

# REVIEW OF THE SPACE PROGRAM

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HEARINGS  
BEFORE THE  
COMMITTEE ON  
SCIENCE AND ASTRONAUTICS  
U.S. HOUSE OF REPRESENTATIVES  
EIGHTY-SIXTH CONGRESS  
SECOND SESSION

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## REVIEW OF THE SPACE PROGRAM

MONDAY, FEBRUARY 8, 1960

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

The committee met at 10 a.m., Hon. Overton Brooks (chairman) presiding.

The CHAIRMAN. The committee will come to order. We will give the photographers just a moment, time to finish their picture taking before we go into session.

Mr. Beresford, do you have a report you want to make in reference to a briefing Wednesday afternoon?

Mr. BERESFORD. I have an announcement, Mr. Chairman, that we are trying to arrange for a briefing to be given on Tuesday afternoon at 2 p.m.

The CHAIRMAN. Wait, I want everyone to hear.

Would you stand up, Mr. Beresford, and talk a little louder, because you don't have the microphone.

Mr. BERESFORD. We are trying to arrange for a briefing to be given tomorrow afternoon at 2 by representatives of the Navy and the Goodyear Co. on Project Wagnight for such members of the committee as can attend.

The CHAIRMAN. Is it going to be here?

Mr. BERESFORD. Here, yes, sir.

The CHAIRMAN. Well, we can all bear that in mind. So we will finish early enough in order to have that briefing afterward. All of the members of the committee that wish to remain can do so for the briefing.

Those that have other engagements, we will understand if they can't be present.

Now, is Captain Ducander of the Navy Reserve here?

Mr. DUCANDER. Yes, sir.

The CHAIRMAN. We are proud to announce that Mr. Ducander is now a captain in the Navy Reserve.

Mr. DUCANDER. Also Mr. Fulton.

The CHAIRMAN. I want to announce that in the presence of the Secretary.

Also Mr. Fulton is Captain Fulton.

We are very happy to have all of this brass around us here.

[Laughter.]

Mr. FULTON. If we act too favorable to our superiors this morning, you will know the reason.

The CHAIRMAN. Mr. Secretary and Admiral Burke, it is customary in this committee, in these hearings, to swear in all of the witnesses. You and the Admiral and who else will support you there?

Secretary FRANKE. Assistant Secretary Wakelin and Admiral Hayward.

The CHAIRMAN. We would like to swear everyone in at one time. Do you and each of you swear that any testimony that you will give to the committee in matters now under consideration will be the truth, the whole truth and nothing but the truth, so help you, God?

Secretary FRANKE. Yes, sir.

Admiral BURKE. Yes, sir.

Mr. WAKELIN. Yes, sir.

Admiral HAYWARD. Yes, sir.

Mr. FULTON. Will you yield for another promotion?

The CHAIRMAN. We can't take too many promotions.

Mr. FULTON. This is your own good self. In the Air Force and Space Digest of February 1960, on page 50 they have a picture of MAAG Gen. James Fry, Charles Ducander, counsel to the Brooks Committee, Colonel Sims, gathered for conference on the European defense problems in Naples and they list here as the committee chairman, Senator Brooks.

The CHAIRMAN. The gentleman is out of order now.

You will have me in trouble with the other body.

This morning we are happy to have the Secretary of the Navy here. There are so many recent Navy developments that need our attention and our understanding, that we look forward especially to this event this morning, having the Secretary.

Mr. Secretary, you have a prepared statement, I believe?

Secretary FRANKE. Yes, Mr. Chairman.

The CHAIRMAN. We will be pleased if you will proceed with the statement.

Secretary FRANKE. Thank you.

#### STATEMENT OF HON. WILLIAM B. FRANKE, SECRETARY OF THE NAVY

Mr. Chairman and members of the committee, it is a pleasure and privilege to be with you this morning to summarize the Navy's views concerning the national space effort, and to introduce to you the Navy witnesses who will tell you of the effort that the Navy Department is making in this field.

First of all, I would like to emphasize that the Navy shares completely the interest and concern of this committee in our Nation's progress in space research and exploration. The Navy witnesses who appear before you will do everything possible to be helpful to you in the work you are doing. These witnesses will be—incidentally, I would like to add Admiral Burke in here, because I didn't know he was going to be here this morning and neither did he, as a matter of fact, know whether he had a conflict of committees or not:

Admiral Burke; Dr. James H. Wakelin, Assistant Secretary of the Navy for Research and Development; Vice Adm. R. B. Pirie, Deputy Chief of Naval Operations for Air; Vice Adm. J. T. Hayward, Deputy Chief of Naval Operations for Development; Rear Adm. W. F. Raborn, Director Special Projects, Bureau of Naval Weapons; Rear Adm. T. F. Connolly, Assistant Chief for Pacific Missile Range and Astronautics, Bureau of Naval Weapons.

They will tell you in some detail of the work that the Navy Department is doing. I believe that I can best further your efforts by limiting myself to a few comments on the Navy's overall policy in approaching space matters.

The Congress has established the National Aeronautics and Space Administration (NASA) to spearhead the Nation's civil effort in the scientific exploration of space. This in my opinion was highly desirable and will simplify the Government's task in mobilizing our country's civilian scientific and technical manpower to further our knowledge of and accomplishments in space.

The military task before us is, of course, closely related to this effort and must be coordinated with it, but the military task presents distinct problems and challenges of its own. We in the military services must strive to assure that the national security is not endangered through the space activities of any potential enemy and that our own military forces are able and ready to seize the opportunities offered by space exploration to strengthen our Nation's defense.

I would like to emphasize that the Navy's efforts in space exploitation and use are directed first and always to improving our ability to carry out the recognized missions which have been assigned to the Navy.

Each year that I am with the Navy Department I become more and more aware of the scale, the scope, and the importance of the Navy's job in maintaining and improving America's seapower and the strength that seapower gives to us as the world's greatest maritime nation.

At first glance, it may seem out of place to discuss such a traditional role with this committee, but our seapower has never been more important and is relevant to today's discussion. Our links to our allies, all of our operations in cold and limited wars, and the invaluable deterrent to be created by roving missile submarines are all essential to our national safety.

Maintaining this seapower is the Navy's first and great task. Our interest in space operations and the large investment we have already made in space research is aimed at using space to do our assigned job better and more efficiently. If we believe that we can navigate our ships more accurately through our space vehicles or communicate more quickly and more surely, then we will seek to build that capability.

The Navy is certain, as I am sure all of you are certain, that there is more than enough work that needs to be done in space research for all the civil and military groups interested in the field. Certainly each military service has a contribution to make. Today each service has primary responsibility for a specific type of warfare and as a result, each service has developed specialized equipment.

For example, each needs specialized types of aircraft to meet its own peculiar requirements. We in the Navy believe that the same specialized requirements will prove true of space vehicles.

For the years immediately before us, however, our need in space work is knowledge, and that means research work—hard research work from many different angles and toward many objectives. This research work should, and will, I believe, be conducted with the free interchange of information and findings between services and between departments which the Navy has always sought to foster.

It is a pleasure for me to be here this morning. I hope that you will call upon the Department of the Navy to help you in every way possible as your study continues.

The CHAIRMAN. Mr. Secretary, a very fine statement. I think it is very fair. It has a cooperative touch to it, and with that sort of attitude, I know you will get along with the other departments.

Would you like, Mr. Secretary, for us to proceed to hear from the admiral, or would you like for us to ask you questions and then release you to go back to your duties? What is your pleasure?

Secretary FRANKE. Dr. Wakelin has a statement to make. I think Admiral Burke does not have one—you have one? I am sorry.

The CHAIRMAN. The admiral has one. I think we have copies of it.

Secretary FRANKE. And Dr. Wakelin also has one. Mr. Chairman, I would like to suggest, it would seem to me it would be good for the committee to hear the three statements.

The CHAIRMAN. All right.

Secretary FRANKE. And I am prepared to stay here.

The CHAIRMAN. All right. We will hear the three statements. Here is one by Dr. Wakelin. Does everybody have a copy of that?

We will hear then the Assistant Secretary of the Navy for Research and Development, the Honorable James H. Wakelin, Jr.

**STATEMENT OF HON. JAMES H. WAKELIN, JR., ASSISTANT SECRETARY OF THE NAVY, RESEARCH AND DEVELOPMENT**

Dr. WAKELIN. Mr. Chairman, gentlemen: It is an honor for me to have the opportunity to talk with you gentlemen this morning. I sincerely hope that I and the officers who will follow me can provide you with information and assistance that will help you in the work before you.

Mr. Franke has summarized for you the Navy's overall policy on space efforts. I would like to tell you a little more about how we in the Navy Department are approaching research in space technology.

Like Mr. Franke, I would like to emphasize that the Navy is and always has been a specialized service with specialized tasks and duties to carry out. Our work centers on the place of the sea in our national security and in our way of life. For the conceivable future adequate strength in the ocean areas of the world will continue to be as vital in our national scheme of things as it is today.

But through the years the Navy's research efforts in seeking better ways to do its traditional job have led to discoveries and inventions that have far wider applications for the Nation as a whole. In the last century the Naval Observatory was set up to improve the quality of our navigation.

This institution has played a key role in the growth of the Nation's proficiency in astronomy and has set a standard for precision, particularly in the field of timing, which is recognized throughout the world.

The intensive work which Dr. Robert Page and others at the Naval Research Laboratory put in on the early development of radar vastly improved the fighting ability of the fleet, but the results of their ef-

forts are now seen in many phases of commercial aviation and shipping. Modern radio astronomy which opened to view new distances in outer space owes much to the early work on radio and its uses carried out at the Naval Research Laboratory and other naval facilities.

Our research work in the space age is still directed to our task. The Navy has a job to do and we are seeking better ways to do it. To increase our knowledge of the upper atmosphere and weather conditions we began exploratory work with high altitude balloons some 10 years ago. This work is continuing today and has been fruitful throughout. Some of you may have noticed press reports of a balloon research experiment conducted from the carrier *Valley Forge* only last month. The activities you will hear about from the officers who follow me are part of an overall effort which already has a commendable history and which, as experience accumulates, has an ever greater potential for the Navy and for the Nation's benefit.

In short, the Navy's program to develop its knowledge of and capability in space is a natural growth of our never ceasing work to improve America's capability to launch power from the sea.

Now, I would like to tell you very briefly about the Navy's organization for work on space matters.

First, there is my office—that of the Assistant Secretary of the Navy for Research and Development. This is a new office created on February 6, 1959. As Assistant Secretary, I am responsible for the control and management of all phases of the Navy's research and development work. I sincerely believe that the existence of this office has permitted a real improvement in the coordination and focusing of research work on the pressing problems that confront us. Another important aspect of my job is the coordination of the Navy's efforts with those of the other services and other agencies in the Government. I have excellent working relations with my colleagues in the other services and I am satisfied that constructive cooperation among us is still improving.

Within the Office of the Chief of Naval Operations there have been two recent changes which facilitate efficient management of the Navy's work on space. A new post of Deputy Chief of Naval Operations, Development, was created last year. This post is ably filled by Vice Adm. John T. Hayward who, among his other duties, coordinates development work in astronautics. He will speak to you on this area in greater detail.

The Deputy Chief of Naval Operations for Air, Vice Adm. Robert B. Pirie, who will also testify, has created within his organization an Astronautics Operations Division with responsibility for operational phases of space application and space flight.

As you know, during the last year the Bureaus of Aeronautics and Ordnance were combined into a single Bureau of Naval Weapons, since it was felt that a single organization could better meet the demands of modern technology and modern warfare. This Bureau has an Assistant Director for Astronautics whose responsibility it is to oversee the astronautics work in the Bureau's laboratories and test stations, and in contracts with private firms. This officer is also responsible for the technical and management control of the Pacific Missile Range.

In 1946 the Office of Naval Research was created by congressional action, and, while this hardly constitutes a recent change in Navy



organization, it is worth mentioning this morning, for the Office of Naval Research in its relatively short life has built up a national reputation for imaginative and competent research in virtually all fields of science. This office has repeatedly demonstrated that it is one of the Nation's major assets in meeting new and demanding technical challenges.

These are the mechanisms whereby the Navy guides and coordinates a large and broad program of scientific and technical advancement. The laboratories of the Navy explore problems in the fields as diverse as weather, photography, and medicine. They have already made major contributions in our initial steps toward the conquest of space. Their potential is great. The Navy is determined to move forward rapidly in meeting its own urgent and evident requirements. We will cooperate to the fullest with the other elements of Government working in this field and we will do everything we can to advance the Nation's overall space effort.

(The biographies are as follows:)

#### BIOGRAPHY OF WILLIAM BIRRELL FRANKE

Appointed by President Eisenhower to serve as Secretary of the Navy, the nomination of William B. Franke, of New York City, was confirmed by the Senate and he took the oath of office on June 8, 1959. Prior to his appointment, Mr. Franke served as Assistant Secretary of the Navy (Financial Management) from October 1954 until April 1957, and as Under Secretary of the Navy from April 1957 until June 1959.

William Birrell Franke was born in Troy, N.Y., on April 15, 1894. He has resided in New York State since his birth. In Washington, D.C., Mr. and Mrs. Franke reside at 5016 Loughboro Road NW. They have a home in Rutland, Vt.

He attended local schools in Troy, N.Y., and was graduated from Pace Institute of Accountancy in New York City.

Prior to graduation from Pace Institute, Mr. Franke was employed by Cluett, Peabody & Co., of New York, and by Naramore, Niles & Co., of Rochester, N.Y., until 1928, when he formed his own accounting firm of Franke, Hannon & Withey, of New York, and became the senior partner. In 1924 he became a member of the American Institute of Accountants and also during that year, was received into the New York State Society of Certified Public Accountants. He holds an honorary degree of doctor of science from the University of Louisville, which was bestowed in 1948 and the honorary degree of doctor of laws from Pace College in June 1955.

From 1948 to 1951, Mr. Franke was a member of the U.S. Army Controllers Civilian Panel, Washington, D.C. He was special assistant to the Secretary of Defense in 1951-52. In 1951 Mr. Franke was given the Patriotic Civilian Commendation by the U.S. Army, and in 1952 the Distinguished Service Award by the Department of Defense.

In addition to being the senior partner in his own firm, Mr. Franke was associated with a number of other firms in various capacities which included positions as chairman of the boards of John Simmons Co., Inc., and General Shale Products Corp., and as director of the Carolina, Clinchfield & Ohio Railway Co.

Mr. Franke is a member of the Union League Club, of New York City; the Army-Navy Club and the Chevy Chase Club of Washington, D.C.; and the Rutland Country Club, of Rutland, Vt.

Mr. Franke is married to the former Bertha Irene Reedy (formerly of Schenectady, N.Y.). They have three children: Phyllis (Mrs. Harding H. Fowler), Anne (Mrs. John Anthony Ulinski, Jr.), and Patricia (Mrs. W. Sherman Kouns).

AUGUST 25, 1959.

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#### BIOGRAPHY OF JAMES H. WAKELIN

James H. Wakelin was born in Holyoke, Mass., on May 6, 1911. He attended the public schools in Holyoke, graduating from high school in 1928. He received

an A.B. degree in physics from Dartmouth College in 1932. During 1932-34 he attended Cambridge University, Cambridge, England, where he was granted a B.A. degree in the natural sciences in 1934 and an M.A. degree in 1939. Dr. Wakelin received his Ph. D. degree in physics from Yale University in 1940, where he specialized in the field of ferromagnetism. During 1939-43 Dr. Wakelin was a senior physicist in the Physical Research Department of the B. F. Goodrich Co., Akron, Ohio. His work there was concerned with the structure and physical properties of natural and synthetic rubber, and with X-ray diffraction and electron microscope studies of high polymers.

From 1943 to 1945 he was ordnance staff officer to the Coordinator of Research and Development, Navy Department, Washington, D.C. During 1945-46, as a lieutenant commander, USNR, he was head of the Chemistry, Mathematics, and Mechanics and Materials Sections of the Planning Division, Office of Research and Inventions, and was active in the planning and organization of the Navy's Office of Naval Research. Following World War II, Dr. Wakelin joined a group of former Navy research scientists in the establishment of Engineering Research Associates, Inc., of Washington, D.C., and St. Paul, Minn., and held the position of director of research.

While with this company, he was also director of the field survey group of ONR Project Squid under contract to Princeton University. In 1948 he became associate director of research of the Textile Research Institute in Princeton, and in June 1951 was appointed director of research of the institute, serving in this capacity for 3 years. In 1954 Dr. Wakelin established his own consulting business in Princeton and has been a consultant on research planning and organization to the lamp division, General Electric Co., Cleveland, Ohio; Stanford Research Institute, Palo Alto, Calif.; American Radiator and Standard Sanitary Corp., New York City; J. P. Stevens & Co., Inc., New York City; Frenchtown Porcelain Co. and Star Porcelain Co. of Trenton, N.J. He was one of the founders in 1954 of Chesapeake Instrument Corp., Shadyside, Md., established to conduct research and development for the Navy in the fields of underwater sound and acoustic devices. He has been a vice president and consultant of that company. During this period he was also a research associate on the staff of Textile Research Institute working on the structure and physical properties of high polymers under a program sponsored by the Office of Naval Research.

Dr. and Mrs. Wakelin, the former Margaret Cushing Smith of Concord, Mass., have lived in Lawrence, N.J., for the past 10 years. They have three boys: James H. III and Alan B., who attend the Lawrenceville School, and David, a student at the Princeton Country Day School. The Wakelins have been active with the Cub Scouts and the parent-teacher association in Lawrenceville and with the American Red Cross in Princeton. Dr. Wakelin served as president of the Nassau Club of Princeton in 1955 and as a member of the board of trustees 1956-59; he is also vice president of the fathers' association of the Lawrenceville School. Mrs. Wakelin is active as a volunteer with the Princeton Hospital where she is now chairman of the hospital aid committee. The family's recreational hobbies include golf and sailing and they spend their summer vacations on Pickering Island in Penobscot Bay, Maine.

Dr. Wakelin is a member of Sigma Xi, the American Physical Society, American Association for the Advancement of Science, the Association for Computing Machinery, the American Crystallographic Society, Textile Research Institute, the Textile Institute of Great Britain, and is a contributor of scientific papers to the Journal of Applied Physics, the industrial and engineering chemistry and textile research journal in the field of high polymer physics. He is a coauthor, with C. B. Tompkins and W. W. Stifer, Jr., of "High-Speed Computing Devices," published by McGraw-Hill Book Co. in 1950.

The CHAIRMAN. Thank you very much, Dr. Wakelin. It is interesting to note from your statement that the Office of Assistant Secretary of the Navy in charge of this work is about 1 week younger than is this committee, itself; created about the same time.

Now, we have Adm. Arleigh A. Burke, Chief of Naval Operations.

Admiral BURKE. Thank you, Mr. Chairman, and I want to apologize for not having my statement written out, but I didn't know I was going to appear. It was written yesterday, sir.

The CHAIRMAN. Well, you will deliver it with your usual emphasis and we will understand it all right, I am sure.

Admiral BURKE. Thank you, sir.

**STATEMENT OF ADM. ARLEIGH A. BURKE, CHIEF OF NAVAL OPERATIONS**

Admiral BURKE. Mr. Chairman, gentlemen, I particularly welcome this opportunity to reaffirm the views that have already been stated regarding the Navy's role in the space age. I should also like to emphasize, as much as I know how, that the field of space and astronautics is one in which the Navy shares a great interest, with the other military services and civilian agencies. Space is being investigated for scientific, political, and military purposes. From its long experience in basic research, and particularly space exploration, the Navy has concluded that use of space techniques can substantially contribute to the execution of its assigned tasks and missions. It also recognizes that use of these techniques by an unfriendly nation might seriously impede the successful functioning of naval forces some day in the future. Thus, the space activities of the Navy are directed toward accomplishment of these two ends—the use of space, and protection against the use of space by potential enemies.

The rate of our space exploitation is carefully planned to meet the demands of the present and the future. The Navy's space program is not an internal endeavor, but consists of support to the national effort, coordination with the other military services in the military space program, and pursuit of these areas peculiar to naval needs.

In the fields of space and astronautics, the Navy has stated as immediate objectives in 1961 the attainment of improved navigation and communications by use of artificial Earth satellites. We have additional requirements for satellites to perform surveillance, weather observations, and surveying, plus systems to afford detection of space vehicles. It is recognized that some of these requirements may not be met in the near future, although their accomplishment would represent improvements of great value.

Because of naval interest in navigational systems, the Navy was asked to develop the navigational satellite for military use. The satellite detection system, developed by the Navy under Defense sponsorship, provides satellite information for all the military services and the scientific community as well. Similarly, the development of other space systems by the Army or Air Force will help to satisfy naval requirements. Each service, of course, must adapt a basic system to its particular needs and must execute and fund its operations.

The space programs now under development are considered by the Navy as necessary steps in the evolution of systems to be applied tactically in future naval operations. Improvement of components and greater propellant efficiency may allow sea and air launch of satellites at low cost. These systems will provide greater flexibility of operations with increased security and speed.

The Navy's space program provides a logical and efficient transition of current space projects from the research to the operational stage. It also pursues the specialized projects assigned by the Department

of Defense or NASA and supplies the results to all designated users. Participation in space programs will enable the Navy to derive maximum advantage for its own purposes from space activities conducted for the benefit of all services. I believe that the presentations of the various Navy witnesses will give you a clear picture of the importance to the Nation of the Navy's participation in space.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much, Admiral, for a fine statement.

Now, at this point we can proceed with the questions. Mr. McCormack?

Mr. McCORMACK. How is your relationship with NASA?

Secretary FRANKE. Our relationship with NASA is fine.

Mr. McCORMACK. Of course, NASA is a new agency and has to establish a climate. We should realize that fact, and I suppose that is included in your answer.

Secretary FRANKE. Yes, it is, Mr. McCormack.

Mr. McCORMACK. I would like to get your views on section 309 of H.R. 9675. Have you seen it, Mr. Secretary?

Secretary FRANKE. Yes, sir, I have.

Mr. McCORMACK. In the first place, when did the Navy first know about this bill being introduced?

Secretary FRANKE. Well, we did not see the bill before it was introduced, but I believe Secretary Wakelin had some informal conferences and perhaps he should explain.

Mr. McCORMACK. Informal conferences would be consultation?

Dr. WAKELIN. Yes, with Mr. Horner and Dr. Glennan, sir.

Mr. McCORMACK. How long before the introduction of the bill did you have this conference?

Dr. WAKELIN. In the order of the middle of December.

Mr. McCORMACK. So you have been acquainted with the development and the thinking?

Dr. WAKELIN. In a very general way, sir, yes.

Mr. McCORMACK. Well, concentrating on 309, you are well acquainted with it, I assume?

Dr. WAKELIN. Yes, sir.

Mr. McCORMACK. And having in mind what the Secretary said, that the military services must strive to assure that the national security is not endangered through space activities of any potential enemy and that our own military forces must be able and ready to seize the opportunities offered by space exploration to strengthen our Nation's defenses, also this further statement by Admiral Burke that each service must establish a basic space system for its own use, would you care to comment on section 309 as to whether it will restrict any of those functions?

Secretary FRANKE. Mr. McCormack, I don't think so. Of course, this gives the Defense Department the right to undertake these activities. And what Navy does would, of course, be determined by our conferences and our association with the Secretary of Defense.

Mr. McCORMACK. Nothing in this act shall preclude the Department of Defense from undertaking such activities involving the utilization of space. How do you construe the word "utilization"? Have the brains of the Navy Department leveled on that yet?

Secretary FRANKE. I think that means any developments that take place either in any military service or in NASA——

Mr. McCORMACK. You say——

Secretary FRANKE. Would be available.

Mr. McCORMACK. You say development, would that go into research aspects?

Secretary FRANKE. Yes, I think so, because the latter part of that paragraph says including the development of weapons systems utilizing space vehicles and the conduct of supporting research connected therewith.

Mr. McCORMACK. What is supporting research?

Secretary FRANKE. I think any research——

Mr. McCORMACK. The executive branch levels on these words. We found that out on the word "except," which has been construed somewhat differently than the select committee of which I was chairman intended. I know some of the advocates in the Defense Department stretched the interpretation of that word, certainly not as intended by the committee of which I was chairman. I think I can speak for both sides on that.

Mr. FULTON. Correct, sir.

Mr. McCORMACK. What is your construction of "supporting research"?

Secretary FRANKE. I don't read this as being restrictive. It seems to me that any research that we might do or NASA might do would be determined by the relationship between NASA and the Defense Department. And that at that point a decision would be made as to who is going to do it, plus the fact that each side of this picture should have available to it whatever is done by the other side.

Mr. McCORMACK. Well, now I am a strong defender of NASA in its sphere, but I recognize the world of today and the importance of preservation and our military services. We just got to be practical. Does this mean that you or your representatives have got to get an agreement that you have jurisdiction over things like navigational satellites?

Secretary FRANKE. Well, I think that originally the responsibility for the development of a navigational satellite, for example, would have to be determined. A determination would be made whether this would be NASA or the Defense Department.

If it were then agreed it should be the Defense Department's responsibility, the Secretary of Defense would have to determine which service could best perform this task.

Mr. McCORMACK. If the Defense Department makes that decision—did you say that?

Secretary FRANKE. I think it is done in cooperation and coordination with NASA.

Mr. McCORMACK. That is different from what you said.

Secretary FRANKE. I didn't mean it to be different.

Mr. McCORMACK. I am not here to cross-examine you. I am trying to get information to perform what I consider to be my duty. I will be frank with you, and I have stated to the world that I think we have got to resolve any twilight decisions in favor of the military in the world of today, questions of jurisdiction, that is.

Go ahead. You say now that you agree among yourselves, but then you go over and consult with NASA, is that right?

Secretary FRANKE. That is right.

Mr. McCORMACK. Well, what effect does that have? Does that mean that NASA has a veto?

Secretary FRANKE. Well, if there were a major problem and the be decided without any great difficulty. Now, on any major project—

Mr. McCORMACK. I won't disagree with that. There will be no great difficulty if everyone has an understanding mind. Go ahead.

Secretary FRANKE. Well, if there were a major problem and the Defense Department and NASA could not agree, then, of course, the President would have to make the decision as to who was to sponsor the project. But in most of these we have close association with NASA, we have liaison people with NASA and I don't anticipate great difficulty.

Mr. McCORMACK. So speaking for the Navy Department, you approve of the language as written in section 309?

Secretary FRANKE. Yes, sir.

Mr. McCORMACK. The Air Force approved in principle—they are going to look it over more carefully and might make some suggestions. I think the Army is probably the same way. But you approve absolutely of the language used?

Secretary FRANKE. Yes; I think so. I noticed that the Air Force in testifying said there might be changes in individual words here and there, and maybe this is true, but in general, I think this is a good act.

Mr. McCORMACK. Why don't we ask Admiral Hayward, if it is not going to embarrass him. I don't want any questions asked embarrassing a man in the uniform. I don't want that misunderstood. I will ask questions about the defenses of our country, but there are certain technical delicate situations. Admiral Hayward, what are your views on section 309?

Admiral HAYWARD. I am not a lawyer, but I read supporting research as things we are doing all the time.

Mr. McCORMACK. Wouldn't it be much better if you had the word "supporting" stricken out and said "the conduct of research connected therewith"? That is greater, it seems to me. "Supporting," it seems to me, might be a word of limitation.

Admiral HAYWARD. Well, we use it in the budgetary terms as applied and supporting research. As I say, I am not a lawyer, but I feel that this gives us the right to do any research and development that we need in this area.

Now, I don't see any limitation on that particular section there.

Mr. McCORMACK. Mr. Secretary, there would be no objections from your angle to striking out the word "supporting", would there?

Secretary FRANKE. I wouldn't think so.

Mr. McCORMACK. All right, that is all.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. We are glad to have you here and I am glad to have the interest of the Navy in space. As a matter of fact, we have heard from Admiral Hayward quite a bit and have been briefed several times under Navy auspices on various projects and it has been very informative. I would like to ask shortly about the navigation satellite. Would you people like to have that Transit project assigned to you by ARPA?

Secretary FRANKE. The answer is "Yes."

Mr. FULTON. Now about the Notus, communications satellite, are you interested in that?

Admiral HAYWARD. We are interested in it, but I feel strongly the way was decided originally to the Army, the Army should get on it.

Mr. FULTON. Is there any dispute on the assignments of anything like Midas, Samos, or any kind of that project? Is there any question on where it should go in the Department of Defense or should it just be held by the ARPA people? I am trying to get the allocation.

Admiral BURKE. Yes, sir, there is always question about these projects—take the Transit project which is a Navy-assigned project. We are going to put into that satellite equipment which will assist the other services. They will assist us in developing that equipment and inform us of their requirements. Now, that is true in all the other satellites. In communications satellites, for example, our requirements are somewhat different from those of the Army, because we will want to read these satellites out at sea from ships. So there is always a good deal of close cooperation required in order to get the material that is needed by all the services in each satellite.

Mr. FULTON. And you would say that the assignment to a particular service is not quite as important as some people are making it, because close cooperation makes it a joint effort anyhow?

Admiral BURKE. Well, the service with the majority of the experience in that particular area, or the service with the greatest requirements in that area, and sometimes they are not exactly the same, should have the assignment of the satellite.

Mr. FULTON. Do you put the Midas project at a high priority?

Admiral BURKE. Yes, sir, the Midas project is at a high priority. Yes, sir, I do. It is further away than Transit, but all of these experimental projects which will help us do our job on the face of the earth better are important, sir.

Mr. FULTON. And the Samos project, then, photographing and electronic processes?

Admiral BURKE. Yes, sir, that is further away, probably than—

Mr. FULTON. But you think that is high priority?

Admiral BURKE. Yes, sir, it will be.

Mr. FULTON. Could I ask you then, in conclusion on one point and that is the Project Wagnight. That is the foldable low level aircraft?

Admiral BURKE. Yes, sir.

Mr. FULTON. First, does the Navy have an interest in it?

Admiral BURKE. Yes, sir.

Mr. FULTON. Secondly, does the Navy have a strategic—an area need?

Admiral BURKE. Yes, sir. We have a great interest in that project. As you know, Wagnight is an inflatable device and we have a great interest in it.

However, in examining the problem, the material that has to be carried in Wagnight is noncompressible. I mean by that you have to put a lot of electronic equipment in this vehicle. And that equipment was noncompressible. The equipment that had to be put into

it was so big in proportion to the vehicle, itself, that it looked like use of Wagnight was not going to be feasible.

Mr. FULTON. Would it be feasible to cargo ships or submarines where space is important?

Admiral BURKE. Yes, it would be, but you can't compress it nearly as much as we thought we would be able to. We are still interested in it, but we have to do a lot more miniaturizing before that will be a feasible project, sir.

Mr. FULTON. You do have an interest that research and development are formed on it, whether by you or by private enterprise, is that right?

Admiral BURKE. That is correct, sir.

Mr. FULTON. And you do have a need of a vehicle or some sort of a project of this kind where you can mass produce it, do it quickly, at low level flight, possibly at 2,000 foot altitude and maybe 400 knots speed? Could we ask Admiral Hayward that?

Admiral BURKE. All right.

Admiral HAYWARD. Mr. Fulton, there has been a lot of confusion on this program.

The actual proposal that was turned down was one that was submitted by Goodyear that had to do with getting aerodynamic data on an airfoil. The real advantage of this particular material might be to use it structurally in a lot of places, but to try and go from zero, from nothing, really, and make a foldable jet missile or airplane was just too much to expect. You can't do it technically. You might use this material in many places and our interest in it is: Can we substitute this material for metal, structurally?

Mr. FULTON. But you are interested?

Admiral HAYWARD. Yes, sir, we are interested in the material as such, but to say we are interested in going right now to a complete folded jet airplane of this 400-knot configuration is wrong. This is where we are all the time getting ourselves in trouble by trying to invent on schedule again.

Mr. FULTON. Do you have any funds under you that would be available for such a research and development project?

Admiral HAYWARD. We have funds on the materials, always, Mr. Fulton. We would investigate it structurally as to what you actually could expect from it.

Mr. FULTON. Is there any program now in operation on it or programmed?

Admiral HAYWARD. There is not at the moment; no, sir.

Well, there is the fact that we actually have an inflatable airplane as you probably know, but this is at a much lower level structurally than the Wagnight proposal.

The CHAIRMAN. That is a matter we are going to be briefed on tomorrow.

Admiral HAYWARD. Yes, sir, it is.

Mr. FULTON. That is all.

The CHAIRMAN. By the way, too, the Admiral is a witness for tomorrow.

Admiral HAYWARD. Yes, sir.

The CHAIRMAN. You can use him today, but you will be crowding the Secretary, and the Assistant Secretary.



Mr. FULTON. Thank you very much, I appreciate it.

The CHAIRMAN. Mr. Miller?

Mr. MILLER. Mr. Secretary, talking not about theoretical things, I am very much concerned with the present, where we stand right now. How far, if you can tell me, do you think Polaris is away from being operational, or is that classified?

Secretary FRANKE. It is very close to being operational, we believe. We will have some tests within the next few months, probably by about July, which, if successful, will pretty well prove out this program, although we do not anticipate any difficulties.

Mr. MILLER. In other words, your last firings of Polaris have all been successful?

Secretary FRANKE. They have all been successful, five in a row.

Mr. MILLER. Five in a row, because after all, when we talk about closing this gap, to me Polaris is one of the things you are going to use to close this gap and it is the "Sunday punch" that we have got to get on with right now. I am very happy to get this.

Incidentally, I want to congratulate the Office of Naval Research. I think you have brought Polaris along and while you brought it along, you have had the courage to get it to the point where we could put it into production. I feel it is one of the great defensive weapons of this generation. Maybe there will be some more things in the future, but right now, we are depending a great deal on Polaris.

How far, or is that classified, do you think that you can fire it? We have heard—

Admiral BURKE. This missile, as it now stands, will fire about 1,200 miles.

Mr. MILLER. 1,200?

Admiral BURKE. Yes, sir. Within a couple of years it will fire 1,500 miles. We anticipate no difficulty in that at all.

Mr. MILLER. 1,200 miles gives us a good range, that is within 10 percent of what we thought it would do when we first began to talk about it.

Admiral BURKE. Yes, sir.

Mr. MILLER. I want to congratulate you, too, on Sidewinder. This is something that is gone and forgotten. It was developed inhouse in the Navy and I think it is a great weapon. It stopped the Chinese Communists cold last time and they haven't seen fit to want to challenge it with all of the developments that have supposed to have taken place behind the Iron Curtain since. You have also been doing a lot of work down at the South Pole and the Arctic. I believe this is in the field of magnetism and gravitation, that sort of thing.

All of this has a direct reference, has it not, on our space work? We have got to know how our own world operates here, what operates on this planet, if we are going to apply it and we are going to leave this planet and get back to it, is that correct?

Admiral BURKE. That is correct.

Secretary FRANKE. That is correct.

Mr. MILLER. And this has all been done in conjunction, too. Of course, we are all interested in weather. While we talk about sending satellites up to look at the weather, tell us about the weather. The weather, I believe, becomes the transference of heat, basically. There are other fields where you are also trying to solve this problem in a little more mundane way, are you not, fields of oceanography?

Secretary FRANKE. That is correct.

Admiral BURKE. May I explain? Weather is greatly influenced by ocean currents, for example, as one of many things. There are a few things that happen to ocean currents which happen now and then and we don't know why they happen. For example, the current from the Antarctic which flows north in the Pacific, up the west coast of South America, is called the Humboldt Current. About every 10 years it changes its course and its characteristics a little. As you know, the west coast of South America is normally very dry.

But when the Humboldt Current makes minor changes, there are terrific floods, terrific changes in weather, high winds and regular downpours. Nobody knows why. We want to find out. A more beneficial effect, however, results in the Atlantic with the current there, the Gulf Stream which warms the adjacent land area.

If we can find out what causes those changes, perhaps we can do something to control them some day.

Mr. MILLER. Not only control them, but then we can anticipate and project and know very finally about the weather, can't we?

Admiral BURKE. That is correct.

Mr. MILLER. Without even looking into the heavens?

Admiral BURKE. That is correct, sir.

Mr. MILLER. If we can know about the ocean currents and this transference of heat that takes place in this field, we can come to know as much about the weather from this source as any other source that is available to us.

Admiral BURKE. Yes, sir.

Mr. MILLER. And this is important and the Navy has been doing a great deal of work in this field and I want to congratulate them on it. I happen to serve on another committee, the Committee on Oceanography, that works very closely with the Navy, and I know of these things, know of the great work that you are doing, and Mr. Secretary, I think you have got a great staff, and you are to be congratulated.

I particularly want to pay my compliments to Admiral Hayward, because I won't be here tomorrow when he formally comes on.

The CHAIRMAN. Mr. Chenoweth?

Mr. CHENOWETH. I also want to welcome you to the committee and congratulate you and commend you on the very splendid statements of you and your staff.

Secretary FRANKE. Thank you.

Mr. CHENOWETH. We in Colorado are very proud over the fact that Admiral Burke heads up the Navy operations. I think I speak not only for the people of Colorado, but I think for the people of every State in the Union, when I tell you, Mr. Secretary, we have complete and full confidence in what Admiral Burke is doing and he is to return to Colorado next month to receive a very important award for his outstanding services. I thought you would be interested in that.

Secretary FRANKE. Thank you, I am interested.

Mr. CHENOWETH. I would like to ask you, Admiral Burke, about the top question which is raging in Washington these days and that is about our defense program and just where the Navy stands and whether we are ready to meet any contingency, whether we will be able to deliver the striking load when it is necessary.

I would like to have you give us just your observations, Admiral, on the "posture"—is that the word that they are using today—of the

Navy today as compared to what requirements will be for the Navy to perform in the near future.

Admiral BURKE. Yes, sir. Of course, this is one of the most difficult problems because we are dealing primarily with futures. What is going to happen in the future? What is Russia going to do? What are our allies going to do? What are we going to do? We are trying to balance the possible enemy strength against our possible strength under any contingency which various people can envisage and opinions are always just a little bit different.

Each man envisages a slightly different situation. It is a most difficult problem. Of course, this is a problem in which the Joint Chiefs of Staff, the Department of Defense, all military establishments spend most of their time on.

Right now, I think that the United States is the most powerful country on earth. I think that there is nothing whatever that Russia can do or anybody else can do which can prevent her destruction, if she wants to start a war. There is nothing whatever that she can do to prevent her own destruction if she wants to start a war.

Now, something new has been added. Russia can, if not now, sometime in the future, wreak heavy destruction on this country and there is nothing we can do to prevent it.

Now, when that time comes, is dependent upon a great many things happening, mostly in Russia. We will reach a stage sometime when Russia can inflict severe damage upon this country. But, by doing so, she cannot by any means prevent retaliation and her own destruction.

Now, this is true now. I believe it will be true in the future.

We have many ways, many methods, many systems to deliver that destruction. For example, it is not just by ICBM's, although those are very important. It is not just by IRBM's, those are important, too. We have a few, a few will be in Europe and other places. We have our carriers at sea in the Sixth and Seventh Fleets. These are heavy striking forces that can do a significant amount of harm. The Tactical Air Forces which are deployed all over the world, the Army missiles which are short range, but still can do a great deal of damage, and then, of course, there is SAC, which I think is a powerful force.

Now what is causing concern is the time when Russia gets an ICBM, gets many ICBM's in operation.

ICBM accuracies increase, just due to normal advances in science. Some day this will mean that we can destroy any target on the face of the earth whose location we know and which is fixed with ballistic missiles.

Similarly, Russia will be able to do the same thing to us. There will be other people, other nations that will also have that capability against fixed targets, in known locations. Any fixed target in a known location can be destroyed.

But that means what is needed now is invulnerability, the possession of a force which cannot be destroyed because it is not in a known location. That is, of course, exactly the reason why we stress carriers so much, they are not capable of destruction by ballistic missiles because their address is not known. There is no way that the Russians or anybody else can fire a ballistic missile from the Continent or from anyplace and destroy a carrier because they don't know exactly

where it is. Of course, that is also the reason why we developed the Polaris submarine. When the Polaris submarines come along, as they will—we have the utmost confidence now; the tests have all been successful—it will be impossible to destroy them. There is nothing that Russia can do to destroy that striking power and thereby prevent her own destruction.

If she starts a war, she will be destroyed.

Mr. CHENOWETH. Your statement is most reassuring, Admiral, and I am sure that it reassures the American people as to what our military strength is. One last question:

You mentioned that the Navy is using all of these new techniques in space in the missile program in its preparedness?

Admiral BURKE. Yes, sir.

Mr. CHENOWETH. You feel now that the Navy is making good progress in the use of these new modern techniques and scientific knowledge which we are developing?

Admiral BURKE. Yes, sir. We have, of course, very close cooperation with all the services and all civilian agencies in our research and development programs.

Mr. CHENOWETH. Do you know of anything that is being overlooked in this situation today?

Admiral BURKE. No, sir. We surveyed the question of gaps in our research very carefully to make sure that we aren't overlooking something. Of course, we might be overlooking something, but I don't think so.

Mr. CHENOWETH. Isn't there a tendency to magnify the gaps and really degrade what we are doing ourselves here, isn't that the tendency in this country today? We are reading so much about it every day.

Admiral BURKE. It seems so to me, sir. We have a lot of wonderful engineers in this country, a lot of wonderful scientists, both in and out of the services, both working for the services and for the civilians, sir. We get a lot of advice on what needs to be done and some of it is very good advice indeed.

So if anybody thinks that we are overlooking something, we usually hear about it, sir.

Mr. CHENOWETH. I appreciate that very fine statement, Admiral, and commend you for the admirable job that you are doing. Thank you very much.

Admiral BURKE. Thank you.

The CHAIRMAN. Mr. Sisk?

Mr. SISK. Mr. Secretary, I am interested in people because I think probably people are the most important part of this whole job and I would like to have your comment as to the problems, if such problems exist, in the Navy, with reference to the securing and the keeping of adequate people, adequately trained to do the job for you in research and development in the space field or in the overall field of research and development. What is your basic problem, if the problem exists in this field?

Secretary FRANKE. Well, our principal problem in this very important area is that we compete with industry. Therefore, it becomes difficult to keep people when industry can pay them more. Now, this is not as bad as it sounds, because we have many dedicated people in

the Navy, not only in the research and development effort, but in uniform doing other jobs who are not basically interested in the money.

But we also have others who naturally are. So I think that in brief, the answer to your question is we have problems in keeping people, certainly engineers and scientists.

Mr. SISK. Actually, some of these questions on programs I am sure I will probably direct to Admiral Hayward tomorrow because of his particular responsibility in this field. I was curious to know to how great an extent—we will keep the question general, rather than getting into specific numbers—but to what extent are you dependent in your program of research on civilian and to what extent if you want to use just percentages, on people actually in uniform?

In other words, are the majority of your people actually doing the research, the basic research, and so on? Are they civilian, are they military, or what is the percentage of breakdown?

Secretary FRANKE. It is predominantly civilian, probably 90 percent civilian and 10 percent military.

Mr. SISK. Ninety percent civilian.

Now, what is your situation with reference to paying those people? I appreciate the fact that we do have many dedicated people and we have on this committee from time to time in all branches of the service, seen this dedication at work, yet I wonder sometimes just how much we should depend—and I appreciate the fact that we have these people—but how fair are we being sometimes to expect as much dedication as we have on the part of some people who are working for the Government for 17, 18, 19 thousand a year when they could command 40, 45, or 50 thousand in industry?

Secretary FRANKE. Well, you can answer this question. I don't mean to be facetious about it, but you could ask this question about anyone in this room.

Mr. SISK. I appreciate that, and I know that covers a broad field, separate and apart. But there are problems which we are faced with now, for example, in NASA with reference to making possibly more positions available on a so-called super grade level. That is the thing I am concerned with here. To what extent is the Navy's work being retarded or slowed down if such is the case by a lack of your ability to have positions at higher grade levels?

Admiral HAYWARD. Mr. Sisk, maybe I can answer this. Our chief difficulty comes: We can compete up to about the GS-12 and GS-13 level. We get a lot of young graduates that come into our laboratories and who go up quite rapidly. But when they get to that level, there is practically no place for them to go. We don't have enough super grades.

Having run a laboratory, I know this is one of our problems. It is at that level that our good, trained physicists and mechanical engineers, go to industry. They can't afford to stay with Government really. Actually we don't blame them. We attempt to get around this a great deal by continuing the flow of younger college people and engineers and physicists into the Government again, but it is a problem with the Government, and in all three services, as far as in-house work is concerned.

It is a tremendous problem with NASA as we know. Now, contrary to this approach, the Atomic Energy Commission took the con-

tract approach and have been able to keep top people in Los Alamos and Livermore because with the contract approach, there was no limitation on the actual pay or the number of grades.

When we brought industry in, Western Electric into Sandia, the University of California had to re-do its wage scale and up the price to compete with industry, Western Electric. This is a problem, there is no question about it.

Mr. SISK. I am sure the Department of the Navy is concerned, as I think all branches of the service are concerned with having people in service or in uniform, who have the knowledge and the background to evaluate and to some extent manage these programs and not be completely dependent upon contract and private industry, because we have had this problem expressed many times. It's important to you to know exactly what is going on and whether or not they are producing.

Now, let me ask you this question: To what extent are these new fields of research being stressed in Annapolis today or is primarily the Navy still just training officers—

Admiral BURKE. Just training sailors, sir.

Mr. SISK. Well, Admiral Burke, I think you get the point I am making. In other words, to what extent are the Academies being used to stress these new fields of scientific need?

Admiral BURKE. Not to the extent that I would like to see, sir. We changed the curriculum last year to increase the scientific education of the Naval Academy, but there is a limit on the amount of time which these young men have to learn. They have to know about 10 times more now than they did when I went through there.

In other words, we push them just as hard as we can. We have dropped a lot of the things that they can learn about the Navy after they are commissioned.

So it is not so much at the Naval Academy that advanced education has to be done, because they are undergraduates and they can only come up to the B.S. level. Our educational program now provides for preparing them to absorb more later on.

Now, one of the most difficult problems we have right now is to get enough well-trained officers with the technical background so that they can know what the scientists are talking about and know how to make an evaluation of their work. To overcome that, we are stressing increased numbers of people in advanced education, technical education, but that takes 3 years. This requires an increase in the number of officers. We are short, we have a smaller percentage of officers than any other service except the Marines.

So that is one of the things we are trying to do, get a larger number of officers so that we can give more of them better education.

For example, one thing we are trying to do is take 10 very young officers a year, 5 from the Naval Academy and 5 from the NROTC, who are properly motivated, have the basic background to advance fast, send them to sea for a year for intensive Navy training and then send them to civilian universities for their doctorates. That is 20 to 30 years in the future this is going to pay off. We have increased the numbers of post-graduate students among the older officers, that is men around 25 and 30. These officers are sent to universities after they have been out to sea for a while, to get them well educated.

We will get many more masters degrees that way. But what we need is more scientifically trained officers for the future.

Mr. SISK. I am glad to hear that you actually have a program of taking these officers and then permitting them to move on to doctorates and so on, because I think this is certainly one program that needs expansion. I want to pay tribute to Admiral Hayward and I think I am giving credit to the proper person.

A couple of years ago, Admiral Hayward made the statement, and I have always remembered it, that regardless of how expert men have become in developing machines and computing equipment, the human brain is still the greatest computer on earth. I believe, Admiral Hayward, you were at least the first person I heard make the statement. I thought many times about it.

Certainly, to me, it seems essential that in your service, as, of course, in all other services, that there should be more emphasis, if possible, Admiral Burke, on doing the things you have described with these young officers, as they come out of the Academy, and giving them the opportunity for those who have the capacity to absorb it, to get this higher education and additional training in order to be able to evaluate what your contracting groups are doing, because without it, I just don't see how you could know whether they are delivering the proper amount of bang for a buck or not.

Admiral BURKE. That is correct, also. That is also the reason why Admiral Hayward has the job he has.

Mr. FULTON. Will you just yield for a question, Mr. Riehlman?

Mr. RIEHLMAN. Yes, sir.

Mr. FULTON. I will be interested to hear through Mr. Sisk tomorrow when he questions Admiral Hayward how Seaman Second Class J. T. Hayward got ahead so far, so fast, and has done so well without all this training capacity and facility.

Mr. RIEHLMAN. Admiral, I was delighted to hear your statement in respect to what is being done, and the Navy, particularly, to advance these young people or the officers in the Navy who have an aptitude toward engineering and science.

But isn't there another link in this chain that destroys the usefulness of these boys after assigned to this job, that they have to be moved on into another phase of activity to get their promotion?

Admiral BURKE. No, sir. What we need—

Mr. RIEHLMAN. Hasn't that been true in the past, that they have been rotated in the service?

Admiral BURKE. Everybody at this table is a technical graduate student.

Mr. RIEHLMAN. Aren't you losing the usefulness of a man who has the qualifications in research and development by rotating him just so that he can be promoted in the Navy?

Admiral BURKE. No, sir; that is not the reason they are rotated. What we have to have is the scientist who knows what the Navy requirements are.

And you can't tell him that, he has got to have that experience. He has got to know what nobody can ever explain to another man, what happens at sea—what happens to a ship in a heavy sea and what things have to be done. He has got to have the experience. Just telling him is not enough. What we are trying to do is to bridge the gap between

the people who are the straight scientists, who work in a particular narrow field, and the broad field of Navy requirements.

So we have to have sailors who know their sailing business, but also who know the scientific business. That is the reason why we have always rotated our trained people.

Admiral Hayward is a third-class physicist. I, myself, am probably a fourth-class explosive expert of many years ago. We have both had that training—many of the senior officers in the Navy have. That doesn't affect their promotion.

As a matter of fact, the people who have technical educations on a percentage basis actually have a better chance for promotion than the people who have not.

Mr. RIEHLMAN. Well, you take a young officer in the Navy who has his background in engineering and some field of science, is he rotated into a field of activity where that is going to be useful to him?

Admiral BURKE. Yes, sir.

Mr. RIEHLMAN. And be exposed?

Admiral BURKE. Yes, sir. It is always useful. As I say—

Mr. RIEHLMAN. And is it going to be in a productive way?

Admiral BURKE. Yes, sir, but not in a narrow field. We aren't training mathematicians, for example, who deal solely with computing mechanisms, and that alone.

What we want are mathematicians who understand computing mechanisms. There will be other scientists who know more than they know, but these officers know how to apply computing mechanisms to the problems of the Navy. To do that they must know the problems of the Navy they must know both.

Mr. RIEHLMAN. I think you said that about 90 percent of the scientists and engineers in the Navy were civilians?

Admiral BURKE. That is about right.

Mr. RIEHLMAN. And 10 percent were officers?

Admiral BURKE. That is about right.

Mr. RIEHLMAN. Do you feel that the 10 percent of naval officers are sufficient to carry on this program?

Admiral BURKE. No, sir; I do not. That is the reason why we are trying to get more and more technically trained officers.

We must have highly educated officers in the future, not only for the things in space, but also for normal shipboard things, a missile, for example, missiles and nuclear power. All of these things demand very highly educated officers.

Mr. RIEHLMAN. Mr. Chairman, I would hate to pass this opportunity when we have been passing out compliments here this morning, to fail to recognize that the Secretary of the Navy comes from the great State of New York and we in New York are delighted to have him as our Secretary.

Now, I want to ask the Admiral one other question.

The CHAIRMAN. The record will show that, Mr. Secretary. He has also been in the Government service for quite a length of time.

Mr. RIEHLMAN. I am sure of that.

The CHAIRMAN. Everybody knows his ability.

Mr. RIEHLMAN. Yes, sir.

The CHAIRMAN. And his devotion to duty.

Mr. RIEHLMAN. Admiral Burke, I know, in response to Mr. Fulton's questioning, the interest the Navy has in the Transit program.



And you were saying that the interests of the other services were recognized, and in this program they were furnishing instrumentation that would be helpful to their field of activity, the Air Force and the Army; am I correct in that?

Admiral BURKE. Not quite, sir. Sometimes they furnish the instrumentation, other times we develop the instrumentation to fit their needs. It is coordinated.

Mr. RIEHLMAN. It is developed to fit their needs?

Admiral BURKE. That is correct.

Mr. RIEHLMAN. Do I understand that that same cooperation, that same program is being carried on in respect to the Air Force in its program of the Midas and Samos?

Admiral BURKE. As a matter of fact, sir, the details of the Midas program are being developed in the Navy laboratories for the Air Force.

Mr. RIEHLMAN. Fine. And the same cooperation and work between the Air Force and the Navy will be true with the Samos in its development?

Admiral BURKE. Yes, sir.

Mr. RIEHLMAN. For the three services, the benefit of the three services.

Admiral BURKE. Yes, sir.

Mr. RIEHLMAN. So that there is a free interchange of knowledge and information and cooperation with respect to the development of these programs?

Admiral BURKE. Yes, sir.

Mr. RIEHLMAN. That is all, Mr. Chairman.

The CHAIRMAN. Mr. Karth.

Mr. KARTH. Mr. Secretary, several areas have already been explored today and I should like to explore still another one if I may. It has been testified to on several occasions before this committee and other committees of Congress and pretty much agreed to by Admiral Burke today that the deterrent powers of the Soviet Union and the United States are so awesome that it is highly improbable that we will have an all out nuclear war because whoever the aggressor may be, they would, in turn, be destroyed. So emphasis is being placed on an overall military posture to fight these brush fire type wars if I may use that expression.

So that leads me to this question, sir: Insofar as fighting a limited war is concerned, as far as the Navy is concerned, are World War II Navy vehicles obsolete at this time?

Secretary FRANKE. Well, it depends on what you mean by vehicles?

Mr. KARTH. Well, your ships and your other Navy vehicle posture that makes up your naval strength.

Secretary FRANKE. Let me put it this way: Carriers are not obsolete. That is, a particular carrier, itself, can be old and worn out, this is true, but the necessity for carriers, for the type of war you are talking about, is still a very definite requirement.

Now, it is true that as we proceed and we get more technical knowledge, that some types of weapons systems will be superseded by others in whole or in part like missiles on board a ship, for example, as compared with guns. This is a transition, of course, that has gone on for many years and I suppose will always go on as we get new ideas and new weapons systems.

But our great problem really is that we have a lot of ships that are old and they are wearing out. They are still usable and we try to extend the life of these ships by better modernization program, but we will meet the day in which they will no longer serve the purpose.

Mr. KARTH. If you could, what percentage of that fleet today is obsolete in the sense of the word that is not capable of shooting missiles, but rather still adheres to the old gun type defense?

Secretary FRANKE. Well, it isn't so much that. You can convert a ship to the use of modern weapons, most ships, but you reach the point after a while when the age of the hull doesn't justify the cost of conversion.

This becomes a very difficult problem. We have done this with a number of ships.

Mr. KARTH. What percentage of our fleet is in this position, would you say?

Secretary FRANKE. We have got about—oh, a very high percentage of our ships are old and are World War II ships.

Mr. MILLER. Would the gentleman yield for a question?

Mr. KARTH. Yes, sir.

Mr. MILLER. Isn't it true we can give you the most modern carrier, but if they don't have ancillary ships such as oil tankers, that are modern and up to date, you can't keep her at sea very long and isn't this one place where the Navy is particularly weak right now that we haven't given you any new tankers and you are patching them to keep them together in some parts of the world?

Secretary FRANKE. No, I don't think so. Of course, for a carrier, a modern carrier, it depends on whether it is nuclear or conventional. But a modern nuclear carrier can stay at sea for an unlimited length of time. It is a question of the crews, really, replacement of crews.

Mr. MILLER. But you do have some trouble with your ancillary ships, you had it last year?

Secretary FRANKE. Yes, and we always need more.

Mr. MILLER. Thank you.

Mr. KARTH. Mr. Secretary, I am attempting to find out what part of the Navy's fleet is of such obsolescent nature that it really doesn't justify converting it to other means of warfare and, in effect, therefore, pretty much mandates new vehicles? What part of the Navy's fleet is in that position?

Secretary FRANKE. You mean new ships, particularly?

Mr. KARTH. Yes, sir.

Secretary FRANKE. Admiral Burke, why don't you take that over. It is a difficult question.

Mr. KARTH. Surely.

Admiral BURKE. Seventy-eight percent of the ships in our present fleet are World War II ships.

Those ships are not nearly as capable as modern ships. And they cannot do the jobs that a modern ship can do. But still they are useful.

For example, these old ships have SQS-4 sonars on them, for example. It is not nearly as good equipment as the more recent sonars. But still the old ships so equipped will be useful. They will do some work as long as they can be held together. We are trying to hold them together by modernizing them as much as we can for another 5 to 8 years. The day will come, however, when the hulls, the machinery,

the piping, the wiring—like the one-horse shay, they will just fall apart.

Mr. KARTH. Admiral, we can't wait for that day to come.

Admiral BURKE. No, sir, we can't wait for that day to come.

Mr. KARTH. Are we doing everything now, is the budget permitting everything to be done so that the modernization of the Navy can take place over this 3- to 5-year period?

Admiral BURKE. We now have now about 860 ships in the fleet. Our shipbuilding bills over the last few years have provided an average of 22 new ships per year. The average life of a ship, and it varies among ships, we can say is about 20 years; 20 times 22 is 440 ships. This is considerably less than 860.

Mr. KARTH. So we are moving about half as fast as we should, is that what you are saying?

Admiral BURKE. What I am saying is that with a shipbuilding program of that extent, you cannot keep an 860-ship Navy forever. Sooner or later, the ships are going to wear out.

Mr. KARTH. How much money was originally requested by the Navy for modernization of the Navy in this area and how much money has been allowed in the budget for this purpose?

Admiral BURKE. Our budget was submitted this year on a guideline basis. We were given two guidelines at the beginning, in July. One of them was an NOA guideline which was equal to the budget in 1960 less 10 percent of the procurement, military construction, and research and development appropriations.

The other one was an amount equal to last year's budget plus half a billion dollars.

Those were the two guidelines that we were given. We submitted our budget based upon those guidelines.

Mr. KARTH. And what did you get, sir? What is being requested?

Admiral BURKE. Well, it is in between. All the services are in between the basic budget and the addendum.

Mr. KARTH. And in dollars and cents figure, how much difference does this amount to?

Admiral BURKE. We did not submit our requirements this year. We had a requirements budget, which we developed for ourselves, which amounted to about \$19 billion. Then we cut that down, the Commandant of the Marine Corps and myself, to about 15 billion by cutting out the least urgent projects.

The CHAIRMAN. May the Chair interrupt here? We don't want to get too far afield from the purpose of this, which is the development of space. I am trying to give everybody all the time they want this morning. We have 40 minutes to finish with the committee.

Mr. KARTH. If I may, I should like to submit several more questions in writing to the Admiral and ask for his answers to be put in the record.

The CHAIRMAN. All right. Don't get into the question of the operation of the Navy, because that is not our jurisdiction.

Mr. KARTH. I am very interested in it.

#### STATEMENT IN ANSWER TO CONGRESSMAN KARTH'S QUESTION

(1) How much money was recommended in Navy for "modernization" of the Naval Fleet?

Answer. Modernization is not considered a separate item in Navy budget planning, since all programs are aimed toward future effectiveness of the

fleets. Extraction of the figures for procurement of new missiles, aircraft and other equipment, ship construction, ship and aircraft conversion and overhaul and research and development, all of which may be considered modernization, provides an approximate total figure of \$12 billion originally proposed by the program sponsors for fiscal year 1961.

(2) How much money was allowed in the budget for this purpose?

Answer. Approximately \$6 billion.

(3) Does the money provided adequately provide for modernization over the "20-year" period?

Answer. The funds provided are not sufficient to modernize a fleet of the present size over the period of 20 years.

(4) How many nuclear subs were requested by Navy? (Assume this to mean "How many SS(N) did the Navy request from the Department of Defense in fiscal year 1961 budget?")

Answer. Four SS(N) were included in the Navy fiscal year 1961 budget request to the Secretary of Defense.

(5) How many nuclear subs are provided for in the budget?

Answer. Three SS(N) are included in the President's fiscal year 1961 budget.

(6) How many submarines do we have with Polaris capability?

Answer. Nine SSB(N) have been authorized plus long leadtime items for three more in fiscal year 1961. The first of these nine SSB(N), the U.S.S. *George Washington*, SSB(N) 598, was commissioned December 30, 1959. The second will be commissioned March 31, 1960.

(7) (a) How many (SSB(N)) have been requested?

Answer. Within the framework of the Navy's overall requirements and resources available, four SSB(N) and long leadtime items for four additional SSB(N) to commence in fiscal year 1962 were included in the Navy submission to the Secretary of Defense for inclusion in the fiscal year 1961 budget.

(b) How many (SSB(N)) are provided for in the fiscal year 1961 budget?

Answer. Three SSB(N) and long leadtime items for three additional SSB(N) in fiscal year 1962.

(8) (a) How many CVA(N) had been requested?

Answer. The Navy submission to OSD requested one CVA(N).

(b) How many CVA(N) are provided for in the fiscal year 1961 budget?

Answer. None, however, one CVA is provided for in the fiscal year 1961 budget.

(9) What percent of the Navy fleet is of World War II vintage?

Answer. Of the 864-ship inventory, December 31, 1959, about 78 percent were of World War II or prior construction.

(10) What percentage of this is obsolete or fast becoming obsolete?

Answer. Two factors contribute to the obsolescence of our ships. These are old age and technological deficiencies.

Of the portion of the June 30, 1960, ship inventory that are of World War II or prior construction, the following ships will become overage as shown below:

Fiscal year	Number	Percent of 864 fleet
1961.....	298	34.5
1962.....	300	34.7
1963.....	310	35.9
1964.....	347	40.2
1965.....	477	55.2
1966.....	507	58.6

Technological advances in electronics, weapons systems, and propulsion systems has compounded the obsolescence of our older ships and even rendered many of our underage and some of our post-World War II ships obsolescent to some degree.

The CHAIRMAN. So are we all.

Mr. McCORMACK. Who gave the guidelines?

Admiral BURKE. Secretary of Defense.

Mr. McCORMACK. Who gave him the guidelines?

Admiral BURKE. I don't know, sir.

The CHAIRMAN. Mr. Hechler?

Mr. HECHLER. Admiral, in addition to your concern about getting technically trained officers through Annapolis and through the regular officers' system, don't you have a very great stake in the quality of our general education system in this country?

Admiral BURKE. Oh, yes, sir. Both in our educational system and also in the motivation of youngsters.

Mr. HECHLER. Isn't it just as important—even though you are interested in the construction of hardware today—isn't it just as important to make sure that our educational system will provide us the brains to improve our hardware, keep us developing and moving ahead in the future?

Admiral BURKE. Yes, sir; and that is the reason why we are particularly interested in the quality of people. These young men have the capacity to do remarkably good work and then are not motivated to do work up to their capacity.

Mr. HECHLER. I would very quickly now like to turn to a question for the Secretary of the Navy.

Last year when Admiral Hayward testified before our committee, Mr. Secretary, he spoke very cogently of the danger that both our missile and space programs might be choked by bureaucracy. Admiral Hayward said there was some danger that we might lose out to Russia, not so much through a lack of scientific or military talent, but through the choking effect of too many bureaucratic committees and a lack of responsibility and control.

And to me, Admiral Hayward made the most sense of any of the witnesses who commented on the organizational structure of our missile and space effort when he advised that there should be a single space program akin to the Atomic Energy Commission with a military applications division, something that would provide central leadership, responsibility, and control. After he made these comments, I asked a number of the witnesses, both in the Defense Department and other services about this suggestion and they all said things like: Well, competition is good, it is part of the American system; or, don't disturb the organization we have.

The NASA organization disturbs me a great deal because it assumes that the interest in space is exclusively civilian and it worries me very, very much that the military may have insufficient voice, when it wants to carry on operations and research which will directly affect the national security in the future.

You can do this with liaison, with committees, with coordination, with collaboration, but it seems to me that not only from the standpoint of the military interest, but from the standpoint of an understanding of the people in this country, that there needs to be a more clear-cut leadership and direction over this whole effort. I wonder if you care to comment on that?

Secretary FRANKE. Well, I think that—personally, I think that this present division as between NASA and Defense will work and will work well. Everything that you do in any walk of life or in any effort depends upon people, depends upon the coordination of people, their willingness to talk to each other.

I think that there can be a fairly clear-cut division between what NASA is trying to do and what the Defense Department is trying to do.

Now, one of the reasons why I would favor that type of organization rather than one overall agency being responsible for all efforts in space is that if we had the responsibility in Defense, maybe we would give too much emphasis to Defense needs, and by the same token, if NASA had it, maybe they would give too much emphasis to peaceful operations.

Mr. HECHLER. May I interrupt to suggest that I am not saying defense should control this agency or the military should control it, but one single person, perhaps, could provide the oversight and control and put the whole thing in its proper perspective. Let's face it, there is a military interest in space.

Secretary FRANKE. There undoubtedly will be, yes, sir.

Mr. HECHLER. There is.

Secretary FRANKE. There is at the present time, yes.

Mr. HECHLER. One further question, Mr. Secretary: Wouldn't your job be much easier if all of the American people were really alerted to the nature of the threat which confronts us?

Secretary FRANKE. Yes, I suppose that is true. This is very difficult to get across to the American people because they read all sorts of differing views in the newspapers and they are certainly confused, I am sure of this.

Mr. HECHLER. You are saying that the newspapers are not reporting it accurately?

Secretary FRANKE. No, I don't mean that. I think that the newspapers are reporting what different people think and I think it is perfectly normal that—Admiral Hayward, for example, in his area, thinks that he has the most important job in the Navy, I am sure, and he should feel that way.

So that you get dedicated, intelligent, able people who present their views from their own standpoint and I think this is right, but this is what confuses the American people, because somebody else also thinks he has the most important job.

Mr. HECHLER. Mr. Secretary, you have just given the most powerful argument for what I have been trying to advocate. Thank you, sir.

The CHAIRMAN. Mr. Daddario.

Mr. DADDARIO. No questions.

The CHAIRMAN. Mr. Moeller.

Mr. MOELLER. Some of us in this committee are confused, too, we spell confused with "k" now because we are so confused.

Two brief questions. I would like to direct this one to Admiral Burke. It is maybe a little bit irrelevant now. The replacement ships are all American built, are they not?

Admiral BURKE. Yes, sir.

Mr. MOELLER. How about the repairs for these ships, are these also American repair productions?

Admiral BURKE. It depends on where a ship is when she is damaged.

Mr. MOELLER. If it is on our coast lines.

Admiral BURKE. Repairs are made in American yards, yes, sir, that is correct.

Mr. MOELLER. Are we paying a premium sometimes for American made things? Just yesterday I heard a statement of a shipbuilder in Ohio who said that he could get a far better propeller with better

materials, better workmanship for far less money from an oversea supplier. This appears as though we are paying a premium here, maybe, for American-made things.

Now, I am not telling the Navy where to make its purchases, but possibly the better thing would be even cheaper for us if we made a thorough investigation into who is making what for these naval repairs.

Admiral BURKE. You are correct. There is a Buy American Act, of course, which we abide by. You have touched upon, I think, the biggest threat to the United States that we have and that is the ability to compete, the ability to compete in the manufacture of things, the ability to compete in education, the ability to compete in getting our views across to the world, particularly to these nations which are just now being formed.

This competition is very keen and we are going to have to compete and on rules which we sometimes don't make. It is a very important thing. It is bad when the same quality steel can be laid down at the door of one of our steel plants at a lower price than we can make it. I understand that sometimes that can be done and that means we are out of the competition.

Mr. MOELLER. I am glad to hear that statement. Now, my second question is this: We are all very pleased with what you are doing with the Polaris. It occurs to me that we would need far more submarines, knowing what the Soviet Union has, than we have today. Have you been denied requests for more submarines with Polaris installations?

Admiral BURKE. You have got two parts to your question.

First, on the numbers of Polaris submarines. We did request more Polaris submarines, of course, than are in this budget. However, those additional submarines were not granted at that time because the system was not yet fully operational and the reason was given that we should plan to continue a three-a-year rate until the weapon system had been better tested.

We expect that when the system is operational we will have a larger Polaris program. We think that will be very soon indeed, since we have passed all the major milestones which marked the major difficulties that we anticipated with the Polaris. We are sure it will work now.

Second, as the Secretary said, the last five Polaris shots have all been successful, remarkably so. We anticipate that perhaps we will be permitted to submit a supplemental for more Polaris submarines.

Mr. MOELLER. I am glad to hear that. It takes a long time to make a submarine.

Admiral BURKE. It takes a long time to make a submarine, about 32 months.

Mr. McCORMACK. Will the gentleman yield? How many Polaris do we have built or in process of construction?

Admiral BURKE. Nine, sir. There are three more in this budget, of course.

Mr. McCORMACK. That will be 12.

Admiral BURKE. Twelve, yes, sir.

Mr. McCORMACK. Of those 12, I think 5 or 6 or 7 are due to money appropriated by Congress over the budget in past years?

Admiral BURKE. That is correct, sir.

Mr. FULTON. May I ask a question?

Mr. McCORMACK. And on the Polaris it was felt, while it was a calculated risk, that the missile, itself, justified the building of the submarines rather than have that big gap to wait until after complete perfection?

Admiral BURKE. Yes, sir.

Mr. McCORMACK. I think it was a wise calculated risk to take.

The CHAIRMAN. Mr. King?

Mr. KING. Admiral Burke, will the navigational aids provided by your Project Transit be of value to aircraft as well as surface craft?

Admiral BURKE. Yes, sir. Not the original Transit but in the future they will supply this information.

Mr. KING. The Navy, then, will in effect be offering a service that will be of value to—

Admiral BURKE. Well, it will be of value to all ships and aircraft, not only to our armed services, but to anybody else who gets the ephemeris.

Mr. KING. That was going to be my next question. Then you are going to be, in effect, providing a service for the Air Force and for the civilian aspects of this?

Admiral BURKE. That is correct.

Mr. KING. Civilian surface craft, civilian aircraft, and for other nations as well?

Admiral BURKE. That is correct, sir.

Mr. KING. Now, have the details of that been worked out? I can see business implications. Do you sell your services or how does it work out?

Admiral BURKE. No, sir. That will be almost like a star. There will be an ephemeris printed and data will go out every morning, periodically as often as necessary but probably every day, on the orbit of the transit. Any ship or aircraft that has the equipment to read it out can use the satellite. The equipment is not expensive and will be built by commercial concerns.

Mr. KING. Then this is a service provided gratis to anybody who tunes in on it, then?

Admiral BURKE. Yes, sir; in the world.

Admiral HAYWARD. We will give a presentation to the committee on that.

Mr. KING. Yes. Is my time up?

The CHAIRMAN. No.

Mr. KING. I have a couple of other short questions, Mr. Chairman. Doesn't the development of your Polaris program render relatively less necessary the need for your carriers?

Admiral BURKE. No, sir. There are two reasons for that. One is the contribution of carriers to general war, and second, to limited war.

It is very bad to have a single weapons system and be absolutely dependent upon it. If you are dependent absolutely on a single weapons system, then the enemy can concentrate all of his effort on countermeasures to that system.

Another thing is that the carrier can contribute significantly in retaliation. There are 200 attack aircraft on the alert ready to go in



the Sixth and Seventh Fleets. That is a significant number of aircraft, attack aircraft, which can assist a great deal in a nuclear war strike, if that is ever required.

But the big need for a carrier is in limited war, in wars where we will go up against the best aircraft that the enemy can provide. Although a war is limited, the equipment that is used in a war is not necessarily limited.

For example, in the Taiwan Straits affair, the equipment we would have had to go up against, if the Chinese Communists had attacked us, would have been the best equipment in the Communist world. We would have needed the very good equipment we did have.

Mr. KING. What other nations have carriers?

Admiral BURKE. Britain and France.

Mr. KING. And the Soviets have none?

Admiral BURKE. The Soviets have none. There is a very good reason for that. All of the Soviets' allies are adjacent to them. If we want to fight, we must carry the war to the enemy. If we want to support our allies, they must be supported overseas. Our own forces, many of our own forces are overseas. The forces of our allies and our own would be destroyed if we ever lost control of the seas. The battle areas for limited war are away from the United States.

So we have to take our own power with us and we have to be able to exercise that power any place in the world. When trouble is started by somebody else, they choose the time and they choose the place. And they will choose those times and places to be the most inconvenient possible for us. So we have to furnish the military power. Air Power is a great portion of that military power and is essential to protect other nations and to protect our own deployed forces.

Mr. KING. Thank you.

The CHAIRMAN. Mr. Roush?

Mr. ROUSH. Admiral Burke, does the Navy have any present military need for a super booster vehicle such as the Saturn?

Admiral BURKE. No, sir; not that we can foresee.

Mr. ROUSH. I said presently.

Admiral BURKE. No, sir.

Mr. ROUSH. Do you have any in the future that you can foresee for a super booster engine beyond that which we now have?

Admiral BURKE. I can perhaps envisage big satellites which we would like to have, but there is no specific need, sir.

Mr. ROUSH. All right. A couple of questions concerning the Polaris.

When a Polaris is fired, is it controlled and tracked and is everything done that is necessary to be done within that submarine or do we need other vehicles to assist in its operation?

Admiral BURKE. No, sir. All the data that is necessary for the firing of a missile is in the submarine and just before the missile is fired, all the data is put into the mechanism in the missile. Once the missile is fired, there is no control over it. It has gone.

That is not true, of course, on a test range. You can destroy a missile on a test range. It has a lot of equipment in it.

Mr. ROUSH. Yes, I understand.

All right. Now it was announced some time ago that Russia is also developing a submarine similar to the Polaris.

Admiral BURKE. She has developed some missile-firing submarines. They are not exactly similar to Polaris. They have shorter range, but she has missile-firing submarines.

Mr. ROUSH. Are those operational now?

Admiral BURKE. The submarines are, yes, sir. Whether or not they have the missiles in them we don't know.

Mr. ROUSH. Do we know how many she has?

Admiral BURKE. Yes, sir.

Mr. ROUSH. And is this matter of its range common knowledge?

Admiral BURKE. Yes, sir; it is common knowledge, it is short range.

Mr. ROUSH. What is the range?

Admiral BURKE. 350 miles or less at the moment. That is what we estimate.

Mr. McCORMACK. Will the gentleman yield right there?

Mr. ROUSH. Yes.

Mr. McCORMACK. Have you any information about an unmanned submarine that the potential enemy might have?

Admiral BURKE. No, sir. That is some sort of torpedo mechanism. No, sir, we have no information.

Mr. ROUSH. I have no further questions.

The CHAIRMAN. I would like to ask a question now, if I may.

Mr. Secretary, perhaps I ought to ask you this question. It is controversial, but what effect is the development of the Polaris submarine and the Polaris missile going to have on the use of carriers by the Navy?

Secretary FRANKE. It won't have any effect. They are really two different things. The Polaris submarine has, of course, a great capability for all-out nuclear war. A carrier also has a capability in this respect, but it has a tremendous capability for limited wars. This is the ability to be on the spot at the right time. I don't think there is any—I don't think Polaris, for example, in any way eliminates the use of carriers.

The CHAIRMAN. Then leading up to the next question, this inflatable airplane, regarding which we have said a good deal, if that develops as some hope it will, what effect will that have on the use of carriers? I have heard that discussed.

Secretary FRANKE. None that I know of. Admiral Hayward is better able to answer that question than I am.

Admiral HAYWARD. Assuming that it worked, it would permit you to carry a lot more aircraft aboard a carrier.

The CHAIRMAN. It would permit the aircraft to be carried aboard almost any type of Navy vessel, wouldn't it?

Admiral HAYWARD. Well, as I say, that is assuming that it works.

The CHAIRMAN. We are assuming it would work, if you are going to put it on carriers.

Admiral HAYWARD. It would not necessarily be carried aboard all other types of Navy vessels, because you have to get it back again. Actually what would change the carrier more than anything else would be our real vertical take-off type of machine rather than the Wagnight proposal.

The CHAIRMAN. Now, as for the Wagnight, suppose it does work out, just as you would hope that it might, what effect will it have, then, on the use of carriers?

Admiral HAYWARD. Well, it will permit you to store an awful lot more airplanes than you can now.

The CHAIRMAN. On carriers?

Admiral HAYWARD. Yes, sir.

The CHAIRMAN. And permit storage on other vessels?

Admiral HAYWARD. On other vessels.

The CHAIRMAN. Now, what about the other development, the vertical take-off, what effect would that have on carriers?

Admiral HAYWARD. This would probably change configuration somewhat. Once again like all of these developments, it has to be competitive. You either have to get a new capability from it or to do the same job you are doing today better. It would help the Marines, the Army and the Air Force.

The VTOL would probably change the carrier configuration and it would probably have a tremendous impact on the way we actually did our operations.

The CHAIRMAN. It would have an impact on the future designing of your ships, wouldn't it?

Admiral HAYWARD. Yes, sir, it would. The probability of VTOL depends on solving the technical problem of getting an engine with a thrust to weight ratio much greater than we now have. You have to have at least 15 to 1. Our normal engines now run around 6 to 1. The reason for this high thrust to weight ratio is that you do have to hover and this takes lots of power and lots of fuel. This is a component research program that the Army, the Navy, and the Air Force are working on now in the engine field.

The CHAIRMAN. It is just a little speculative at this point, but nonetheless, it is something to think about.

Admiral HAYWARD. We certainly are thinking about it, Mr. Chairman.

The CHAIRMAN. I want to ask another question. We had several years ago an atomic breakthrough so that we could develop smaller atomic warheads and that permits now the development of missiles as we are using in the Polaris.

What about Russia? Has Russia ever developed that breakthrough on the atomic warhead?

Admiral HAYWARD. Do you want to answer it, Admiral?

Admiral BURKE. She probably has, sir.

The CHAIRMAN. She probably has ability to make a smaller atomic payload?

Admiral HAYWARD. Yes, sir.

The CHAIRMAN. Just as we have?

Admiral HAYWARD. Yes, sir, she would.

The CHAIRMAN. I want to ask you this. I think you testified the Navy was satisfied as to current level of funding for its various missile programs. I think Admiral Burke testified to that.

Admiral BURKE. No, sir, if I—

The CHAIRMAN. Well, all right, if you didn't. I got that impression.

Admiral BURKE. There are several things that no man is ever satisfied with. No man is ever quite satisfied with the salary that he gets nor is any military man quite satisfied with the money that is given to his programs, sir.

But we accept this program. Somebody must make the decision, sir. So we support the President's budget.

The CHAIRMAN. Well, wherein are we short, according to the views of a great Navy man, which is yourself?

Admiral BURKE. Our greatest shortage, sir, is new procurement. We need ships, we need—

The CHAIRMAN. No, I am referring now purely to the missile program.

Admiral BURKE. To the missiles?

The CHAIRMAN. Yes.

Admiral BURKE. Polaris submarines and more surface-to-air and air-to-air missiles, sir.

The CHAIRMAN. How many more Polaris could you use at this time?

Admiral BURKE. We anticipate that a total of about 45 Polaris submarines will be all that we will require.

The CHAIRMAN. And you have?

Admiral BURKE. We have nine. We can build submarines at the rate of about one a month after we have a year's buildup. It takes about a year to build up to that rate.

The CHAIRMAN. So it would take you 15 months to start turning the Polaris out when you are ready to go?

Admiral BURKE. No, sir, we can turn them—

The CHAIRMAN. I mean at the rate of one a month?

Admiral BURKE. Yes, sir, that is correct.

The CHAIRMAN. And you need 45, whereas you have now in the mill only 15?

Admiral BURKE. Twelve, sir.

The CHAIRMAN. Twelve. Only 12. We are short, then, a considerable number of Polaris submarines.

Admiral BURKE. Yes, sir.

The CHAIRMAN. Is there anything else we are short, in respect to the space program?

Admiral BURKE. Do you want to answer that?

Admiral HAYWARD. We could use more money in research and development.

The CHAIRMAN. How much could you use?

Admiral HAYWARD. Well, in the missile area, exclusive of Polaris, there is about \$80 million that we could use. But I accept my boss' decision on this. If I ever was satisfied with the amount of money I had, he probably would fire me, too.

The CHAIRMAN. Admiral, that is true. You may accept his decision, but I don't know whether the members of the committee would accept it. If you will tell us what you really have in mind.

Admiral HAYWARD. Well, in the missile field primarily we could spend more money in what is known as the advanced weapons system. This is the surface-to-air missile system, which has the primary requirement of defending our ships at sea against air-to-surface missiles. We have less money than we need in the missile systems which we are going ahead with to replace the gun in the 1965 to 1970 era. We are going to have to replace the gun with the missile.

In these areas there is a considerable sum of money involved. I can furnish the committee a detailed list of what is involved.

The CHAIRMAN. I wish you would, Admiral, yes.

Admiral HAYWARD. All right, sir.

The CHAIRMAN. We would be interested.

*Additional requirements for guided missiles (exclusive of Polaris)*

Missile systems:	<i>Additional requirements</i>
Typhoon:	
Long Range-----	\$11, 800
Medium Range-----	14, 400
Eagle-----	4, 067
Tartar/Talos-----	1, 050
Sidewinder 1C-----	2, 000
Corvus-----	2, 013
Bullpup-----	2, 000
Total, missile systems-----	37, 330
Guided missile exploratory devices and supporting research (guidance, fire control, propulsion, propellants, etc.)-----	20, 625
Pacific Missile Range support-----	19, 216
Total-----	77, 171

The CHAIRMAN. Does the Navy have a requirement for the man in space program?

Admiral HAYWARD. We don't have a requirement as such. We certainly support Project Mercury. Four out of the seven people are naval aviators. We have a pretty good chance of placing a Navy man in space. The odds are 4 to 3, of course.

The CHAIRMAN. You have to support them, then?

Admiral HAYWARD. Oh, yes, sir. As a matter of fact, some people feel that the Navy man will go because then the Navy will be sure to recover him.

One is actually a marine, Mr. Chairman.

The CHAIRMAN. You think the Marines will make the recovery?

Admiral HAYWARD. Maybe the Marines will make it.

The CHAIRMAN. What about the weather satellite, do you have a requirement for this?

Admiral HAYWARD. Yes, sir, we do have a requirement and we are working quite actively with NASA on this. There was a decision made a year and a half ago to give the weather satellite to the space agency.

We are working for the Department of Defense with the Army and the Air Force, of course. We will present in detail to the committee just what is going on in this field on the weather satellite.

The CHAIRMAN. Fine. We look forward to your testimony tomorrow.

Mr. Fulton?

Mr. FULTON. The question comes up, the Polaris has been working so well, and when big boosters and big thrusts are now so popular. Could you possibly cluster the Polaris?

Admiral HAYWARD. It is a possibility, Mr. Fulton. Any time you put large solid rockets together of that type you always have difficulties with what we call resonant burning.

We haven't considered putting Polaris as a cluster. We certainly would look at Polaris for any seaborne launchings that we want for

satellites, however, because it would give you the opportunity to put about 180 pounds into orbit very easily.

Mr. FULTON. Then on your communications work on the research on using the moon as an earth satellite, actually it is the Navy that has first put the Moon to any practical use, is it not?

Admiral HAYWARD. That is right.

Mr. FULTON. On that reflecting relay program of signaling.

Admiral HAYWARD. Yes, sir.

Mr. FULTON. The Russians are always claiming firsts with the Moon. I think we ought to get some publicity out to the fact that we first put it to any practical use.

Admiral HAYWARD. That is true.

Mr. FULTON. Are you free to comment on what there might be the status on using the Moon for surveillance purposes?

Admiral HAYWARD. No, sir.

Mr. FULTON. Are you free to comment on ion emission programs?

Admiral HAYWARD. No, sir.

Mr. FULTON. Do you have any programs in prospect on the use of energy for reducing or deflecting or upsetting the target range of enemy missiles? Have you done any work on that?

Admiral HAYWARD. No, sir. We have looked at the problem because as you know, with the Russian submarine we have to be prepared to fight the Polaris-type system as well as to have it.

As Polaris succeeds we look very hard at this problem. It is quite apparent, technically, that the place to work on the ballistic missile is the first part of the trajectory instead of when it is coming down at you. We are looking at it, but we have no solution, I must say.

Mr. FULTON. Do you need any more money for detection on enemy craft such as submarines?

Admiral HAYWARD. Yes, sir. In our submarine warfare we do have requirements for more money. I can also furnish that list.

Mr. FULTON. Put that in the record if you will.

Admiral HAYWARD. Yes, sir.

*Fiscal year 1961 summary of additional antisubmarine warfare research development, test and evaluation needs*

	<i>Cost in millions</i>
Category research development, test and evaluation :	
Classification and detection.....	\$89, 296
Weapons and ordnance.....	18. 684
Vehicles and propulsion.....	15. 771
Collateral support.....	9. 885
Total.....	133. 638

Mr. FULTON. One last question if I may, that is on your OP. 54 program, on a possible maneuverable manned space vehicle. Is that in prospect and is it in competition possibly with the manned Mercury space project?

Admiral HAYWARD. We are looking at that from a study point of view primarily, Mr. Fulton. Frankly, if you can maneuver something in space, it is important.

Whether it has a man in it or not is immaterial really to that part of it. You have to be able to maneuver it accurately. This is the important problem.

Mr. FULTON. So your study is more along the maneuverability in space?

Admiral HAYWARD. Yes, sir; more than the man in it.

Mr. FULTON. Would you say that was the purpose of the Connally report?

Admiral HAYWARD. Yes, sir; I believe so.

Mr. FULTON. That is all.

The CHAIRMAN. Admiral, would you say you are participating in the simplification program? I am very much interested in that. I think it has possibilities. The program to simplify the complexity of these large missiles, these systems.

Admiral HAYWARD. Yes, sir, Mr. Chairman. This is one of my very strong "hobbyhorses." I think only by simplifying some of these are you really going to make them operational and reliably operational. We have to simplify the electronics. We are doing a lot of work in molecular electronics which we hope will enable us to do away with some of the things which we believe now are simple. This is a large effort. It is an effort in Admiral Bennett's shop, Office of Naval Research, and we are striving all the time to simplify the things.

The ballistic missile is an excellent "beast" now and with the inertial system, I suppose it is no surprise to you that those floated gyros in there cost about \$15,000 to \$18,000 apiece. If we could make them for \$3,000 apiece, we would be a lot better off.

But in order to get a system like that, you go through this stage of complexity. We are very vitally interested in any way we can to simplify our systems. That is across the board. Not just missiles.

The CHAIRMAN. Thank you very much. Mr. Daddario has one question and then I want to say to the committee I have a note here from Mr. McCormack. He says our bill will come up right after the three district bills which shouldn't take any length of time, that we all ought to be on the floor promptly at 12 o'clock.

Mr. DADDARIO. Admiral, last year you testified that we needed 45 Polaris submarines to do the job and testified to that today. Taking the present rate into consideration, when will we get these 45?

Admiral BURKE. Well, if we build three per year, it will take, of course, 15 years. Subtracting the nine we have built or building, it will be about 12 years from now.

Mr. DADDARIO. When, in your consideration, taking the country's security as one of the necessary items, should we have those 45?

Admiral BURKE. Well, we feel that the Polaris submarine, because of its invulnerability and accuracy, and because it can be used under such a variety of general war situations, will be a very important segment of our total retaliatory power.

And, of course, we feel that a high rate of production would be profitable.

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

Mr. RIEHLMAN. Mr. Chairman, I have just one quick question.

The CHAIRMAN. We are going on the floor.

Mr. RIEHLMAN. Just one question.

The CHAIRMAN. Mr. Riehlman, just one question.

Mr. RIEHLMAN. In your program of research and development, Mr. Secretary, is there any possibility of converting the Naval Gun Factory here into one of your research programs?

Secretary FRANKE. Not that we can now foresee. The building and equipment doesn't lend itself at the minute. This is under investigation.

Mr. RIEHLMAN. You don't have any definite plans?

Secretary FRANKE. We don't have.

The CHAIRMAN. The committee will adjourn until tomorrow morning.

(Whereupon, at 11:57 a.m., the committee adjourned to reconvene at 10 a.m., Tuesday, February 9, 1960.)