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United States General Accounting Office
Washington, D. C. 20548

FOR RELEASE ON DELIVERY
Expected at 10:00 a.m. EDT
Tuesday, July 9, 1974

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STATEMENT OF
ELMER B. STAATS, COMPTROLLER GENERAL OF THE UNITED STATES ^H 3400
BEFORE THE
HOUSE COMMITTEE ON SCIENCE AND ASTRONAUTICS
ON
FEDERAL POLICY, PLANS, AND ORGANIZATION FOR SCIENCE AND TECHNOLOGY

Mr. Chairman and Members of the Committee:

1-25 NSF

I am pleased to meet with you today to discuss a subject which has been of interest to me for many years. I am confident that the Committee's comprehensive examination of the problems involved in relating science and technology to overall national strategy and policy will provide an important contribution as has the previous work of this Committee. Also, I found the Interim Staff Report to be most helpful in pulling together pertinent background material on the subject.

I believe it unnecessary, especially before this Committee, to emphasize the importance of science and technology. One of our great national assets has been our leadership in science and technology and the important role played by the Federal Government in maintaining this leadership. Estimated Federal expenditures for fiscal year 1975 for research and development are approximately \$20 billion. If additional evidence is needed as to the importance of science and technology, I need only refer to the growing shortages of energy and raw material

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resources and to the increasing concern as to our ability to maintain our competitive position in the world economy. Science and technology pervades almost every aspect of daily living and is an important component of virtually all programs carried out by the Federal Government.

ROLE OF ORGANIZATION
AND STRUCTURE

Accepting the importance of science and technology in today's world, the question which we are addressing today is "How can the Federal Government best organize to carry out its responsibilities involving science and technology?" I start with three basic premises.

First, there is no one single best way to organize to assure that the major issues which have been raised are dealt with satisfactorily. It is important, therefore, to continually examine organizational structure as this Committee is currently examining into it to make certain that this structure is adapted to changing needs and situations.

Second, organization of the units within the Executive Office of the President, designed primarily to advise the President in policy making and to assist him in carrying out his responsibilities, must be flexible and serve the needs of the individual Presidents. This has been true since the Executive Office was established in 1939. Congress has recognized that need and has been quick to respond when Presidents sought authority to add or subtract from units established within the Executive Office.

The third premise is that any unit established--whether it is within the Executive Office or outside--should be responsive to Congress'

interests; in particular, it should be able to present testimony and to make available to the Congress its assessments of the science policy and programs of the executive branch. The principal officer should be confirmed by the Senate.

The recent report of the National Academy of Sciences, entitled "Science and Technology in Presidential Policy Making--A Proposal," focuses again upon the role of the President and the Executive Office of the President. It is my understanding that these hearings are concerned broadly with the whole subject of science policy and science organization within the Federal Government. Personally, I believe that this is the correct focus for I doubt whether a good answer can be given to the proposal advanced by the National Academy of Sciences except in the context of a comprehensive look at the way these activities are organized and conducted at all levels within the Federal Government. Even so, I will attempt to address myself to the question of the Executive Office role and organization, particularly since the Academy report reopens an old issue, especially in the light of the President's decision of a year and a half ago to abolish the formally established machinery in the Executive Office--an action which no doubt stimulated the Academy to prepare its report.

The issues involved in the President's recent actions have their roots going back to at least World War II. Inasmuch as my concern with this subject dates back to that period, my remarks are necessarily colored by my own experience and may suffer from biases developed over the time that I was more directly concerned, that is, prior to my becoming Comptroller General in 1966.

The Office of Scientific Research and Development, established by President Roosevelt under emergency powers granted to him in 1939, was designed to mobilize the scientific talent of the Nation in support of the defense, and later the war, effort. Its role ran the gamut of policy advice, trouble-shooting, resolution of interagency differences, and so on.

Toward the end of the war, Dr. Vannevar Bush, who headed the Office of Scientific Research and Development, along with many other scientists in the United States, proposed the establishment of a permanent agency to support basic scientific research. A major consideration was the difficulties faced during World War II because of the previous low level of basic scientific research effort in the United States, together with the recognition of the long-range importance of science and technology for the future strength of the United States, both militarily and economically. The National Science Foundation, which came into being in 1950, was designed to provide the answer to these concerns. In concept, its purpose was not to supplant but to supplement the research efforts of other Federal agencies. However, it was given another important role, namely "to evaluate scientific research programs undertaken by agencies of the Federal Government, and to correlate the Foundation's scientific research programs with those undertaken by individuals and by public and private research groups." This is a function to which I shall refer later because of its bearing upon the National Academy proposal.

The establishment of the National Science Foundation did not settle the question as to whether machinery was needed at the Presidential level

concerned with science and technology. The question continued to be raised by individuals outside the Government as well as within the Government. Added to this, the Korean War led the Bureau of the Budget to request a special study by Mr. William Golden, who served in the Navy during World War II and who had returned to private industry. Mr. Golden was an investment adviser although he had considerable interest in and acquaintance with the issues involved arising from his experience in the Navy and as an adviser to the Bureau of the Budget. His proposal was to establish a Science Advisory Committee and the appointment of a Presidential Science Advisor, recommendations which were approved by President Truman on the advice of the Budget Director. Mr. Oliver Buckley, retired head of Bell Telephone Laboratories, was named Science Advisor to the President.

President Eisenhower continued the arrangement but placed it with the Office of Defense Mobilization where it remained until the Soviet launch of Sputnik caused him to establish it directly in the White House. He named Dr. James Killian, Jr., Special Assistant to the President for Science and Technology. Dr. Killian, as you know, chaired the National Academy of Sciences panel and testified recently before this Committee. What was previously known as simply the Science Advisory Committee in the Office of Defense Mobilization was renamed the President's Science Advisory Committee. Subsequently, an interagency Council for Science and Technology was established, consisting of representatives of the principal departments and agencies concerned with these activities.

The arrangement continued under President Kennedy but soon ways were being suggested to strengthen and institutionalize it. One

particular difficulty was the fact that under the traditional rules of the White House, the Science Advisor was not permitted to testify before committees of the Congress. This resulted in complaints from the Congress that no one was available to testify on overall Federal policies and programs, a point which was made more cogent by the continuing reference by agency representatives in their testimony to policy guidelines, agreements, and so forth, issued by or under the auspices of the President's Science Advisor.

In an effort to further institutionalize the arrangement and to remove the inhibition on testimony, the President approved a recommendation developed jointly by the Budget Bureau and the President's Science Advisor to request the Congress to approve a reorganization plan creating an Office of Science and Technology, the Director of which would also serve as the President's Science Advisor. The Congress approved this plan in 1962. The President's Science Advisory Committee was continued. The important evaluation function of the National Science Foundation referred to earlier was transferred to the Director of the Office of Science and Technology.

The more recent reorganization plan submitted by President Nixon abolished the Executive Office machinery and the functions were transferred to the Director of the National Science Foundation and the National Security Council. The Federal Council on Science and Technology is now chaired by the Director of the National Science Foundation and the President looks generally to the Director of NSF for overall scientific and technological advice in the civilian area. Research and development

matters regarding the Department of Defense have been excluded from the charter of the Science Advisor since early in President Nixon's administration.

PRESIDENTIAL CONCERNS IN POLICY
FORMULATION AND PROGRAM ADMINISTRATION

In my thinking over the years with respect to this matter, I have found it useful to separate out--to the extent that this is possible--the types of Presidential concerns and responsibilities involving science and technology.

1. Assurance of a strong national level of effort in science and technology. All recent Presidents have had this basic concern because of its increasingly and obvious national importance. This concern involves the level of support of basic research in our colleges and universities, the capability of our scientific laboratories, and the level of research carried on by private industry. A host of Federal programs affect this base and many pieces of legislation are debated on their merits or demerits as they may affect the capability of the public or private sector to strengthen their research programs. In developing national goals and objectives, the President must have some means to assess how well we are doing as a Nation with respect to programs which cut across department and agency lines and which cut across different levels of government as well as between Federal Government and private industry.

2. Establishing priorities within the Federal budget. The budget presented by the President each year is essentially a statement of Federal financing priorities. For the most part, priorities submitted

in the President's budget are priorities among program objectives-- programs to deal with the energy and material shortages, to deal with environmental pollution, to provide a strong national security, and so on. All of these programs have varying degrees of science and technology components--in some cases critical to the success or failure of the program itself. The space program is a case in point. Perhaps as much could be said for "Project Independence" and the solution to our environmental problems. Certainly, we would all agree that our defense programs are heavily dependent upon science and technology.

3. Program management. As head of the executive branch, the President is responsible for the effective execution of programs approved by the Congress. Here again, the role of science and technology is great but, in the execution of governmental programs, the President must look primarily to the heads of departments and agencies to carry out these programs. For this reason, the role of the Executive Office is quite a different one, simply because the President must hold the heads of agencies responsible for results and they in turn must be held accountable to the Congress and the President for the establishment of the necessary organization, the selection of capable staff, and the mobilization of necessary resources to carry out his responsibilities. Any machinery established within the Executive Office should, therefore, be less involved--even though the science and technology component may be important. The President may well wish to have an individual or a unit concerned with monitoring progress and problems in carrying out research and development activities--particularly those which cut across

agency lines of responsibility--and he may wish to have the independent advice of such an individual or unit in the event major problems arise. The difference in the role played is an important one. It does not necessarily dictate whether such a unit or staff should exist but it does have a great deal to do with how the function is defined and how the President utilizes such a staff.

ALTERNATIVES FOR CONSIDERATION

What, then, are the principal alternatives with respect to the arrangements for policy making and interagency coordination? Obviously, there are a great many that might be considered. However, there are at least three which I should like to mention.

1. The National Academy of Sciences' proposal. Dr. Killian has already testified at length with respect to this proposal and the Academy report has been made available to this Committee. I shall, therefore, not restate the proposal in detail other than to say that it basically reaffirms the arrangements existing prior to the President's action abolishing the President's Science Advisory Committee and the Office of Science and Technology. It should be pointed out, however, that a principal difference is that the Academy proposal would establish a Council of three in lieu of the single Science Advisor to the President. Otherwise, the Council, supported by staff, would function much as the previous Office of Science and Technology and in much the same pattern as the present Council of Economic Advisors. Presumably the ad hoc use of outside experts would take the place of the President's Science Advisory Committee in much the same manner as this device was used during the

Kennedy and Johnson Administrations even with the existence of PSAC, that is, whenever special problems made it desirable to reach beyond the talent available in PSAC.

I believe it has been generally recognized that the combination of PSAC, OST, and the Federal Council on Science and Technology contributed a great deal, although selectively, in a number of ways during its existence. However, the President apparently concluded that the arrangement was not an effective one and settled on the National Science Foundation as the focal point for science policy in the executive branch.

A modification in the Academy proposal would, of course, be to reestablish a single science advisor as head of a small staff in the Executive Office of the President. There are always problems associated with a council instead of a single advisor even though a council avoids the charge that the President is receiving advice based on the bias of a single individual and the field of science in which he may have specialized. While a group of three to some degree overcomes this type of criticism, it nevertheless tends to be more cumbersome particularly as the council is concerned with testimony before the Congress and is called upon to take the lead to resolve interagency differences. Perhaps the Academy proposal to name one of the members of the council as science advisor would partially overcome this difficulty, although I would be inclined to opt for a single advisor instead of a council.

2. The Director of the National Science Foundation as policy advisor and coordinator. The second alternative would be to continue the

present arrangement under which the Director of the National Science Foundation in effect wears two hats--science advisor and Director of NSF. This arrangement has many precedents and is therefore not a dramatic departure from past practices. President Eisenhower used the Chairman of the Atomic Energy Commission as his advisor on atomic energy matters at a critical point in our nuclear energy program. Budget Director Roy Ash currently serves as Director of OMB as well as Presidential Assistant. These "two-hat" arrangements depend upon their effectiveness in large measure, it seems to me, on the personality of the individual and his relationship to the President.

Two major concerns have been expressed with respect to the present arrangement.

(a) The Director of the National Science Foundation is a contender for research and development funds along with other contenders in the executive branch. It is argued, therefore, that the Director cannot be an objective adviser to the President and the Director of the Office of Management and Budget in the formulation of the budget or in establishing priorities for research and development within total funds available for science and technology. His views, therefore, will be attacked as being biased irrespective of how objective he might be. Reorganization Plan No. 2, which established the Office of Science and Technology and which transferred the evaluation and coordination function from NSF to OST, was based upon this premise. The President's message, outlining the 1962 Plan to the Congress, argued that:

"* * * the Foundation, being at the same organizational level as other agencies, cannot satisfactorily coordinate Federal science policies or evaluate programs of other agencies. Science policies, transcending agency lines, need to be coordinated and shaped at the level of the Executive Office of the President drawing upon many resources both within and outside of Government. Similarly, staff efforts at that higher level are required for the evaluation of Government programs in science and technology."

(b) The Director of the National Science Foundation suffers from the limitation that his charter does not give him jurisdiction with respect to research and development programs of the Department of Defense. While this constriction is one which the President could change, it nevertheless represents a recognition of the difficulties of having the Director of NSF serve in a coordinating role with respect to R&D programs of the Defense Department. Whether these criticisms and limitations are significant depends in part on how the President carries out his budgetary responsibilities and the staff resources available to the Director of OMB to satisfy himself that he is giving the President the best possible advice with respect to priorities in the field of science and technology. A relevant point here is that the Director of OMB has been criticized in the past on the grounds that he did not have available to him scientific experts and, therefore, lacked competence to make the qualitative assessments of priorities which make up the judgments on major R&D investments. This was a consideration in President Kennedy's decision to request Congress to establish OST as against the alternative of establishing a science staff within OMB.

It should be pointed out, on the other side of the issue, that the same argument with respect to the expertise on the staff of the Director of OMB has been made in most other major fields as well--transportation,

agriculture, national defense, and so on. I doubt whether it would ever be possible for the Director of OMB to satisfy all of these criticisms. Moreover, I believe that any Director of OMB must turn primarily to the experts in the operating agencies--and perhaps outside the Government--for advice on major problems and issues. Science and technology programs are no exception.

In addition, as has already been pointed out, science and technology, for the most part, are simply components which contribute to the accomplishment of program objectives in such fields as transportation, medical care, national defense, and food production. Program objectives and goals are the principal considerations in establishing budgetary plans, more than the amount of money contemplated for the science and technology component per se. The important thing here, it seems to me, is that the Director of OMB be assured that the agency head has available to him the best scientific and technical advice available and that he has the competence to expend the requested funds effectively.

While too little time has elapsed for adequate evaluation of the new arrangement, in my judgment, many seem to believe that it is not a satisfactory one for the reasons presented in support of the establishment of the Science Advisor in 1951 and the Office of Science and Technology in 1962. Critics of the present arrangement are careful, however, to state their views without any derogation of the qualifications and competence of the Director of the National Science Foundation and his staff.

3. A cabinet department. A third and somewhat more radical proposal is to establish a Department of Science and Education or a Department of

Science and Technology. This idea, again, is not a new one but it has been advanced from time to time with a somewhat different combination of responsibilities. One significant variable is whether the education function should be included in view of the importance of a strong base of scientific manpower and because of heavy involvement of colleges and universities in carrying out research programs.

In establishing such a department, it would obviously not be possible to bring together all of the scientific and technological programs of the Government. It could, however, bring together such major components as AEC, NASA, NSF, National Oceanic and Atmospheric Administration, and the Bureau of Standards. It would also provide a cabinet officer who could serve as the President's advisor on scientific matters generally and coordinate, on behalf of the President, crosscutting R&D-type matters in much the same way the Secretary of the Department of Transportation takes the lead in the transportation area currently.

A SUMMARY OF
MAJOR CONSIDERATIONS

As I perceive issues involved, the major concerns can perhaps be summarized in the following questions.

- Just how important is science and technology in domestic and world affairs? Does this subject merit consideration continuously at the Presidential level of decisionmaking?
- How can we best determine whether our science base is sufficiently strong and viable to assure our continued international leadership and competitive position, national security, quality of life, and a healthy economy?
- How can we develop a national strategy and investment plan for research?

- What is the best structure and framework for dealing with decision dilemmas that involve establishing science priorities?
- How can we strengthen the Government's ability for early recognition, alert and warning concerning impending problems with significant scientific components to avoid crises or at least to soften their impact?
- How can we improve our ability to mobilize scientific and technological resources to head off or deal with impending crises?
- What executive branch science structure will serve Presidential needs and at the same time be accessible to the Congress and responsive to its oversight responsibilities?

There seems to be little doubt that the all pervasive impact of science and technology on national security, quality of life, the economy, and international relations is so important that Presidential decisions regarding national policy, strategy, and tactics must have the benefit of the best advice available. The National Academy Committee base their recommendations on this fact. In matters such as arms control and international safeguards; national security and defense posture; foreign relations and sharing of technological resources with other nations; potential critical shortages of energy, materials, and food; environmental protection, the economy, objective, thoughtful and imaginative advice from the science community is vital.

Whether vested in one individual or a council, Federal science leadership at the Presidential level requires special attributes. First of all, it must be statesmanlike, acceptable to, trusted by, and with direct access to the President. Secondly, it must be respected by the community of scientists and engineers. It must not be an advocate of science, per se, but should serve as an interpreter and advisor concerning all matters with a science component.

An annual report, as suggested in the Academy proposal, should be prepared on the state of science. It should have high priority.

All of these functions to some extent transcend agency jurisdictions. If the NSF is to perform them, some portion of the agency must be able at times to back off, put on another hat, and evaluate itself, as well as the performance of other R&D programs.

In considering the Presidential advisory role and the central oversight of science and technology, it may be useful to consider as a model the corporate structure employed by a number of high technology companies. Reporting to the Chief Executive Officer, there are both operating and staff Vice Presidents. The operating Vice Presidents usually have line management responsibility for operating departments or divisions concerned with individual products, or groups of related products and services. Each technology intensive product division may have its own chief engineer and mission-related R&D. Among the corporate staff Vice Presidents, various functional elements are represented, including marketing, public relations, the corporate comptroller, the treasurer, and a Chief Scientist or Vice President for Research and Engineering.

The Federal counterpart of this latter individual at present is the Director of NSF. Formerly, the Director of OST would have been the counterpart with a strong assist from the Director, NSF. The Vice President for Research and Engineering, together with his supporting staff, in cooperation with the chief engineers of various operating divisions and occasionally with help from outside consultants, serve the Chief Executive Officer in much the same role as we have been discussing here in relation

to the Presidential advice and central Government oversight of science and technology.

Some of these companies also have a central corporate research division in which longer range exploratory research is performed to advance a broad technology base to spawn new products and fill in gaps that are not clearly under the purview of any operating division. To a large extent, the National Science Foundation plays this role in the Federal establishment.

In most companies employing this type of structure or model the planning and performance of R&D for individual product lines is highly decentralized and delegated to the operating divisions--similar to the Federal pluralistic approach. The role of the corporate Vice President--Chief Scientist in no way preempts this authority but does provide oversight, coordination, policy guidance, trouble shooting assistance, and advice and certification to the Chief Executive Officer on matters that affect the companies' overall technological posture.

How best can we structure the Federal science policy apparatus to accommodate: the advisory role to the President, the oversight and coordination of Government-wide R&D, and the solving of long-term problems with a science component. These three functions are closely interrelated. The National Academy Committee report deals to some extent with all three of these functions, but its main thrust was directed toward reestablishing the Presidential advisory function on a formal basis in the Executive Office.

In general, it seems to me that the most important need of these times is for Congress to find a way for those with important responsibilities and good ideas to have the opportunity to put forward their views and then to go through a process of testing those by evaluating those areas and projects which have yielded high returns and those which have not succeeded to the same degree. In this process, a thorough effort should be made to understand the requirements for administrative success as well as scientific and engineering progress. Know how in systems management and in large scale governmental administration, as well as in science and technology, should be an essential ingredient of governmental R&D advice and decisionmaking. In many cases, the departments and agencies will have more of this than any group of scientists, or engineers, who are chosen for a White House role.

Mr. Chairman, this concludes my statement. I shall be happy to answer questions.

NOTICE OF HEARINGS

Committee: House Science and Astronautics

Subject: Federal Policy, Plans and Organization
for Science and Technology

Date: July 9, 1974

Time: 10 a.m.

Room: 2318 Rayburn House Office Building

Membership: Olin E. Teague (D-Texas), Chairman

Majority: (17 D) Representatives Teague (Tex.), Hechler (W.Va.),
Davis (Ga.), Downing (Va.), Fuqua (Fla.),
Symington (Mo.), Hanna (Calif.), Flowers (Ala.)
Roe (N.J.), Cotter (Conn.), McCormack (Wash.),
Bergland (Minn.), Pickle (Tex.), Brown (Calif.),
Milford (Tex.), Thornton (Ark.), and Gunter (Fla.)

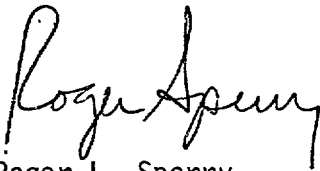
Minority: (13 R) Representatives Mosher (Ohio), Bell (Calif.),
Wydler (N.Y.), Winn (Kans.), Frey (Fla.),
Goldwater (Calif.), Esch (Mich.), Camp (Okla.),
Conlan (Ariz.), Parris (Va.), Cronin (Mass.),
Martin (N.Car.), and Ketchum (Calif.)

Principal staff: John L. Swigert, Jr., Executive Director
Philip B. Yeager, Counsel

GAO Witness: Elmer B. Staats, Comptroller General

Accompanied by: Phillip S. Hughes, Assistant Comptroller General
Harold H. Rubin, Deputy Director, Procurement
and Systems Acquisition Division
Osmund T. Fundingsland, Assistant Director, PSAD
Roger L. Sperry, Legislative Adviser, OCR

Car will leave G Street, 1st basement, at 9:45 a.m.


Roger L. Sperry
Legislative Adviser, OCR