

The CHAIRMAN. Mr. McCormack.

Mr. McCORMACK. I am going to ask you questions on another subject: You have seen the new bill amending the NASA Organic Act.

Secretary SHARP. Yes, sir; I have.

Mr. McCORMACK. Addressing yourself to section 309, is the Air Force satisfied with that language?

Secretary SHARP. Yes, sir. I think we are greatly satisfied. Dr. Charyk said a moment ago he was involved with NASA in drawing up these slight changes to the act. I think on the whole the Air Force is thoroughly satisfied with those amendments. I think some in the Air Force might have certain wording they would like to have clarified a little and I think probably they will discuss this with members of the staff but basically we are satisfied with it.

Mr. McCORMACK. Now, you say you might have some wording to clarify. Can you give us any indication as to what that might be now?

Secretary SHARP. I don't know about the details of that now. It would only be in clarifying wording so that the intent which we know exists is perfectly clear without any possible ambiguity. In the minds of some of our people there are some slight changes that might be advantageous. I think, however, they would be satisfied with the present wording although I think they would like to suggest some changes to the committee, sometime.

Mr. McCORMACK. To establish more definitely the original jurisdiction of the military in the field of research?

Secretary SHARP. I don't understand that question.

Mr. McCORMACK. To establish more definitely the jurisdiction of the Defense Department in the field of research?

Secretary SHARP. I believe Dr. Charyk might answer that better than I because he was intimately involved in drawing it up. However, I think we feel generally in the Air Force that the division of responsibilities as set out are certainly adequate as far as we are concerned.

Mr. McCORMACK. I understand the word "generally" has a very broad—could be applied very broadly. I can understand where you might in principle agree to something.

Secretary SHARP. I think we agree with the intent—I don't think there is any question but what NASA and the Defense Department agree completely on the intent of these amendments to the act as being perfectly satisfactory to both parties. As I say, there are some elements who feel certain words could be made a little clearer but they are not terribly worried about it and would like to make some suggestion to the staff of this committee.

If you would like to hear more from Dr. Charyk on the details I am sure he can tell you more about it because he was in on drawing these up.

Mr. McCORMACK. I don't know how much we are going into that.

The CHAIRMAN. We are going into it in a general way. Later on we will take it up in detail.

Mr. McCORMACK. Then I will wait until later on to take it up.

How are you going to determine what is military and what is the peacetime use? I can understand appliances, now, but it is difficult for me to separate research from the development aspect. Who is going to determine what is military and what is not?

Secretary SHARP. I don't think this will be difficult when we are able to arrive at a military requirement, let's say, for the larger booster that is coming along. When we are able to definitely say that we need this booster for certain military requirements to lift a certain sized thing into orbit I don't think we will have the slightest bit of trouble in establishing the fact that we need it.

Mr. McCORMACK. I will pursue it later. I was chairman of the select committee and I think I know the views of the members of the select committee and without regard to party we all react unanimously. We were very strong for NASA but we thoroughly appreciate in the world of today the importance of preservation of our country and in turn how vital the preservation of our country is connected with our defense and our Military Establishment.

With that broad statement, I would like to have any amendment considered from that angle. At least for one, in the world of today I am not downgrading the military. If anything I am emphasizing the military because I know some military benefits come slowly but I think we should do those things that will assure the very thing you said; a deterrence that will probably cause evil minds to rationalize where their own self-preservation is involved.

Secretary SHARP. I think this act certainly is conducive to exactly what you say. I don't think we have—

Mr. McCORMACK. We thought we did last time, but we found the construction was somewhat different when it got to the executive level. I have no further questions. I just wanted to give that broad observation. I want you to realize this committee appreciates the significance and importance of preserving our country and that that depends upon our military.

The CHAIRMAN. Mr. Fulton?

Mr. FULTON. I wanted to agree with the gentleman from Massachusetts, Mr. McCormack, to say we had worked together. I was one of the members working under his leadership as chairman of the Select Committee. It was a united effort and I think under his leadership it has advanced the space programs of the country very much to have had that kind of a broad statesmanlike approach.

I am interested, as you know, in trying to advance the programs. I am one of the eager beavers on space, I guess, and I am interested in seeing that there be as broad a base for development as we can get. That means I am interested in seeing that there might be competitive systems.

For example, we have Von Braun's system, the Saturn rocket, and you people also have your Hound Dog engine that you use on your long-range missile, your air-to-ground missile. I think you call it the plug nozzle engine, where you have fuel put in on the rim of an inverted cone and then the exhaust pushes out at the tip.

I understand there is great possibility that that might be maybe 50 percent more efficient than our current rocket engines. Would you comment shortly on the possibilities of developing that particular engine as an alternative system to the Saturn booster, because if you

can get a 50-percent increase through a different configuration and through a configuration you already have on a small level, a 20,000-pound-thrust level, in operation, why don't we go ahead with something with your people on that?

Secretary SHARP. I think I will have to ask Dr. Charyk to answer that because the question is highly technical and he would have to comment on that.

Dr. CHARYK. I agree with you, Mr. Fulton, that the plug nozzle concept has very many attractive aspects. As a matter of fact, that particular approach was one of the things that I had in mind when I made reference in my statement to the fact that some of the rocket approaches that are attractive from a military applications point of view, are not always the same as exist in the case of missile applications, for example.

Mr. FULTON. Could I ask you, do you already have that under research and development with the Pratt & Whitney Division of United Aircraft, or are you just simply making the Hound Dog engine there, without doing any development on it with this possibly in mind, to get up to a million and a half pound thrust?

Dr. CHARYK. We are in the process of trying to firm up an actual development program which would incorporate this concept in an actual rocket engine.

Mr. FULTON. What would be your forecast of time, on such an R. & D. program?

Dr. CHARYK. We are trying to combine the introduction of this particular idea with several other ideas that we think are important to boosters for military space applications, and we have actually requested details of a development plan which is being prepared at the present time.

Mr. FULTON. Would you put a statement in the record on it, and I would like to have it correlated with the Saturn program, on time.

Dr. CHARYK. I will be very happy to do that, Mr. Fulton.

(The information requested is as follows:)

The plug nozzle engine principle has been investigated for the past few years by at least three major rocket engine contractors. The principle consists of the use of annular combustors, suitably subdivided into segments, which are then combined with an isentropic plug nozzle to form a rocket thrust chamber assembly. This assembly is then mated to conventional gas generators, pumps, valves, and controls to form a rocket engine. In contrast with the conventional rocket engine, the annular combustor, characteristic of the plug nozzle engine, would permit the development of a segment of the engine, thus simplifying the testing phase and reducing facility requirements. There is the further advantage of an inherent flexibility in engine sizing. Using one segment as a building block, it appears possible to arrange appropriate numbers of segments circumferentially about one plug nozzle to produce, within limitations, engines of different thrust sizes with minimum time and effort.

It is generally assumed that the plug nozzle engine will be technically competitive with conventional rocket engines as used in the Saturn booster. There exists the potential of a small increase in total impulse over the mission trajectory because of the variable expansion ratio characteristic of the plug nozzle. Except for the nozzle and combustors, the components are virtually the same for the plug nozzle engine as they are for the conventional liquid rocket engine. However, because of the manner in which these components are arranged, the plug nozzle engine is most conveniently adapted to large diameter boosters.

The meager inventory of design information relating to annular combustors, cooling, and thrust vector control, and the possibility that unforeseen development problems may arise indicate that a longer time would be required to develop an acceptable plug nozzle engine than that required to cluster existing proven

engines for the Saturn booster. It is estimated that a minimum of 4 years and \$150 million would be required to develop an engine in the 1,500,000-pound thrust class.

The Air Force is planning to activate a program aimed at the exploitation of the plug nozzle concept for rocket applications.

Mr. FULTON. In your statement at page 1 you say:

In this endeavor we also feel the responsibility to utilize to the fullest the information being developed by other agencies and departments of the Government.

Now, the converse of that ought to be true, too. You should feel the responsibility to give information to the other agencies of the Government.

Dr. CHARYK. I would agree.

Mr. FULTON. And is that the case in the other services, for example, the Navy? Do they get the fullest information from you?

Dr. CHARYK. I believe that our record is fairly good on that point. We try to keep them informed of our various development efforts and our plans.

Mr. FULTON. So you feel the relations are satisfactory and this so-called rumor about the Navy's part out in California at the Vandenberg Base in California—there is no real dispute out there, is there?

Dr. CHARYK. I don't believe there is any real dispute as such. Actually we made a presentation to the Navy sometime ago as to our general thoughts in the space program.

The difficulties, if you want to describe them as difficulties at Arguello and Vandenberg have dealt with rather minor things which have been resolved after discussion.

Mr. FULTON. So there is no real difficulty then with your Dynasoar problem and the Navy probably through its OPS-54 program?

Dr. CHARYK. I actually do not know of a Navy program that would be competitive with Dynasoar and the Navy is certainly familiar with what we are planning in the Dynasoar area.

Mr. FULTON. They have a manned maneuverable space program designated as OPS-54 and it was first outlined generally in the Connolly report.

Dr. CHARYK. I think this relates to certain studies the Navy has made. We have received copies of the Connolly report. I think this relates to certain studies the Navy has made. We have received copies of the Connolly report. I think all of the services continually make studies on various possibilities.

I do not believe that there is an active program along these lines.

Mr. FULTON. On your statement you have said on page 2:

The Air Force had a long and fruitful intimate association with a predecessor organization, NACA.

And then you say:

We view our responsibilities to be the full exploitation of technology for the development of systems to enhance our military capability and strength. We do not view space to be a separate medium, but rather an extension of our previous horizons as a result of expanding technology.

And then you say:

The expansion of our horizons to include space also permits development of the capability to carry out functions of military importance that we believe can be done in other ways.

And then you say:

It is our responsibility to utilize to the fullest whatever means are best for the fulfillment of our defense responsibilities.

I think that you could rewrite that so you don't start off with the contention of the Air Force and you might make the other services a little more happy. I think they think you are preempting the field completely. I have always enjoyed Mr. McCormack's reference to the word "aerospace" that you people have manufactured—

The CHAIRMAN. It is a good word.

Mr. FULTON. That pretty well puts under the Air Force everything from the surface of the land, out.

Dr. CHARYK. I think we recognize, Mr. Fulton, that there are important military requirements for all three services using the space medium. I might cite, for example, the Transit program, the navigation satellite for which the Navy has responsibility.

Mr. FULTON. I might say to you, with regard to jurisdiction, our national policy is that we are to go into space for peaceful purposes, that space is open to everybody.

At one point you use the old military idea of the mastery of space. Now, under no context could it be felt that we are in a race into space for the mastery or the control of space.

The CHAIRMAN. Let me suggest to the gentleman there that we had in mind going into executive session at 11:30. Yesterday we missed the opportunity to go into executive session with Dr. von Braun. I have two more members I haven't recognized.

Mr. BASS. Mr. Chairman, I have one or two questions.

Mr. FULTON. \* \* \*

The CHAIRMAN. I haven't checked the time.

Mr. FULTON. \* \* \*

The CHAIRMAN. I have appointed the gentleman to check the time on all of us. Of course, when he is questioned, he can't check his own time.

Is the gentleman finished?

Mr. FULTON. \* \* \*

The CHAIRMAN. Will you answer the question?

Dr. CHARYK. The connotation that I had in mind in the use of the particular words there, when I referred to mastery, was mastery in the sense of being able to operate in the media, solving the technical problems associated with operating in that environment.

The CHAIRMAN. Mr. Teague.

Mr. TEAGUE. No questions, Mr. Chairman.

The CHAIRMAN. Mr. Bass.

Mr. FULTON. \* \* \*

The CHAIRMAN. Well you know the rules, there.

Mr. BASS. Mr. Secretary, I would like to refer back again to the statement made by General Power to which some of my colleagues have referred earlier this morning.

What I have to say, I would like to make clear, in no way do I question General Power's integrity or his loyalty. But it seems to me, he is being a good advocate of his part to get a bigger slice of the pie. He doesn't have the overall picture which the Secretary of Defense or the President have in relation to our overall deterrent power, and that is to my mind what counts.

For instance, I didn't see in his statement anything more than a very minor passing reference to our Polaris submarine and the Polaris missile. Would you comment on that? Do you agree in general with what I say, or not?

Mr. SHARP. Yes; I do. I think this is a natural tendency in commanders. I think we would find the same thing true in the Air Defense Command and the Tactical Air Command, and the Navy and Army. Each one feels that since he only sees his portion of the picture, as you pointed out, that he could do better with a little more and would like to have a little more.

I think it certainly is true when you take the whole concept of deterrents and national defense considered as a whole, you have a different picture than when you are looking at only one segment, as General Power is looking at it.

We have various bodies constituted to look at the overall picture including the Joint Chiefs of Staff. I think the Secretary of Defense, advised by the Joint Chiefs of Staff and the President advised by the Secretary of Defense and the Joint Chiefs of Staff and the Security Council have a better opportunity of looking at the whole picture including the Polaris submarine and the aircraft carrier strike forces and the deployment of intermediate range missiles in the hands of the British, for instance. In Europe we have many facets to our overall defense picture and I think only the people who see the overall can come to sensible conclusions.

Mr. BASS. I am very glad to hear you say that, Mr. Secretary. I certainly agree that the people of this country ought to get the facts on our defense situation, but I abhor these statements and implications that we are a second-rate power now or that our program is such that we will be in the next year or two.

Secretary SHARP. I agree with you. I also deplore the impression that is given.

The CHAIRMAN. Mr. Quigley?

Mr. QUIGLEY. No questions, in the interest of getting into executive session.

Mr. FULTON. I have one more question.

The CHAIRMAN. Mr. Quigley waived his question so we could go into executive session.

(Whereupon, at 11:30 a.m., the committee proceeded in executive session.)