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Recommendations included in a 1975 report were designed to improve the Federal Government's ability to formulate effective national materials policy by improving the adequacy of information on materials R&D in the public and private sectors. A followup review indicated that virtually no corrective action was taken since the 1975 report. There are still no stated national materials policy goals or objectives; no organization has assumed responsibility for overseeing all materials R&D; and adequate steps have not been taken to develop a comprehensive materials R&D information system. Following the earlier report, Congress established the Office of Science and Technology Policy (OSTP) within the Executive Office of the President to oversee scientific, engineering, and technological considerations that require attention at the highest levels of Government. OSTP is the best existing institution to oversee the Government's R&D program. The Director of OSTP should: determine the type of materials R&D data needed, determine national materials research needs, and develop relevant budget recommendations. Congress should enact legislation which would recognize the Smithsonian Science Information Exchange as the official data center for all materials-related research and development. The President of the Exchange should be more aggressive in gathering data from non-Federal sources and in filling agency requests. The Office of Management and Budget should require a mandatory reporting system for all agency materials R&D data. (RRS)

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STATEMENT OF
ELMER B. STAATS, COMPTROLLER GENERAL
BEFORE THE
HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON SCIENCE, RESEARCH, AND TECHNOLOGY

Dear Mr. Chairman:

You have asked us here today as you consider HR 10859, a bill with three broad purposes: (1) to establish a materials policy for the United States; (2) to promote a more effective materials research and development capability; and (3) to provide an organizational structure for the effective application of such capability.

We have just completed a study which bears directly on the second purpose -- improving the effectiveness of national materials R&D. We have underway other work which, when completed later this year, should provide the basis for informed GAO commentary on the first and third purposes of the Bill. Today, however, I want to focus my testimony on materials R&D information management, based on our report which is in final preparation. That report will be issued within the next few weeks and we hope that the Subcommittee will find it helpful in its consideration of the subject legislation.

BACKGROUND

In December 1975, I testified before the Senate Committee on Commerce, Subcommittee on Science, Technology and Commerce on a GAO report entitled, "Federal Materials Research and Development: Modernizing Institutions and Management." I discussed the need for institutional change relative to materials R&D policy and program formulation, emphasizing GAO's report recommendations that:

-- The Congress consider establishing an institution to analyze national materials issues and provide policy guidance on a continuing basis;

-- a comprehensive unclassified information system for materials research and development be established building on existing information in the Smithsonian Science Information Exchange (hereafter referred to as the Exchange); and

-- the Exchange include in its information system data pertaining to materials research and development outside the Federal Government.

Our recommendations were designed to improve the Federal Government's ability to formulate effective national materials policy by improving the adequacy of information on materials R&D in the public and private sectors. Unfortunately, our

follow-up review indicates that virtually no corrective action has been taken since our 1975 report. The Office of Management and Budget (OMB) has done nothing to implement the mandatory R&D reporting system called for by our 1975 recommendations. Further, in 1976, the National Commission on Supplies and Shortages (NCSS) recommended the establishment of a comprehensive materials R&D information system very similar to that favored by GAO. The NCSS recommendations also have not been implemented. Consequently, there still are no stated national materials policy goals or objectives; no organization has assumed responsibility for overseeing all materials R&D; and adequate steps have not been taken to develop a comprehensive materials R&D information system.

Though the basic mechanisms for managing materials policy and materials R&D expenditures have improved as a result of recent Congressional action, the Federal materials research and development program is not managed cohesively and could be costing the taxpayer millions of dollars through unnecessary duplication; the appropriation of funds to areas not related to national goals; and the failure to coordinate Federal Government materials research and development activities with those outside the Federal Government.

Following our earlier report, the Congress enacted the National Science and Technology Policy, Organization, and Priorities Act of 1976, which established an Office of Science and Technology Policy (OSTP) within the Executive Office of the

president. This office was created to provide scientific, engineering, and technological considerations that require attention at the highest levels of Government, and to assist the President in providing general leadership and coordination of Federal R&D programs. In pursuit of these broad objectives, OSTP is to evaluate the scale, quality, and effectiveness of the Federal effort in science and technology; advise the President on scientific and technological considerations with regard to Federal budgets; assist the Office of Management and Budget with an annual review and analysis of funding proposed for R&D in budgets of all Federal agencies; and aid the Office of Management and Budget and the agencies throughout the budget development process.

The law also established the Federal Coordinating Council for Science, Engineering, and Technology, which was a group of committees, designed to assist the OSTP in promoting more effective use of resources and facilities, and identifying research needs. One such committee, the Committee on Materials, had responsibilities including (1) assessing R&D adequacy to meet national needs, (2) coordinating total materials effort within the Federal Government, and (3) identifying national materials technology gaps with new national needs. The Coordinating Council was abolished as a statutory entity under President Carter's Reorganization Plan #1, and its functions transferred to the President. We understand that a similar unit may be re-established in the future by Executive Order to operate as a sub-cabinet working group.

A centralized overview of materials R&D is necessary to determine whether Federal R&D complements private research and whether the sum of Federal research represents a viable overall program -- without gaps or unnecessary duplication. The 1976 report of the National Commission on Supplies and Shortages (NCSS) supports this conclusion. It stated that "the Commission believes that priority must go to improving the management of the current Federal materials R&D program.... Only when we know the level of Federal and private resources that are directed to ensuring the timely development and introduction of new materials technology, and only when we begin to have an understanding of how Federal actions other than direct funding impact on private materials R&D decisions will we be in a position to judge the appropriateness of the level of Federal funding."

GAO believes that the OSTP is the best existing institution to oversee the Government's R&D program. Again, the NCSS supports GAO's view. Its report stated that "Central to the improved management of the Federal materials R&D effort is the development of a means to view Federal R&D activities in areas cutting across departmental and agency lines (such as materials) as a coherent whole. This will have to be tied to the budget process. It is obvious that the newly created Office of Science and Technology Policy will have to play a major role here as an "honest broker" to ensure that the Federal Government creates the proper environment for the

generation and utilization of technology. The Office must do more than merely advocate greater Federal funding of R&D."

GAO RECOMMENDATIONS

To formulate an effective materials R&D policy, the OSTP and any future Federal Coordinating Council will require data appropriate for comprehensive analysis and evaluation. The work we are now completing leads us to several recommendations consistent with the judgment of the NCSS regarding materials R&D information requirements. They either reiterate our December 1975 recommendations, or modify them to address the significant events which have transpired since that time. First, we recommend that OSTP implement its legislated responsibilities. Specifically, the Director should:

-- determine the type of materials R&D data needed;

-- determine national materials research needs; and

-- develop relevant budget recommendations for the Office of Management and Budget.

Second, we recommend that Congress enact legislation which would recognize the Smithsonian Science Information Exchange as the official data center for all materials related research and development.

Third, we recommend that the President of the Exchange be more aggressive in gathering data from non-Federal sources, and in filling agency requests.

Fourth, we recommend that the Director of the Office of Management and Budget require a mandatory reporting system for all agency materials R&D data.

Finally, if the Congress finds that the Office of Management and Budget fails to implement mandatory reporting procedures, it should enact legislation which would require that all agencies report materials related R&D projects to the Exchange in a complete and timely manner. The vital matter of mandatory reporting has been an open issue far too long. The Congress should ensure that this issue is soon, and finally, resolved.

BASIS OF GAO RECOMMENDATIONS

I would like to discuss briefly the supporting rationale for our recommendations.

Congressional Mandate To The Office of Science And Technology Policy/Federal Coordinating Council For Science, Engineering, and Technology

In enacting the National Science and Technology Policy, Organization, and Priorities Act of 1976, Congress said that the Nation's capabilities for technological planning and policy formulation must be strengthened, and that the appropriate scope, level, direction, and extent of scientific and technological effort must be determined through a continuous appraisal of the role of science and technology. Accordingly, Congress delegated

OSTP and the Federal Coordinating Council to oversee the Government's science and technology program; emphasizing in part, their role in coordinating R&D programs of the various participating agencies.

In addition to their explicit review, analysis, and advisory responsibilities to the President and OMB, OSTP's and the Federal Coordinating Council's missions also implicitly include the establishment of national materials R&D policies and goals, and the monitoring of materials R&D in the public and private sectors. Together, OSTP and any future Federal Coordinating Council could achieve significant results if these missions are implemented.

Despite its legislated mandate, OSTP has decided to await the results of a new domestic decision-making process (implemented in accordance with President Carter's Reorganization Plan #1), before addressing the issues to be presented in our report. However, it is our opinion that until these issues are addressed, only limited progress can be expected toward the development of a cohesive materials R&D program.

Designated Data Center

If OSTP is to provide leadership in formulating national materials R&D policy, it will need comprehensive, complete, and current R&D information, categorized so that it can be related

to and directed toward materials problems and issues. At present, the available information is inadequate and therefore, adversely impacts on any efforts to channel our resources most effectively. For example, policy makers and budget analysts must rely on incomplete data for policy decisions and resource allocation. Also, researchers may unnecessarily duplicate the work of others because complete information (i.e., in a detailed format), is often unavailable at the inception of their respective projects.

The process for evaluating or d aterials R&D is essentially done on an agency-by-agency basis, based on each agency's particular mission. No means exist by which gaps or duplicate research can be identified in the Federal Government's overall materials R&D program. Further, only the most elemental data exists on non-Federal R&D.

Federal R&D analyses have been made, but these have rarely included materials as a special category. Also, they are all made after the fact from the compilation of decisions already made, and are therefore not an integral part of the budget process.

In our 1975 report, we found that the Exchange provided the most immediate opportunity for an effective, operational materials R&D information system. In our opinion, the Exchange continues to provide the most viable means to fulfill these needs.

Need For An Improved Exchange

The Exchange can be a useful tool to the OSTP in directing Federal materials R&D. It can also provide a valuable service to individual researchers by identifying projects related to their particular efforts. However, the Exchange suffers from various internal and external problems which, if not resolved, will preclude the operation of an effective materials R&D information system. Problems external to the Exchange include the following:

-- several heavily oriented R&D performing agencies have not supplied data on a substantial amount of their research projects;

-- data received are often incomplete, non-standard, and non-current;

-- and certain agencies argue that the benefits to be derived from the Exchange are not cost effective.

The Exchange, though clearly capable of fulfilling the requirements, has been unaggressive and sporadic in its efforts to compile complete and comprehensive information. Attempts to obtain private industry data have been generally limited to those industries that first contacted the Exchange. There has been no consistent effort to solicit research and development information from industry, state, and local governments. Most non-government

information is obtained indirectly through data submissions provided by the sponsoring Federal agency. Inquiries and past performance indicate that most industries will not submit detailed data regarding on-going research and development but may submit more general data that could be useful. Other non-Federal groups are more responsive; information from universities, state, local, and foreign governments are often readily available but the Exchange has lacked the manpower to request and process the input.

Need For Mandatory Reporting

The findings of at least 15 studies conducted over the last 17 years have well established the value of the Exchange and the need for mandatory reporting.

The Exchange's data bank is incomplete and not current, primarily because of agency reporting deficiencies. Presently, the Exchange receives data on about 80 percent of all on-going R&D in the Federal Government, but based on discussions with agency representatives, only a fraction of the reported data appears to be current and complete with respect to funding information and descriptions of the work to be performed. The cost of correcting these deficiencies is reasonable for agencies with well established information systems. Though the cost may be substantial for others, we believe every agency needs to develop an effective information system.

In a 1972 report, the General Accounting Office concluded that the ability of the Exchange was being handicapped by non-reporting agencies. Accordingly, it recommended that OMB evaluate the role of the Exchange and then determine whether mandatory reporting should be imposed.

The OMB later advised the General Accounting Office that it would not require mandatory reporting since it felt that voluntary submissions were sufficient. Nevertheless, it recommended that a study be done to determine the future of the Exchange and the need for mandatory reporting. Accordingly, OMB authorized a $50,000 study of the Exchange by a private management and consulting firm. The study, which was completed in 1973, found that the Exchange provided benefits that exceeded its costs many times over, and recommended that the Exchange be recognized as an official element of the Federal Government. While it did not address mandatory reporting per se, the study recommended that executive departments and agencies be required by Executive Order to use the Exchange for exchanging research information.

Almost five years later, no Executive Order has been issued, and OMB has not implemented any of the study's recommendations.

Legislation May Be Required

As illustrated by numerous studies, the need for mandatory reporting procedures is an issue that has been neglected far too

long. Although cognizant of many of these studies and their recommendations, OMB has still not imposed mandatory reporting for all Federally sponsored R&D. Accordingly, Congress should enact legislation such as it did with the "Water Resources Research Act of 1964" (Public Law 88-379).

The Act was established to assure the Nation a supply of water sufficient to meet the requirements of its expanding population. It authorized: (1) appropriations to establish a water resources research institute; (2) the Secretary of the Interior to make grants and contracts related to water research (then valued at an estimated $70 million); and (3) the establishment of, in such agency and location as the President would determine, a center for cataloging current and projected scientific research in all fields of water resources.

In an October 1964 memorandum, President Lyndon Johnson noted that water resources research projects were particularly difficult to coordinate because of the overlapping statutory missions of numerous agencies. Recognizing its progress in cataloging water resources research, President Johnson designated the Exchange as the general purpose facility for such information. In addition, each participating agency was required to provide the Exchange with information regarding on-going and proposed research. The program's success can be measured by the fact that the Exchange now receives data on virtually 100 percent of all water research projects.

In 1964, Federal water research projects were valued at $70 million. By 1975, the program had grown to an estimated 8000 projects valued at $200 million. By contrast, the materials R&D program is even more diverse (an estimated 17,000 projects), and costs two to five times the amount of the water research program.

The precedent has been set. The Exchange is now recognized as the official center to catalog on-going and planned water resources research. All agencies that sponsor water research have established reporting systems to insure compliance with the intent of the law and have thereby demonstrated the feasibility of mandatory reporting for materials related research and development projects. Further, the OSTP is now on record favoring the concept of mandatory reporting for all materials R&D.

The history of inadequate reporting dates to the 1960's and will likely continue until appropriate action is taken.

Because the Congress considered the $200 million water resources program sufficiently important to warrant mandatory reporting, mandatory reporting should be considered even more vital for the more diverse and more costly materials R&D program.

That concludes my formal statement, Mr. Chairman. I shall be pleased to answer any questions the Committee may have.