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The United States is the world's largest consumer of materials and has become increasingly dependent on foreign sources for materials. This materials supply problem has created the need for finding new resources at home, improved extraction and processing techniques, materials substitutes, and new materials uses. Findings/Conclusions: The Government's materials research programs have not been managed cohesively and could be costing taxpayers millions of dollars because of unnecessary and duplicated research, appropriation of funds to areas not related to national goals, and activities not coordinated with those outside the Federal Government. Many organizations have recommended that a single manager be designated to oversee materials research, but so far, no one has assumed this responsibility. The Office of Science and Technology Policy (OSTP), whose mission is to oversee the Government's research and development R&D programs, could provide the necessary leadership, but additional information on current research is needed to determine where to place emphasis. The Smithsonian Science Information Exchange (SSIE) could provide the research information, but it lacks information on private industry, and its information on Federal agencies is neither complete nor current. Recommendations: The Director of OSTP should determine needs for data and for materials R&D budget recommendations for the Office of Management and Budget (OMB). The President of SSIE should: take more effective

measures to obtain data from non-Federal sources, determine the feasibility of incorporating industrial information developed by other Federal sources into its information system, work with agencies to develop a standard reporting form and a universal classification system for materials program management and project review, inform agencies that data search costs can be reduced by excluding their data from searches, and redefine the data elements of its project submission form to conform with OSTP requirements. The Director, OMB, should institute a mandatory reporting system for agency materials R&D. The Congress should enact legislation that would: designate SSIE as the official data center for materials-related R&D; and, if OMB fails to implement reporting procedures, require agencies to report materials R&D projects to SSIE. (RTW)

7009

BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

Management Of Federal Materials Research Should Be Improved

The United States is the world's largest consumer of materials, yet there is no single Federal organization which directs materials research and development on a national level. GAO recommends that the Office of Science and Technology Policy provide the needed direction.

A centralized materials clearinghouse could save millions of dollars by identifying unnecessary research duplication and by facilitating coordination of research and development programs. GAO further recommends that the Smithsonian Science Information Exchange be the official information center for materials research and development and that the Office of Management and Budget take certain actions to assure that the information is collected.



EMD-78-41
JULY 14, 1978



COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-183336


To the President of the Senate and the
Speaker of the House of Representatives

There has long been a recognized need for closer monitoring of materials research and development both in the Federal Government and the private sector. Meeting this goal has been hampered by the lack of data on the total research activity and the lack of an organization capable of assuming an oversight role.

This report presents our views on how considerable progress could be made in managing Federal materials research and development. Agency comments have been incorporated as appropriate in the body of the report. Comments are also included as appendixes II through VI.

We made our review pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

We are sending copies of this report to the Director, Office of Management and Budget; the Director, Office of Science and Technology Policy; the President, Smithsonian Science Information Exchange; and the heads of those departments and agencies involved in materials research and development.


Comptroller General
of the United States

D I G E S T

The Nation's increasing dependence on foreign materials has emphasized the need for finding new resources at home, improved extraction and processing techniques, materials substitutes, and new materials uses. (See pp. 1 and 2.)

The Government's materials research programs have not been managed cohesively and could be costing taxpayers millions of dollars by unnecessary and duplicated research, appropriation of funds to areas not related to national goals, and activities not coordinated with those outside the Federal Government. (See p. 4.)

Many organizations, including the General Accounting Office (GAO), have recommended that a single manager be designated to oversee the Nation's materials research, but so far no one has assumed this responsibility, probably because the data needed to facilitate the analysis is inadequate. (See p. 10.)

THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY
COULD PROVIDE LEADERSHIP

The Office of Science and Technology Policy was created by law in 1976 to help the President direct and coordinate Federal research programs, and to annually review and analyze the research and development budgets of all Federal agencies. Because the institution's mission is to oversee the Government's research and development programs, it could provide the necessary leadership. (See pp. 8 and 12.) However, additional information on current research is needed to determine where emphasis is needed.

GAO previously reported and still believes that with certain management improvements, the Smithsonian Science Information Exchange could best provide research information to the Office

GAO further recommends that the Director, Office of Management and Budget, institute a mandatory reporting system for all agency materials research and development. (See p. 35.)

MATTERS FOR CONSIDERATION BY THE CONGRESS

GAO recommends that the Congress enact legislation that would designate the Smithsonian Science Information Exchange the official data center for all materials-related research and development. Also, if the Congress finds that the Office of Management and Budget fails to implement mandatory reporting procedures, it should enact legislation requiring all agencies to report materials research and development projects to the Smithsonian Science Information Exchange in a thorough and timely manner. (See p. 36.)

AGENCY COMMENTS

The Office of Science and Technology Policy agrees that materials research and development are important and endorses GAO's recommendation on mandatory reporting. The Office did not specifically address the other recommendations. (See p. 36.)

The Smithsonian Science Information Exchange agrees with GAO's recommendations, noting that they can be implemented only to the extent that funding is available and that there is legislative and executive support. The Smithsonian Science Information Exchange also agrees that it can provide a valuable service to the Office of Science and Technology Policy, the Office of Management and Budget, and others concerned with materials research and development. (See p. 36.)

The Office of Management and Budget agreed to look into the question of mandatory reporting of materials research information, but felt that it was premature to designate the Smithsonian Science Information Exchange as the appropriate organization to maintain materials research data. GAO disagrees. (See p. 36.)

C o n t e n t s

	<u>Page</u>
DIGEST	i
CHAPTER	
1 INTRODUCTION	1
The importance of materials research and development	1
Private and Federal R&D	2
Purpose of report	3
NCSS report	5
OTA report	6
The COMAT report	6
Establishment of OSTP/FCCSET	8
Scope of review	9
2 NEED FOR IMPROVED MANAGEMENT OF MATERIALS R&D	10
Inability to analyze R&D	10
Conclusion	11
OSTP and FCCSET could provide leadership	12
3 DATA COLLECTION	14
SSIE	14
Alternatives to SSIE	16
Conclusion	18
Need for industry data	18
Can data on industrial R&D be improved?	19
4 NEED FOR IMPROVED INPUT TO SSIE	22
SSIE's operation	22
Prior SSIE studies	22
Conclusion	26
Projects not reported to SSIE	26
Out of date and incomplete reporting	27
Cost of reporting	27
Inadequate input medium	28
Agency views on using SSIE's data bank	29
Precedent for mandatory reporting	30
SSIE should be more aggressive and responsive	31
An improved exchange could benefit individual researchers	32

CHAPTER

Page

5	CONCLUSIONS AND RECCMMENDATIONS	34
	Matters for consideration by the	
	Congress	36
	Agency comments	36

APPENDIX

I	Notice of Research Project (NRP)	38
II	Letter dated February 10, 1978, from the President of the Smithsonian Science Information Exchange	39
III	Letter dated February 9, 1978, from the Assistant Director, Natural Resources and Commercial Services, Office of Science and Technology Policy	41
IV	Letter dated March 20, 1978, from the Acting Director, Office of Management and Budget	45
V	Letter dated February 27, 1978, from the Assistant Administrator for Planning and Management, Environmental Protection Agency	47
VI	Letter dated March 7, 1978, from the Director, Division of GAO Liaison, Department of Energy	49
VII	Principal officials responsible for administering activities discussed in this report	51

ABBREVIATIONS

COMAT	Committee on Materials
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
FCCSET	Federal Coordinating Council for Science, Engineering, and Technology

GAO **General Accounting Office**

NASA **National Aeronautics and Space Administration**

NCSS **National Commission on Supplies and Shortages**

OMB **Office of Management and Budget**

OSTP **Office of Science and Technology Policy**

OTA **Office of Technology Assessment**

R&D **research and development**

SSIE **Smithsonian Science Information Exchange**

CHAPTER 1

INTRODUCTION

THE IMPORTANCE OF MATERIALS RESEARCH AND DEVELOPMENT

Materials 1/ are the lifeblood of industrialized societies. In recent times, worldwide consumption has increased tremendously. For example, the United States, Japan, and some Western European countries have used up more materials since 1950 than the entire world produced before that year.

The United States is by far the largest materials consumer. Americans represent only 5 percent of the world's population, yet they consume about 25 percent of the materials produced. The American lifestyle requires over 41,400 pounds of new materials annually for each person: 20,500 pounds of nonmetallic materials, 17,300 pounds of mineral fuels, 1,300 pounds of metals, and 2,300 pounds of organics.

The United States has become heavily dependent on foreign sources for these materials. The following percentages of U.S. annual needs are imported: iron ore--29 percent; gold--45 percent; zinc--64 percent; nickel--71 percent; aluminum ore--85 percent; and most of our manganese, tin, chromium, graphite, and cobalt. Forecasts of the U.S. Geological Survey for the year 2000 indicate that we will be completely dependent on imports for 12 commodities, over 75 percent dependent for 19 commodities, and more than 50 percent for 26 commodities.

Research on improved exploration, extraction and processing techniques, possible substitutes, and new uses can all help solve materials supply problems.

1/The definition of materials, as used by the Federal Council for Science and Technology's Committee on Materials (see p. 6) includes minerals, metals, ceramics, semiconductors, dielectrics, glasses, polymers, wood, fibers, leather, and other nonfood agricultural and animal products. Research and development (R&D) on the processing of coal, gas, oil, and nuclear fuel materials are included in this definition, but not R&D on their use as fuels. Food and drugs are excluded from the definition.

PRIVATE AND FEDERAL R&D

R&D expenditures of the Federal Government, industry, universities, and other nonprofit institutions in the United States were approximately \$38.1 billion in fiscal year 1976. The Federal Government, through 34 agencies and 91 offices, spent 57 percent of this amount, or \$21.6 billion, on an estimated 160,000 projects. Industry funded 40 percent, or \$15.1 billion.

Private industry conducts about half of all federally funded research. For fiscal year 1977, the U.S. budget included approximately \$23.5 billion earmarked for R&D. About \$2.5 billion went for basic research, \$5.3 billion for applied research, and \$15.6 billion for developmental research. Precise data on amounts allocated to industry-managed projects were not available.

The total amount spent on both Federal and private materials research is unclear. In the 1976 Federal budget, materials R&D expenditures were estimated at 2 to 5 percent of the total research budget--from \$470 million to \$1 billion. The private sector is estimated to have spent from \$500 million to \$4 billion.

The Federal Coordinating Council for Science, Engineering, and Technology's (FCCSET's) Committee on Materials (COMAT) reported in 1976 that 18 Federal departments and agencies supported a \$1 billion materials life-cycle R&D program. The principal agencies--the Departments of the Interior, Defense, and Agriculture, the Energy Research and Development Administration (ERDA), 1/ Environmental Protection Agency (EPA), National Science Foundation, and National Aeronautics and Space Administration (NASA)--together funded \$920 million, or 92 percent of the total.

The \$920 million expenditure may be categorized by stages of the materials cycle:

1/The Energy Research and Development Administration has since been incorporated into the Department of Energy.

	<u>Percent</u>	<u>Amount</u> (millions)
Exploration for resources	6	\$ 54
Extraction of raw materials	9	83
Processing of raw materials	6	55
Manufacturing and fabrication	2	18
Application and utilization	20	184
Evaluation of properties	23	212
Development of materials	13	120
Waste management	10	92
Unspecified	<u>11</u>	<u>101</u>
	<u>100</u>	<u>a/\$920</u>

a/Does not add due to rounding.

PURPOSE OF REPORT

In our December 2, 1975, report entitled "Federal Materials Research and Development: Modernizing Institutions and Management," we said that there was a strong need for more centralized and cohesive management of Federal materials research. During that study, we found no systematic means by which an individual agency's research would be applied to government-wide or national needs. Also, there was inadequate information on which to base a program to provide cohesive direction. The report recommended that

- the Congress consider establishing, by statute, an institution to analyze governmental materials issues and policy alternatives;
- the National Commission on Supplies and Shortages (NCSS) and the Executive Office of the President work together to establish an "unclassified" materials R&D information system, which would involve mandatory

agency reporting to the Smithsonian Science Information Exchange 1/ (SSIE); and

--SSIE collect data relevant to private sector materials R&D and include the data in its basic information system.

These recommendations reflected the Federal Government's perceived inability to formulate effective national materials policy without current information on materials R&D in the public and private sectors. This followup review was undertaken to find out what has happened since the 1975 report.

We found that virtually no corrective action has been taken. No organization has assumed responsibility for overseeing materials R&D, and adequate steps have not been taken to develop a comprehensive materials R&D information system.

Although there are basic mechanisms for managing materials policy and R&D expenditures within the Federal Government, the program is not cohesively managed. Consequently, millions of dollars may be lost by unnecessary duplication, appropriation of funds to areas not related to national needs, and the failure to coordinate Federal R&D activities with those outside the Government.

Since our last report, others have been written and legislation addressing many of these problems has been passed. This includes (1) the NCSS report, (2) report of the Office of Technology Assessment (OTA) on information systems, (3) a study to inventory and analyze materials R&D in the Federal Government, and (4) the National Science and Technology Policy, Organization, and Priorities Act of 1976 (Public Law 94-282, May 11, 1976).

1/The Smithsonian Science Information Exchange was established in 1949. It acts as a clearinghouse of ongoing scientific research, and as such attempts to compile resumes of Federal and non-Federal research. Its capabilities were shown in our 1975 report and need not be repeated in depth here. Basically, however, we found that the exchange could provide overall data by materials category, as well as by phase of the materials cycle. Such data was taken from its data bank and presented in our 1975 report.

NCSS REPORT

NCSS was established by the Congress in 1974 in response to congressional concern over impending materials shortages, growing dependence on imported materials, the ability of the Government to deal with materials problems, and the ability of market mechanisms to deal with shortages without causing undue hardship.

An NCSS 1976 report addressed the importance of materials R&D and materials management. The report stated that a system was necessary to evaluate recommendations for specific R&D activities if the Government is to attain effective resource utilization and make the improvements required for materials data collection and policy analysis.

The 1976 report addressed many of the same issues covered in our 1975 report. According to NCSS, the Government must increase its understanding of the role of materials in the economy and improve its materials data and analysis systems. The data must be more accurate and objective and include better provisions for early warnings of potential problems. Further, the relationship between information and policy must be strengthened. Improved management of the Federal materials R&D program, particularly the application of R&D, should have priority. NCSS said

"* * * 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 * * *. * * * 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 * * *. * * * Once the Federal activities in materials R&D can be viewed as an overall program, the program must be linked to the needs of industry and integrated with other Federal policies, priorities, and programs affecting industry's materials R&D decisions." (Underscoring added.)

There has been no apparent action on these recommendations. Perhaps because no centralized management of materials research exists, no agency has assumed responsibility for implementing these recommendations.

OTA REPORT

In December 1976, OTA released a report entitled "An Assessment of Information Systems Capabilities Required to Support U.S. Materials Policy Decisions." The assessment was made to enable the Congress to consider (1) the adequacy of existing materials information (not to be confused with materials R&D information discussed in this report) to support governmental policymaking, particularly in regard to potential scarcities or shortages, (2) the improvements, if any, needed for policymakers to obtain information for dealing with materials scarcities or shortages, and (3) the results, if any, that might emanate from such improvements. The report looked at demand, supply, and other related factors influencing materials flow throughout the materials cycle, from exploration, mining, production, use, and recycling, to eventual disposal.

Basically, current materials information systems were found to be inadequate for anticipating and coping with scarcities or shortages. OTA found that some of the analytical and coordinating functions needed to address new issues were performed inadequately if at all. The Government's materials information services were found to be limited in their ability to address issues of supply and demand because they were neither organized nor managed within a comprehensive integrated framework.

The report concluded that action to improve current Federal materials information systems is both necessary and technically feasible, and the potential benefits would justify the financial and social costs. Also, the potential impact of emerging problems requires more comprehensive integrated information and analysis capabilities to support Federal materials policymaking.

To improve current information systems, the report recommended that data gathering and analyzing functions be organized and operated within an integrated framework. While the improvements could address specific problems, they could also be used to address the entire spectrum of materials-related issues.

THE COMAT REPORT

Another important study on materials was the 1976 COMAT report. COMAT, composed of members from 13 Federal organizations involved in materials R&D, was established in 1975 by the Federal Council for Science and Technology. Its main function is to identify points of emphasis for Federal

materials R&D within the total materials system (or cycle) in the economy--from the origin of resources, both renewable and non-renewable, through translation into materials for use to their disposal. This includes determining where the most beneficial outcome can be expected in Federal R&D activities. COMAT was to:

"promote coordination and cooperation in materials research and foster the advance of materials science and engineering as related to national needs and goals * * * provide a mechanism by which the Government's programs and activities in materials can be viewed in the context of the total national materials activity."

The first phase of COMAT's effort--a compilation of materials R&D supported by Federal spending--was completed under a contract in April 1976.

Although there were certain flaws in this data (see pp. 16 to 18), the report did provide information that would be useful in relating research efforts to national goals and in appraising Government efforts on a functional basis.

For example, basic national goals were established by COMAT, and the total R&D effort was applied to these goals. The data was also presented by stages in the materials cycle and showed that the coding of the computerized data base would permit many other analyses.

COMAT expects the principal users of this data to be Government managers who want to relate the adequacy of their programs to national goals. Generally, users were to include the Federal Council for Science and Technology, the Office of Management and Budget (OMB), other Federal departments and agencies, the Congress, and the private sector.

Unfortunately, the report was not used by the Federal Council's successors--the Office of Science and Technology Policy (OSTP), FCCSET, or OMB--which were most capable of achieving COMAT's goals. There are several reasons for this; in our opinion, the most important one is that these organizations do not yet regard materials R&D as a comprehensive Government effort.

Other inhibiting factors are:

--The creator of COMAT (the Federal Council for Science and Technology), was dissolved before issuance of the report.

--OSTP has not yet established a firm method of operation.

--The second part of the two part inventory and analysis for private and industrial materials R&D has not yet been completed.

--COMAT hesitated to initiate setting priorities. 1/

ESTABLISHMENT OF OSTP/FCCSET

The National Science and Technology Policy, Organization, and Priorities Act of 1976, established OSTP within the Executive Office of the President.

Similar organizations have existed in the past, but only by Executive order. OSTP is significant in that it was created by law. It provides scientific, engineering, and technological information on issues that require attention at the highest Government levels, and helps the President by providing general leadership and coordination of Federal R&D programs. OSTP evaluates the scale, quality, and effectiveness of the Federal effort in science and technology; advises the President on scientific and technological considerations with regard to Federal budgets; helps OMB with an annual review and analysis of proposed funding for R&D in all Federal agency budgets; and helps OMB and the agencies throughout the budget development process.

The act also established FCCSET. FCCSET is a group of committees designed to assist OSTP in promoting more effective use of resources and facilities, and identifying research needs. COMAT is one such committee. Its responsibilities include (1) assessing R&D adequacy to meet national needs, (2) coordinating total materials effort within the Federal

1, NCSS reported in 1976 that: " * * * the Committee [on Materials] has not begun to develop a method for judging research priorities. This aversion is not out of character in an interagency activity where the agreements once arrived at may be detrimental to one or more of the agencies involved." This supports NCSS's belief that data collection and analysis should be separated from policymaking and program management to achieve "lack of bias or * * * commitment to a particular policy position."

Government, and (3) reconciling national materials technology gaps with new national needs. 1/

To date, neither OSTP nor FCCSET has acted to coordinate and direct materials R&D nationwide.

SCOPE OF REVIEW

Our examination included a review of various studies, selected research project submissions, laws, congressional hearings, and agreements pertaining to the Government's R&D data collection and analysis activities. We interviewed appropriate information, grant, and project officials at SSIE, the Department of Energy, EPA, NASA, the National Science Foundation, OMB, OSTP, and FCCSET, and at the Departments of Agriculture, Commerce, Defense, the Interior, and Health, Education, and Welfare.

1/Under Reorganization Plan no. 1 of 1977, FCCSET was dissolved as a statutory entity. However, it has been reestablished under somewhat more flexible form by Executive Order 12030, effective February 26, 1978.

CHAPTER 2

NEED FOR IMPROVED MANAGEMENT OF MATERIALS R&D

An organization with oversight responsibility for materials R&D is necessary to determine whether Federal R&D complements private research and whether the sum of Federal research is adequate. We believe OSTP can achieve progress in providing this oversight if it effectively implements its legislated responsibilities.

INABILITY TO ANALYZE R&D

A comprehensive data information system is essential to budgetary planning. Unfortunately, the available information is inadequate and adversely affects governmental efforts to channel resources effectively. Policymakers and budget analysts generally must rely on incomplete data.

Materials R&D is evaluated and directed agency by agency, on the basis of each agency's particular mission. We did not find any method by which gaps or duplicate research could be identified in the Federal Government's overall materials R&D program. Further, only the most basic data exists on non-Federal R&D.

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

The budget process is described by the American Association for the Advancement of Science. The Association's publication entitled "Research and Development in the Federal Budget: FY 1977," stated in part that:

"* * * the total amount of R&D is not determined by a specific decision; there is no direct limitation on the total and no single central point of control; and trade-off type decisions within the total are generally not meaningful or feasible between separate major functional elements of the total. While OMB may monitor during the annual budget review an 'R&D crosscut' summarizing all the principal R&D budgets, the total amount for R&D in the federal budget is actually the resultant of a large number of separate budgetary objectives of individual R&D programs and the missions to be served by them,

not on their relationships to other R&D. Thus the budget for all military R&D needs to be properly related to the overall defense budget, but does not have a meaningful relation to, for example, the budget for agriculture R&D."

The inadequacy of this approach has been widely acknowledged, and attempts have been made to look at the budget on a more functional level. An analysis by the Federal Council for Science and Technology strongly justifies the need for this overview. In a report on the Federal Government's R&D program, the Council categorized Federal R&D by major functional areas, and said, in part: The total Federal funding for R&D on materials will amount to about \$470 million in fiscal year 1976. Almost half of this effort is directed to materials utilization, which is the principal thrust area for the mission agencies in Energy, Defense, Space, Health, Transportation, and Housing. Approximately one-quarter of the total is directed to the area of materials supply; the major thrusts for the Department of Agriculture and the Department of the Interior. Only a small fraction of the total funding is concerned with resource recovery and no one agency has this area as its principal focus.

Thus, what was apparently considered by the Council to be a major area of concern on a nationwide basis was only receiving minor attention because it did not relate to any one agency's mission.

NCSS pointed out that while annual budget competition within an agency assures that there is some attempt to judge whether materials R&D is given the proper emphasis, it does not insure that total Federal materials R&D spending is appropriate to either its level or its composition. It also stressed that cooperative, interagency, analytical work is needed to produce recommendations on priorities and strategies.

OMB reviews R&D on an individual agency basis but does not attempt to look at all Federal R&D because of insufficient staff. An OMB budget examiner said that he was not aware of the COMAT report (which addressed federally funded materials R&D), and felt that it would not be of use to OMB though it might help OSTP. He said that OMB cannot redirect materials R&D until a national materials policy is determined and materials issues are identified.

CONCLUSION

While we feel that there is a clear need for a centralized overview of R&D, we do not suggest that the responsibility

for research programing be removed from the department or agency level. Instead, we suggest that each agency's efforts be related to a cohesive, overall program on a Government or national basis. This would enable the executive branch to direct Federal materials R&D toward national needs in a manner complementing private industry R&D and, at the same time, providing the Congress an oversight of the total materials R&D effort. It would also give individual researchers better access to technology, permit better planning of individual projects, and help avoid undesirable duplication.

The absence of such an overview stems, in our view, from two primary causes:

- No organization has assumed or been directed to assume the responsibility.
- The data that could be used for such a review is incomplete.

We believe that these problems can be solved within the existing framework of the Federal Government.

OSTP AND FCCSET COULD PROVIDE LEADERSHIP

As stated in the National Science and Technology Policy, Organization, and Priorities Act of 1976, the Nation's capabilities for technological planning and policy formulation must be strengthened, and the appropriate scope, level, direction, and extent of scientific and technological efforts must be determined by a continuous appraisal of the scientific and technological role.

Accordingly, the Congress directed that:

"The Federal Government should maintain central policy planning elements in the executive branch which assist Federal agencies in (A) identifying public problems and objectives, (B) mobilizing scientific and technological resources for essential national programs, (C) securing appropriate funding for programs so identified, (D) anticipating future concerns to which science and technology can contribute and devising strategies for the conduct of science and technology for such purposes, and (E) reviewing systematically Federal science policy and programs and recommending legislative amendment thereof when needed."

To do this the Congress established OSTP and FCCSET. OSTP's mission states, in part, that the director shall:

"* * * 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 research and development in budgets of all Federal agencies, and aid the Office of Management and Budget and the agencies throughout the budget development process: * * * assist the President in providing general leadership and coordination of the research and development programs of the Federal Government; * * * gather timely authoritative information concerning significant developments and trends in science, technology, and in national priorities, both current and prospective, to analyze and interpret such information for the purpose of determining whether such development and trends are likely to affect achievement of the priority goals of the Nation; * * * develop, review, revise, and recommend criteria for determining scientific and technological activities warranting Federal support, and recommend Federal policies designed to advance (A) the development and maintenance of broadly based scientific and technological capabilities, including human resources, at all levels of government, academia, and industry, and (B) the effective application of such capabilities to national needs."

We believe that this would logically include the development of national materials R&D policies and goals, and the monitoring of materials R&D in the public and private sector.

Officials of OSTP agreed that managing the overall R&D program is properly under their direction. They also said that the subject of materials is of universal importance and that the Nation must be concerned with all phases of the materials cycle.

CHAPTER 3

DATA COLLECTION

If OSTP is to provide the leadership in coordinating a national materials 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. In our opinion, the Smithsonian Science Information Exchange could best fulfill these needs. A coordinated Federal materials policy would also require industrial R&D information. However, it is uncertain whether or not detailed industrial R&D data can be compiled.

In our 1975 report, we said that SSIE provided the most immediate opportunity for an effective materials R&D information system. That report presented the capabilities and shortcomings of SSIE, including the fact that it could provide such unique data as research by materials category and by phases of the materials cycle. We recommended that a comprehensive unclassified information system for materials R&D be established, building on information in SSIE, with data input appropriately modified by the Committee on Materials fiscal year 1976 materials R&D inventory.

We found that little action has been taken to improve SSIE's data base; until an organization takes on the responsibility of developing and coordinating materials R&D as a cohesive program, there is no incentive to compile this information.

Following is a brief description of SSIE, comparisons with research data bases within the Government, and a discussion of special problems in developing information from private industry.

SSIE

SSIE was established in 1949 as an informal arrangement among five medical research agencies, which agreed to contribute to a cooperative clearinghouse for ongoing medical research.

In 1953, the program was expanded by interagency agreement to include all life sciences; in 1961, to include physical and social sciences; and in 1964, (by law and Presidential declaration) to include current and projected research in all sectors of water resources.

In 1963 the National Science Foundation assumed the management and funding of SSIE. In 1972 these functions were assumed by the Smithsonian Institution.

SSIE is a nonprofit corporation of the District of Columbia, controlled by the Smithsonian Institution. 1/

The March 1977 report addressed fiscal accountability and control weaknesses resulting from SSIE's private corporate structure. The recommendations were directed at improving fiscal control over Federal appropriations and did not suggest any changes in SSIE's basic mission or method of operation. We believe our recommendations are viable, regardless of the charter or organizational location of SSIE. It is supported by a separate appropriation to the Smithsonian Institution and by income from user fees and contracts. User fees are adjusted when necessary to recover the cost of services. SSIE's 1976 operating cost was \$3.1 million, supported by a \$1.9 million Federal appropriation. Appropriations for fiscal year 1978 are \$1.7 million. SSIE employs approximately 100 scientists, engineers, and support personnel.

The appendix to the Budget for Fiscal Year 1978 describes SSIE's program as follows:

"The Exchange collects, indexes, stores, retrieves, and disseminates information about ongoing scientific research supported or conducted by the Federal Government and by segments of the private research and scientific community. It responds to requests from research investigators, program administrators, policymakers for information on who is currently working on what project, where, when, and under what source of funding, and it provides numerous directories of ongoing research in response to the requirements of Federal agencies. Its purpose is to assist in the avoidance of unwarranted duplication of research and to enhance scientific communication and creative interaction among members of the National research community.

1/In a March 1977 report, we recommended that SSIE be dissolved and absorbed by the Smithsonian Institution. The Smithsonian Institution disagreed with the recommendation. OMB is studying the possibility of recommending that SSIE be made a government entity within a Federal department or agency. Implementation of such a recommendation may require authorizing legislation.

"SSIE plays an increasing role in support of a number of programs of national interest, such as energy, cancer and pesticides research. It is doing so at least partly because it has been able to increase the timeliness and comprehensiveness of its coverage in recent years. Government agencies and all other customers of SSIE pay user charges to obtain information. All revenues received by SSIE are used to support operation of the Exchange."

SSIE maintains data on basic and applied research projects and proposals in the physical, medical, biological, social, and engineering sciences. The system is designed to complement other scientific and technical information services and to supply information from projects still in process. It can make available online information from ongoing projects and projects completed within the last 2 years. A separate historical file is maintained for projects completed more than 2 years ago.

ALTERNATIVES TO SSIE

In determining whether SSIE offers the best means of compiling materials R&D information, we found that SSIE and COMAT are the only sources of comprehensive information on all ongoing Federal Government research. Other Government information systems lack the integrated capability of SSIE.

COMAT is the only other organization which could successfully compile materials R&D information. It does not have an information system per se, but has, under contract, gathered and analyzed data on Federal materials research. Its objective was to identify gaps and desired areas of concentration in Federal materials research. The results of the study were issued in April 1976, and a compilation of similar data from industry is now underway. It is difficult to compare the merits of SSIE and COMAT because the type of data which would be required for an integrated oversight of materials R&D has not been clearly determined.

Following are the relative merits of the two organizations' data and other factors:

--Viability. SSIE is an ongoing quasi-Federal activity supported by Federal funds and user revenues. Its data bank has the capability to provide data to coordinate all types of R&D rather than materials only.

COMAT is an unfunded ad hoc committee which obtains its data through periodic contracts. At the present

time it is not functioning. In October 1977, its parent organization (FCCSET) was dissolved by the President's Reorganization Plan number 1 of 1977. However, FCCSET was reestablished in a somewhat more flexible form by Executive Order 12039, effective February 26, 1978.

Although we were told by FCCSET and COMAT members that COMAT's mission will continue regardless of its status within the Executive Office, it cannot be assumed that COMAT will be in existence in the near future. But even without this questionable status, there is no assurance that COMAT will ever repeat its study.

- Timeliness. SSIE has been criticized for not entering research projects into its data base in a timely manner. We found that this problem is caused largely by the participating agencies.

Timeliness would seem to be a greater problem with COMAT. While SSIE maintains an ongoing data base, COMAT only intends to obtain data periodically. The frequency has not yet been determined, but will probably be once every 3 to 5 years. COMAT's compilation of Federal data began in September 1975 and was completed in April 1976. The compilation of industry data is to be completed in late 1978.

- Completeness of Federal data. SSIE's data is not complete because some agencies are remiss in reporting to SSIE. Its data bank is estimated to be 80 percent complete.

COMAT's study has had similar problems. Some agencies reported 1975 data when 1976 data was desired. Data on Department of Defense manufacturing technology, Department of Commerce oceanographic technology, Department of Transportation railroad and aircraft technology, and other programs were not included because of internal organizational matters or the lack of appreciation of COMAT's needs.

COMAT receives about 2,000 materials projects and programs over a 1-year period, while SSIE receives 5,000 projects a year. It should be noted that the contractor did not search SSIE's data bank during the COMAT inventory.

We believe that actions to establish firm reporting procedures would be more effective if data was reported to a branch of the Federal Government and into

a continuing data system, rather than to a contractor that operates only intermittently.

- Completeness of industrial data. SSIE has had limited success in obtaining industrial data, but now believes that it has the ability to do so. Although COMAT has just begun its collection of industry data, it, too, is optimistic.
- Cost. COMAT's collection of Federal materials R&D data costs about \$150,000. A COMAT official said that some savings should result if its study is repeated. SSIE estimates it could modify its data bank to provide the same data for about \$50,000. Once modified, it could provide future data for about \$25,000 annually, assuming that all necessary information would be provided by Federal agencies in a complete and timely manner.
- Needs of individual researchers. SSIE is a clearinghouse for ongoing research. One of its primary functions is to answer questions from research investigators, directors, and program administrators throughout the national science community regarding the names of researchers currently working on projects, their work locations, the time period, and the source of funding. It has been proven that this easily pays for itself. We do not believe that COMAT, with its periodic inventories, could ever perform this function adequately.

CONCLUSION

We believe that the need for a single organization to compile and disseminate R&D information is known, and that SSIE is the most logical choice. However, the difficulty in collecting R&D information from private industry has been, and may continue to be, a major stumbling block.

NEED FOR INDUSTRY DATA

The desirability of gathering detailed industrial R&D data, and the necessity of relating Federal R&D to industrial R&D have been widely acknowledged.

As we reported in 1975, knowledge of the Federal concern alone will not assure the most productive allocation of resources. NCSS, reaching a similar conclusion in 1976, said:

"* * * 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 action 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."

The American Association for the Advancement of Science reported that Federal R&D budgeting and Federal R&D policy must consider the support other sectors can, will, and should give.

COMAT, in its 1976 report on Federal R&D, stated that:

"While the inventory information obtained * * * thus far, constitutes a large bank of valuable data, it is not enough to accomplish the COMAT objective of identifying gaps, opportunities and roadblocks in the total materials R&D program. To accomplish this, it is recommended that a comparable inventory of materials R&D conducted or sponsored by industry be completed and analyzed in conjunction with the Federal inventory. This undertaking is recommended for early action."

Further, the National Science and Technology Policy, Organization, and Priorities Act of 1976 states that:

"* * * [It] is a responsibility of the Federal Government to promote prompt, effective, reliable, and systematic transfer of scientific and technological information by such appropriate methods as programs conducted by nongovernmental organizations, including industrial groups and technical societies."

The act particularly recognized the Federal Government's responsibility not only to coordinate and unify its own science and technology information systems, but also to facilitate the coupling of institutional scientific research with commercial application.

Thus the need, as well as a congressional mandate, is clearly established. A question remains, however, as to how much industrial data can be acquired.

CAN DATA ON INDUSTRIAL R&D BE IMPROVED?

The National Science Foundation has traditionally used Bureau of Census data as its source for industry R&D information. The data shows R&D by subject matter, such as food,

textiles, and lumber, but it is not adequate for comprehensive direction of materials R&D.

Reports now filed by industry to the Securities and Exchange Commission also provide R&D data, but our sample examination indicates that they are too brief, not uniform, and in the case of conglomerates, not related to particular fields of business.

SSIE has a negligible amount of industrial data available. An SSIE official said that industrial R&D represents approximately 2 to 3 percent of all non-Federal projects within its data bank--a total of about 400 to 600 projects.

Our discussions with industry representatives raised questions as to whether or not detailed industrial data can be obtained. We contacted a number of R&D performing industries and associations and found that generally, the associations were willing to identify basic areas of research, but would not provide detailed descriptions of work in progress, fearing the loss of proprietary data and competitive advantage. Of the 27 companies and associations contacted, only 2 associations and 1 company were willing to provide SSIE with project data.

Associations which represent R&D performing organizations (as distinguished from those which themselves perform R&D) and knowledgeable Government officials agreed that industry would not participate voluntarily in sending descriptions of ongoing research to SSIE.

Although optimistic because of promised cooperation from the Industrial Research Institute, ^{1/} COMAT officials acknowledged that no data would be obtained on a project level and that such data would not identify the performing organization. Nevertheless, COMAT is trying to obtain the type of industrial data considered necessary to identify "gaps, opportunities, and roadblocks" in the total materials R&D program. This effort will be completed in late 1978.

SSIE has also developed a method for collecting and analyzing current U.S. industrial research information. It performed a prototype test on isotope development to demonstrate that ongoing research information could be collected

^{1/}The Industrial Research Institute is an association of manufacturers and industrial firms which maintain and operate industrial research laboratories.

from U.S. industry. even in cases where the propriety of the research precluded submission of detailed, project-level information.

CHAPTER 4

NEED FOR IMPROVED INPUT TO SSIE

SSIE can be useful to OSTP in directing Federal materials R&D, and it can be valuable to individual researchers by identifying projects related to their particular efforts. SSIE suffers, however, from various internal and external problems, which, if not resolved, will hamper its operation as an effective materials R&D information system. Problems outside SSIE include (1) several major R&D performing agencies did not supply data on about two-thirds of their research projects, (2) data received was incomplete, not standard, and out of date, and (3) certain agencies argued that the possible benefits from SSIE were not cost-effective. Internal problems include SSIE's apparent lack of aggressiveness in seeking complete and comprehensive information from R&D activities in the Federal and private sectors and the lack of responsiveness to customer needs.

This chapter includes our observations on SSIE's strengths and weaknesses, and our recommendations, which could expedite progress toward achieving a cohesive, centralized materials R&D program within the Federal Government.

SSIE's OPERATION

Over 1,300 organizations participate in SSIE and contribute data annually on an estimated 120,000 projects. Federal agencies contribute an estimated 100,000 of these research projects. The remaining 20,000 projects are submitted by universities, associations, State and local governments, and private industry. Five agencies annually submit 80 percent of all federally sponsored projects: the Department of Health, Education, and Welfare--40,000 projects; the Departments of Defense and Agriculture--approximately 13,000 each; the National Science Foundation--about 10,000; and the Veteran's Administration--about 5,000.

SSIE estimates that 5,000 materials projects are submitted annually. Including projects submitted during the 2 previous years, SSIE stores a total of about 17,000 materials-related projects.

PRIOR SSIE STUDIES

Attempts to correct the problems of SSIE have been numerous; it has been studied at least 15 times since 1961. Basically, the studies have addressed the internal organization,

administrative practices, and the relationship between SSIE and the Federal Government. Virtually all concluded that SSIE performs an essential service and is an important source of R&D information. Related studies and hearings have shown that centralized data compilation and dissemination are essential for maximum control over R&D resources, and that mandatory reporting is a prerequisite to a complete data information system.

These studies have identified benefits and potential benefits of SSIE and its problems, and have made appropriate recommendations. In our opinion, OMB has been remiss in responding to these studies. OMB has not even complied with the results of a study it requested, which recommended that (1) SSIE be recognized as the official data bank of the Federal Government and (2) executive departments and agencies be required to use SSIE for exchanging research information. A brief discussion on some of these studies and hearings follow.

In 1961, the Senate Committee on Government Operations concluded that agencies should be required to cooperate to the fullest extent with SSIE to facilitate coordination of information on current scientific research. In 1962, before a subcommittee of the same Committee, the Director of the Office of Science and Technology stated that the rapid growth of "scientific and technical information in Government is a national problem which can no longer be considered on an agency-by-agency basis." His statement read in part:

"* * * more than 35 Government departments and agencies carry on scientific and technical information activities tailored to their missions under separate legislative authority. The technical information activities of these agencies must be brought into harmony * * *. Government-wide scientific and technical information clearing-houses are needed to integrate the agency systems with each other. Some of the needed clearing-houses, such as the SSIE are in existence, but a general strengthening is necessary."

A 1964 House report of the Select Committee on Government Research concluded that continued Federal support of the SSIE system was warranted, and the Committee encouraged full cooperation with SSIE from research supporting organizations. It said that SSIE's services are useful for individual researchers and research administrators, and concluded that SSIE had paid for itself many times over by identifying needless duplication.

A 1966 study analyzed SSIE's mission and operations and performed a comprehensive survey of user requirements. The study found that most users were satisfied with the system, and most agencies felt that SSIE facilitated more effective planning, management, and coordination of R&D activities. 1/

A 1970 study performed by an ad hoc committee on agency users concluded that SSIE might need the aid of OMB to attain complete coverage.

In a 1972 report, we concluded that the performance of SSIE was being handicapped by agencies not providing information. We recommended that OMB evaluate the role of SSIE, and if it was found that SSIE should be continued, mandatory reporting should be imposed. 2/

OMB told us that it would not require mandatory reporting since it felt voluntary submissions were sufficient. It recommended that another study be done and said that it would determine the future of SSIE and the need for mandatory reporting on the basis of that study. The two-part study, completed in 1972 by a management and consulting firm, 3/ stated that SSIE provides benefits that exceed its cost many times over. The study recommended that SSIE be made an official element of the Federal Government. The study did not explicitly address mandatory reporting, but it did recommend that executive departments and agencies be required to use SSIE for exchanging research information. OMB has failed to support the study's recommendations and has not yet imposed mandatory reporting even though other studies since 1961 have shown the need for such action.

In 1973, we issued a report on the Government's computerized information systems. On the basis of results from survey questionnaires sent to members of the scientific community, we projected that researchers, using various data

1/"Scientific Information Exchange Requirement Study," Battelle Memorial Institute, May 1966, p. 5.

2/"Effectiveness of Smithsonian Science Information Exchange Hampered by Lack of Complete Current Research Information," B-175102, Mar. 1, 1972.

3/"The Role of the SSIE in Research Management," Research, Planning, and Management Services for the 70s, Sept. 27, 1972, Recommended Action, p. 1.

information systems, had saved from \$9 million to \$42 million during the preceding 12 months through the identification of duplicate research. We noted that many agencies had suggested that an improved SSIE would be a reasonable alternative to a network of multiple information systems. Results of the review were brought to OMB's attention for use in considering the future role of SSIE. 1/

As previously discussed, we recommended in December 1975 that a comprehensive, unclassified materials R&D information system be established, building on information in SSIE. 2/

Other reports have indirectly supported the need for SSIE. For example, our report to the Congress in 1971 stated that surveillance of ongoing research projects is inadequate due to poor information gathering techniques. According to the study, scientific reports on some research efforts are never obtained and others are obtained only after long delays. 3/

Our 1976 report on environmental research concluded that Federal water pollution research must be better coordinated to avoid duplication of R&D activities between various departments and between bureaus and services within the same department. It disclosed a lack of centralized control within the Federal Government for identifying and coordinating water pollution research information. 4/

The 1976 COMAT report (discussed in ch. 3) emphasized the importance of maintaining current materials R&D information for use by a national materials policy group. 5/ In December 1976, OTA reported that materials information systems

1/"Coordination of Computerized Information Systems Reporting on Active Research Efforts," B-115398, Mar. 29, 1973.

2/"Federal Materials Research and Development: Modernizing Institutions and Management," B-183336, Dec. 2, 1975.

3/"Need to Strengthen Management Control Over the Basic Research Program Administered by the Air Force, Office of Scientific Research," B-170807, Jan. 29, 1971.

4/"General Accounting Office Reviews of Federal Environmental Research and Development," B-166506, July 22, 1976.

5/Committee on Materials, "Inventory and Analysis of Materials," p. 1-2, 4.

were inadequate for policymaking purposes because of non-standard data definitions and formats, incomplete coverage, and obsolete data. 1/

CONCLUSION

SSIE could reduce some of its problems itself, but most can be resolved only by the agencies reporting to it. It is unlikely, however, that voluntary submissions will ever be satisfactory. SSIE's data bank is incomplete and out of date, primarily because of agency reporting deficiencies. SSIE receives data on about 80 percent of all ongoing R&D in the Federal Government, but on the basis of discussions with agency representatives, only a fraction of the reported data seems current and complete with respect to funding information and descriptions of the work to be performed. The cost of correcting these deficiencies should be minor for agencies with well-established information systems, but may be substantial for others. Following are the most commonly cited criticisms of SSIE's data base and our observations on them.

PROJECTS NOT REPORTED TO SSIE

Most agencies report their research to SSIE. There are three exceptions. The Energy Research and Development Administration and NASA report on only about 37 percent of their research projects. Before our examination, EPA had submitted data on only about 20 percent of its research projects.

According to previous studies and reports, the Energy Research and Development Administration has weaknesses in its reporting and accounting procedures. These are reflected in its input to SSIE. To illustrate, Energy Research and Development Administration officials said that the agency sponsors an estimated 10,000 R&D projects annually, but only 3,000 are reported, and some reports are in program, rather than the more detailed project, format. In one instance, instead of submitting the prescribed notice of research project, the Energy Research and Development Administration merely forwarded 14 publications to SSIE. From these, SSIE abstracted 712 projects, which accounted for about one-fourth of the Energy Research and Development Administration's input in 1976.

NASA estimated that in 1977 it sponsored from 3,500 to 6,000 R&D projects, but only 2,200 projects had been submitted to SSIE.

1/"An Assessment of Information Systems Capabilities Required to Support U.S. Materials Policy Decisions," United States Congress, Office of Technology Assessment, Dec. 1976, p. 4-5.

EPA is another agency which has had a poor submission record. Though EPA officials told us that they sponsor at least 2,500 projects annually, their submissions decreased from 2,750 in 1975 to 510 in June 1977. In response to our inquiries, however, EPA recently acknowledged the inadequacy of its submission and increased the number of reported projects to over 1,700 by late 1977. EPA had found that only \$18.6 million (or 8 percent), of its \$230 million for R&D programs were reported to SSIE. In the future, EPA promised to send SSIE complete and timely data on at least 90 percent of its projects.

OUT OF DATE AND INCOMPLETE REPORTING

Reports are of little value for planning purposes if the data submitted is not detailed and current. Discussions with agency officials and a review of project submissions indicate that much of the input to SSIE is not timely, does not include funding information, and does not give a detailed description of the projects. Much of the Department of Agriculture's research data is supplied by various States and universities which agreed not to disseminate funding information. Inputs to SSIE are not current because State research centers report to the Department of Agriculture on an annual basis, usually in March. State projects are normally not submitted to SSIE until 6 months after they are received by Agriculture. A State project initiated late in the year may not be reported until 1 year after the next reporting cycle, which means the data submitted to SSIE may be 2 years old and the project may have been completed by the time it is entered as an ongoing project.

NASA's records indicated that their submissions included 1,500 projects from various universities. None of the university projects included descriptions of the research to be performed, and NASA officials agreed that such incomplete information could not be used for research and/or planning purposes.

While EPA gives data to SSIE on a monthly basis, some projects are not sent to SSIE for 9 months to a year after the project date.

COST OF REPORTING

With the exception of water resources data reported under the Water Resources Research Act of 1964 (Public Law 88-379), all R&D data is reported to SSIE on a voluntary basis. Agencies with well-established data information systems are generally more comprehensive and conscientious reporters because

their systems are already in operation, and they incur little if any additional cost in reporting to SSIE. For example, the Department of Agriculture enters data into its Current Research Information System and sends a tape copy to SSIE. The Department of Defense does the same through its Defense Documentation Center. The cost to the Department of Agriculture is about \$3,000 annually. There is only a nominal cost to the Department of Defense.

Other agencies, including the National Science Foundation and the National Institutes of Health, use SSIE's information as a management tool. The cost to these agencies is nominal since they would otherwise have to compile such information internally.

Some officials of the less responsive agencies, such as the Department of Energy, NASA, and EPA argue that reporting to SSIE is a costly burden. EPA officials estimated that when they submit descriptions on each of their approximately 2,500 projects, the cost would range from \$25,000 to \$50,000 annually--or \$10 to \$20 a project.

Energy officials said that it would cost an estimated \$445,000 during the first year, and from \$100,000 to \$325,000 each subsequent year to establish a workable information reporting system. Another ERDA official, however, estimated that the cost to the agency should be considered nominal, since such data would have to be developed as a prerequisite to a well-managed information system.

INADEQUATE INPUT MEDIUM

SSIE receives much data in a format not acceptable for computer entry. Accordingly, SSIE scientists must rearrange the submission, and may unknowingly change it from that which the agency's program manager or researcher had intended.

SSIE has developed a standard notice of research project. (See app. I.) A completed notice provides the following data:

- An identification number.
- A grant or contract number.
- The name of the supporting agency.
- The title of the project.
- The identification of principal investigators and departments.

- The address of the performing organization.
- The time period covered by the notice of research project.
- The funds to be expended.
- A summary of the project.

In 1976, SSIE received 75 percent of all its reports in the prescribed format; 50 percent were on magnetic tape, and 25 percent were on standardized forms. The remaining 25 percent were received on other (not SSIE) forms, such as annual reports, news releases, and other publications. Thus, at least one-fourth of SSIE's data bank requires manual modification and/or subjective interpretation.

AGENCY VIEWS ON USING SSIE's DATA BANK

While most agencies endorse the concept of a comprehensive and centralized data information system, not all agree on the role that SSIE should play.

Some agencies feel that SSIE serves them more effectively than their own internal reporting systems. For example, the Navy used information compiled and tabulated by SSIE to make substantial changes in its energy research program, despite the fact that the Department of Defense has its own Defense Documentation Center. Defense often refers requests to SSIE when a more comprehensive search is needed, because SSIE's system is far more comprehensive than any other agency's, is capable of performing specific searches, and can identify similar or duplicate research in progress. Several agencies consider SSIE user fees to be small compared to the cost of one unnecessary, duplicate research project.

On the other hand, management information officers at some agencies said that their researchers and program managers consider SSIE's system incomplete and lacking in information essential to trend-analyses, decisionmaking, and program coordination.

Many complained about having to pay for the retrieval of their own inputs. Defense officials stated that SSIE would be used more frequently if the system could exclude the information already retrieved by Defense. Similarly, Department of Agriculture officials said they would use SSIE more often if Agriculture's own information could be excluded from SSIE research. SSIE has the ability to exclude an agency's

own projects from a search of its data, and acknowledged that it has not publicized this fact in writing.

Generally, however, agency officials agree that the concept of SSIE's services is sound, and that retrieval costs are nominal considering the potential savings from identification of unnecessary projects. However, they feel they cannot justify the costs of providing information to SSIE, since they receive no direct savings. This is especially true for agencies that do not already have an information system that responds to the needs of SSIE.

Although there are deficiencies in SSIE's data base and in the services SSIE now provides, we believe they can be readily corrected, with one exception--strong measures are needed to assure that agencies provide proper, complete, and timely input. We believe that mandatory reporting is required, and that the benefits of a properly used, comprehensive data system will exceed the costs of system maintenance.

PRECEDENT FOR MANDATORY REPORTING

The Water Resources Research Act of 1964 ^{1/} (Public Law 88-379), was established to assure the Nation a sufficient supply of water to meet the requirements of an expanding population. The act authorized appropriations to establish water resources research institutions, and authorized the Secretary of the Interior to make grants and contracts related to water research. It also stated that there shall be established, in such agency and location as the President determines, a center for cataloging current and projected scientific research in all fields of water resources.

In an October 1964 memorandum, President Lyndon B. Johnson noted that water resources research projects were particularly difficult to coordinate because of the overlapping statutory missions of numerous agencies. He said, however:

"The Science Information Exchange has been making good progress in cataloging such research and shall be the general purpose facility for such cataloging. As required by the Act, each Federal

^{1/}The water pollution research problem discussed on p. 25 is subject to the Federal Water Pollution Control Act Amendments of 1972, and thus are apparently not considered subject to the Water Resources Research Act.

agency doing water resources research shall cooperate by providing the cataloging center [i.e. SSIE], with information on work under way or scheduled by it. Beyond this, it is expected that the Federal agencies will, in turn, make full use of such cataloging center in addition to internal information systems and other means which may be required for good management."

While not all agency submissions are current and in a detailed project format, SSIE and agency officials agree that SSIE receives data on virtually all water research projects, while it receives data on only about 80 percent of projects not related to water research.

In 1964, Federal water research projects were valued at \$70 million. By 1975, the program had grown to an estimated 8,000 projects valued at \$200 million. In contrast, the materials R&D program is even more diverse and costs from two to five times the amount of the water research program.

SSIE SHOULD BE MORE AGGRESSIVE AND RESPONSIVE

Mandatory reporting can do much to alleviate the problems of incomplete, inconsistent, and late reporting. This is shown by the data available on water resources research. Mandatory reporting alone, however, would not achieve an effective data information system.

SSIE, though it is clearly capable of being the cataloging center for materials research, has not been aggressive enough, and its efforts to compile complete and comprehensive information have been sporadic. Attempts to obtain private industry input have generally been limited to those industries that first contacted SSIE. Though there has been no consistent effort to solicit R&D information from industry and State and local governments, it should be noted that SSIE has never been funded to do so. Most nongovernmental 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 ongoing R&D but, as suggested on page 20, they could submit more general data that would be useful. Other non-Federal groups are more responsive; information from universities and State, local, and foreign governments are often readily available, but SSIE has been too short on staff to request and process the input.

Federal agencies feel that SSIE is often not responsive to customer needs. For example, some data searches are too

broad, producing excessive information and unnecessarily high user fees. Others are too narrow and produce little more than an agency's own input. SSIE has not informed users that costs might be reduced by excluding an agency's own data from the data search.

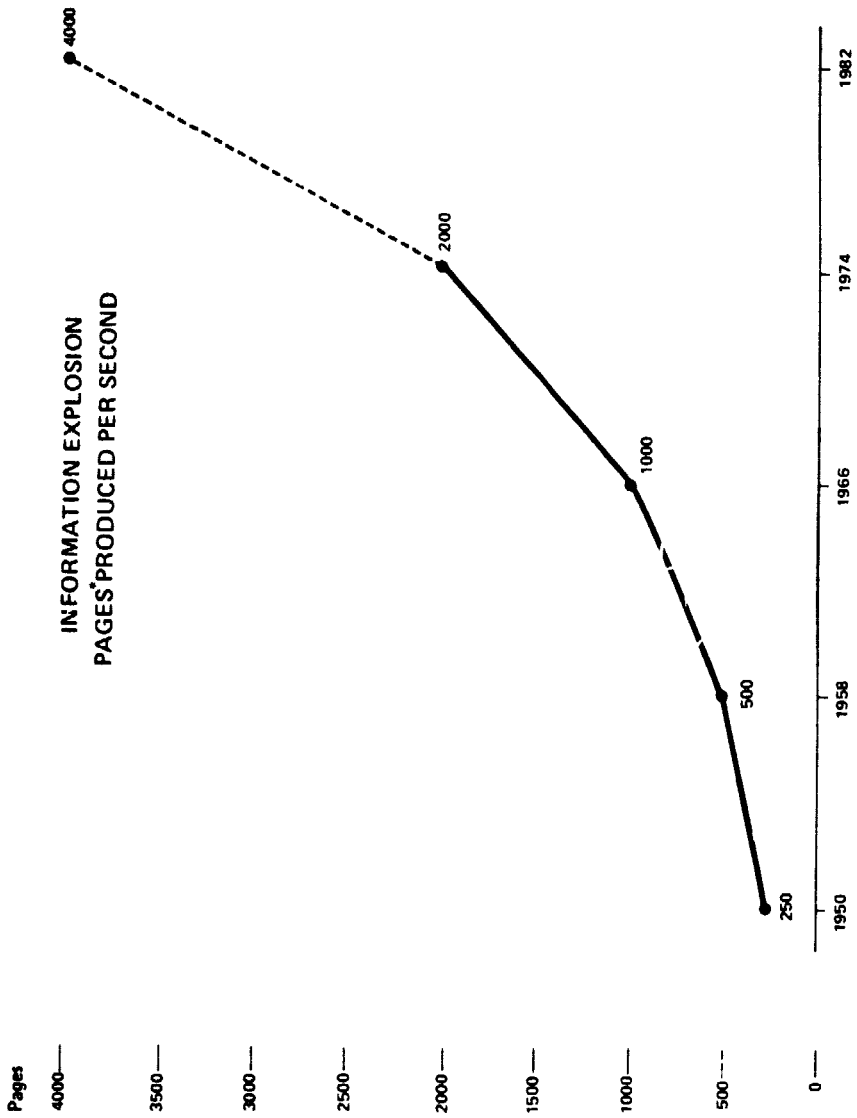
SSIE classifications were designed to provide data by subject, investigator, funding agency, and performing agency. Despite new interest in staff-hour and multiyear funding information, SSIE has not revised the project submission form to accommodate additional data.

AN IMPROVED EXCHANGE COULD BENEFIT INDIVIDUAL RESEARCHERS

The House Committee on Science and Technology reported in 1975 that the quantity of scientific knowledge was doubling every 8 years and growing faster than it could be assimilated. The Committee said an average of 2,000 pages of scientific texts, newspapers, magazines, and reports are published every second. The problem is complicated by the lack of awareness of new and current technologies, and delivery mechanisms to collect, interpret, transfer, and apply them to the user. The chart on page 33 illustrates the exponential increase in scientific knowledge.

SSIE can give the researcher a better view of the available information by classifying projects according to the name of the scientist, the sponsoring agency, and the location of the research, and by providing a description of the work being performed. The system can combine both subject and administrative data, and give relationships among the funding, performing organizations, and geographic location categories. It can provide data on individual projects as well as project summary listings.

The system can also be used to avoid unnecessary duplication. A study initiated by OMB concluded that SSIE users may have saved an estimated \$83 million in 1972 by identifying duplicate projects. On the basis of similar evidence, our 1973 report projected a 12-month savings of \$9 million to \$42 million.



Source: Hearings before the Subcommittee on Domestic and International Scientific Planning and Analysis, House Committee on Science and Technology.

*Scientific texts, newspapers, magazines, and reports.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Materials R&D is not coordinated at either the Federal or national level. Specifically,

- Federal materials R&D is geared largely to specific agency missions,
- the Federal budget is not comprehensively analyzed to determine whether proposed R&D expenditures are directed at complementing private research and/or meeting national needs and goals, and
- no part of the Federal Government has assumed this responsibility.

The oversight needed requires that an organization assume the responsibility for developing an adequate data base for analysis and evaluation. While new institutions may be the ultimate answer, we believe progress can be achieved within existing organizations.

OSTP is more than an ad hoc organization dealing with national materials problems and issues. It represents the only existing institution with the legislated mission to oversee the Government's R&D program. OSTP can achieve significant results if its legislated responsibilities are implemented.

While we are encouraged by (1) COMAT's self-initiated efforts to assume the responsibility of coordinating materials R&D and (2) the apparent willingness of the Industrial Research Institute to participate in compiling private industry R&D data, strong affirmative action is still required if the materials R&D program is to be effectively managed and directed. The uncertain future and the intermittent reporting practices of COMAT lead us to conclude that SSIE remains the logical choice to develop the desired data base. We believe that with certain management improvements and procedures that require timely and consistent reporting, SSIE can provide a valuable service to research planners at OSTP and OMB, and improved service to individual researchers.

Accordingly, we recommend that the Director of OSTP

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

- determine national materials research needs, and
- develop relevant budget recommendations for OMB.

To be effective, SSIE should be more aggressive in gathering data and more responsive in filling agency requests. Accordingly, we recommend that the President of SSIE:

- Take more effective measures to obtain data from non-Federal sources, especially with emphasis on materials oriented trade associations, universities, and State governments.
- Determine the feasibility of sharing industrial information developed through COMAT efforts.
- Work with appropriate agencies to develop an acceptable standard reporting form and a universal classification system for materials program management and detailed project review.
- Inform requesting agencies that data search costs can be reduced by excluding the agency's own data from the search.
- Redefine the data elements of its project submission form to conform with the data requirements prescribed by OSTP.

There are no readily apparent incentives for agencies to participate in SSIE. The immediate benefits to a particular agency do not come from entering data into SSIE but from retrieving complete, current, and comprehensive data from SSIE. Certain agencies, therefore, have not supported SSIE, making it less useful to other agencies. Also of major importance are the benefits which accrue to an agency and the Federal Government from the elimination of undesirable duplication.

As previously discussed, the history of inadequate reporting dates to the 1960s and will likely continue until action is taken to impose mandatory reporting for all federally sponsored materials R&D. Since the Congress considered the \$200 million water resources program important enough to warrant mandatory reporting, it should also be considered vital for the more diverse and costly materials R&D program. Accordingly, we recommend that the Director of OMB:

- Develop and implement a mandatory reporting system for all agency materials R&D.

--Determine the amount of funds required for SSIE to assume the additional responsibilities suggested in this report.

MATTERS FOR CONSIDERATION BY THE CONGRESS

We recommend that the Congress enact legislation that would designate SSIE the official data center for all materials-related R&D. Also, if the Congress finds that OMB fails to implement mandatory reporting procedures, it should enact legislation requiring all agencies to report materials R&D projects to SSIE in a thorough and timely manner.

AGENCY COMMENTS

OSTP agrees with our conclusion that materials R&D is an important element of overall R&D, adding that it deserves support by the Federal Government and private industry. While OSTP endorsed the concept of mandatory reporting for all agencies, it did not address the other recommendations. Until these recommendations are implemented, we believe that only limited progress toward the development of a cohesive materials R&D program can be expected.

SSIE agrees that it can provide a valuable service to OSTP, OMB, and others concerned with materials R&D. SSIE notes, however, that our recommendations can be implemented only to the extent that funding is available and that there is legislative and executive support. In addition, SSIE emphasizes the need for mandatory reporting of R&D project data in a timely, comprehensive, and consistent manner. Specifically cited as a reason for SSIE's lack of aggressiveness was a \$200,000 cut in Federal appropriations for fiscal year 1978.

OMB pointed out that there is an ongoing interagency study of nonfuel minerals policy that will assess the current data base and policy analysis framework used in formulating minerals policy. It also felt that the specific data needs should be defined before determining which organizations would be best as a data base. OMB agreed to look into the question of mandatory agency reporting on materials R&D. We believe that the numerous studies conducted over the years, including one done for OMB, make it quite clear that SSIE is a viable data base and that mandatory reporting is essential. We also believe that there have been enough studies and analyses of the situation, and that the time for action has arrived.

Two organizations having major input to SSIE, EPA, and the Department of Energy, also commented on our reports.

EPA pointed out that development of compatible information systems by SSIE and the National Technical Information Service (a component of the Department of Commerce that maintains data on completed research) would provide a good picture of total R&D activity. It also suggested that SSIE extend its records on completed projects from 2 to 3 or more years for projects that have not been reported in the literature.

The Department of Energy felt that our recommendations lessen the responsibility of individual program managers. As we pointed out on page 11, however, our objective is for OSTP to look at R&D on a broader scale to identify major areas of priority, gaps, or undesirable duplication. We believe that the selection and management of specific programs should remain with individual departments and agencies. The Department of Energy further pointed out that procedures would be needed to control access to and release of data representing a national asset.

The reader is referred to appendixes II through VI for complete agency comments.

SAMPLE NOTICE OF RESEARCH PROJECT

Grant or Contract Number	NOTICE OF RESEARCH PROJECT GUM-4572
Supporting Organization	U.S. DEPT. OF THE INTERIOR OFFICE OF WATER RESOURCES R&D A-027-UTAH
Project Title	IMPACTS OF AGRICULTURAL LAND USE, IRRIGATION, AND DEVELOPMENT RESULTING FROM WATER TRANSFERRED TO OIL SHALE DEVELOPMENT
Investigators	FRANK R. POTERIE BY GARDNER ALCHOURILL
Research Organization	UTAH STATE UNIVERSITY AGRICULTURAL RESEARCH CENTER PAKIN BUILDING, P.O. BOX 160 LOGAN, UTAH 84321
Period of NRP	7/74 TO 6/75 MULTI-SUPPORT FUNDS \$19,400
Funding for This Period	Expect development of an oil shale industry in Colorado, Utah and Wyoming will utilize large quantities of water in production and processing the shale and in residing and maintaining new communities. Water is already scarce in the area and is generally the limiting factor to agricultural growth. If supplies are to be available for oil shale mining, processing, product distribution, and community development, in all instances water will have to be transferred from agricultural uses.
Project Summary	This research will review and evaluate the hypothesized water needs of an oil shale industry of various sizes and will investigate the alternative options of meeting these requirements. Impacts on agricultural land use, income and employment will be analyzed as the primary impact of the study. Programs and policies to facilitate resource adjustments will receive attention, with focus upon alternative arrangements for transferring water.



SMITHSONIAN SCIENCE INFORMATION EXCHANGE, INC.

Room 300 • 1730 M Street, N.W. • Washington, D.C., U.S.A. 20036 • Tel. (202)381-4211 • Telex 89495

— the national source for information on research in progress

— David F. Hersey, Ph. D., *President*

February 10, 1978

Mr. Victor Lowe
 Director, General Government Division
 U. S. General Accounting Office
 Washington, D.C. 20548

Dear Mr. Lowe:

I appreciate the opportunity to review the draft report prepared by the GAO entitled "Management of Federal Materials Research Should Be Improved" developed by your Energy and Minerals Division.

The Smithsonian Science Information Exchange (SSIE) believes now, as it did following the release of the December 2, 1975 GAO report on "Federal Materials Research and Development: Modernizing Institutions and Management", that strong affirmative action is required if the R&D program is to be effectively managed and directed and that the SSIE can, as your reports suggest, represent a logical means of developing information which would be useful in providing a valuable service to OSTP, OMB and others concerned with materials R&D.

We also agree with your report, however, that certain management improvements and procedures regarding the requirement for timely, comprehensive and consistent reporting are essential if a materials information center on R&D is to be of maximum value to its users and the Exchange cannot accomplish this without appropriate OMB, OSTP or legislative support. For its part the Exchange would be pleased to work with appropriate executive or legislative officials to prepare whatever material is necessary to carry out the recommendations made in your report in order to ensure recognition of SSIE as the official data center for ongoing research information in the materials research field as well as implementation of a mandatory reporting procedure.

The Exchange is also prepared to work closely with the Chairman of the Committee on Materials and any other appropriate Federal offices in defining and establishing the types of data necessary to monitor trends and inadequacies in federal materials research. Whatever data is desired we believe can be accommodated within the flexibility of the SSIE system in order to provide the most useful and valuable output.

With regard to the recommendations specifically directed toward the President of the Exchange, the Exchange can and is prepared to carry out these recommendations to the extent that adequate funds are available to do so. One major item which I did not find addressed in the present report is any recognition by the GAO that part of the Exchange's lack of aggressiveness, particularly in soliciting input in the non-Federal sector, is controlled not by our unwillingness to seek out and register such information but rather

— a nonprofit corporation of the Smithsonian Institution —

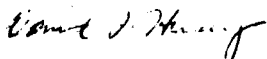
on the lack of adequate funding to collect and process such input into the system. A recent cut of \$200,000, for example, in funds appropriated to the Smithsonian for the operation of the Exchange in FY 1978 has made it virtually impossible for it to solicit, collect and process non-Federal input except in very limited subject areas supported by separate contracts between Federal Agencies and the Exchange. The Exchange has the experience in collecting and processing non-Federal input and is prepared to do so if funding can be made available as it was in the case of the two materials inventories carried out by contracts between the Department of the Interior and a private contractor.

The Exchange is presently making every effort to collect Federally supported research on a complete and timely basis but as the report notes this is presently being done on a voluntary basis and can probably only be made more complete and timely through a mandatory reporting procedure. The Exchange believes that if such action can be taken that usage of the Exchange would increase substantially by Federal R&D managers and ultimately income from such sources would eventually reduce the level of appropriated funds necessary for the operation of the Exchange.

I have incorporated as an attachment to this letter a number of specific comments on the draft copy of the report which you may wish to consider in preparing the final report.

The Exchange believes that since the initial GAO materials research report dated December 2, 1975 it has aggressively tried to carry out the recommendations made at that time which were within the realm of its ability to do. I have attached a memorandum outlining all of these actions but as you undoubtedly are aware, they were without success. I am hopeful that following the release of your new report that development of SSIE as the official center for information about ongoing materials research can be accomplished and thus meet the needs of R&D managers and policy makers in this important area of research.

Sincerely,



David F. Hersey
President

Enclosures [See GAO note.]

DFH/pm

GAO note: The enclosures were deleted because the comments were incorporated in the body of the report.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY

WASHINGTON, D.C. 20500

February 9, 1978

Mr. R. W. Gutmann
Director, Procurement and Acquisitions
Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Gutmann:

Dr. Press has asked me to review the draft report "Management of Federal Materials Research Should be Improved" and provide you comments from the perspective of the Office of Science and Technology Policy. We are pleased to be able to review this report with you in draft form and to have the opportunity to comment on it prior to your presentation of views to cognizant Congressional committees.

The Office of Science and Technology Policy shares the belief that materials research and development is an important element of research and development, one deserving vigorous support by the Federal government and by American private industry. The current level of Federal support for materials research appears to be about five percent of the total Federal support for research and development, based on an analysis of the Fiscal Year 1976 budget by the Committee on Materials of the Federal Council for Science and Technology. This Office would want to have the opportunity for a comprehensive review of the department and agency programs before commenting on whether that level of support is appropriate, or should be increased.

Without commenting in a detailed way on the report, let me make the following observations which may be helpful to the Congress. The current Administration has undertaken a number of steps which will provide a framework for further consideration of the two specific points raised in the GAO report, namely--

- . The coordination of materials R & D needs to be improved.
- . The Smithsonian Science Information Exchange offers an opportunity for improving the collection of information from both Federal agencies and industry concerning material sciences.

Shortly after coming to office, President Carter directed a study of the organization and management of the White House and the Executive

Office of the President. This study resulted in Reorganization Plan #1, now approved by the Congress. The study also resulted in the creation of a new domestic decision process which--in the long run--may be more important than the reorganization. The domestic policy review process is described in Enclosure One. The President believes that this new process can be a valuable analytical and decision tool in handling a variety of Presidential issues, including many that involve research and development. We are committed to the concept of testing the process and helping in its development through the work of the Office of Science and Technology Policy.

Students of the Presidency and of science and technology policy have observed that a close working relationship between the President's Science and Technology Advisor and the Director of the Office of Management and Budget is critical to effective review and study of research and development within the government since the budget process provides the most comprehensive analytical review of the activities of all the Departments and agencies, including those that conduct research and development. Dr. Press has recognized the importance of this working relationship and has devoted a considerable amount of attention to insuring its effectiveness.

Having commented on these two procedural tools that seem to be important for the review of a great number of research and development issues, including ones in material sciences, let me mention three specific actions that have been taken by the Office of Science and Technology Policy in the last year. Each bears on the status of materials research and development. The first of these is the initiation, at the direction of the President, of a non-fuel mineral study utilizing the newly established domestic policy review system. Enclosure Two provides information on the scope of that study. A draft workplan which details the structure of the study and the work to be undertaken by the various task forces is now under interagency review. When this workplan is approved, I will be happy to forward a copy of it to you. While the non-fuel mineral study addresses only a portion of the concerns expressed in the GAO report, we believe that it is a substantial step and it will hopefully develop some options, including options for improved Executive Branch procedures and processes that will strengthen our basic management of mineral policy and mineral information systems.

Secondly, I would like to mention actions taken in relation to the President's FY 1979 budget, now before the Congress. It was Dr. Press' belief that the most important first step for this Administration was to review the comparative balance between basic research, applied research and development, and Federally sponsored demonstration projects and to examine issues in the academic and industrial sectors that affect the capability of both to conduct research and development. Together with the Office of Management and Budget we have conducted such a review in the context of preparing the FY 1979 budget. The outcome reflected in the President's budget which provides strong support for basic, longer

term research and takes a more cautious approach towards demonstration and development projects. I would specifically refer you to the President's budget message, Part V of the budget, and Special Analysis P, all of which articulate the President's emphasis on longer term fundamental research.

We believe that the overall framework of support for basic research, including that which will be undertaken by the Department of Energy, a strengthened basic research program at the Bureau of Mines and continued growth for research sponsored by the National Science Foundation, will provide growth and support for materials research and development, along with research and development in many other fields of fundamental inquiry.

There is a third activity which has been begun by Dr. Press which might be a useful basis for an examination of materials research and development. The office has established a review group to look at basic research in the Department of Energy. This panel of experts has now held an organization meeting and completed its first working meeting. The membership of the group is found in Enclosure Three. We believe that this review will provide some suggestions that will be useful to the Department of Energy in formulating its long term research program and also useful to our office as we take up future work.

I would like to comment on two others points--the role of the Federal Coordinating Council for Science Engineering Technology (FCCSET) and the activities of the Smithsonian Science Information Exchange (SSIE). Under Reorganization Plan #1, the Federal Coordinating Council for Science Engineering and Technology was disestablished as a statutory entity. An Executive Order re-establish the Federal Coordinating Council for Science Engineering and Technology under the authority of the President with the Director of the Office of Science and Technology Policy as chairman. In examining the effectiveness of the former Federal Council for Science and Technology we found that its most successful efforts in interagency coordinating were those pointed towards specific problems with products and deadlines established for participants. It is Dr. Press' hope that the FCCSET can develop into a useful subcabinet body to handle carefully defined issues that have a large scientific and technological content. The Committee structure--which has been under review by the FCCSET--is to be organized with a greater emphasis on problem solving task-groups or ad-hoc committees working on issues of a comparatively short term duration. Examples of such activities which have already been initiated are: a review of bilateral science and technology agreements; a review of safety of Federal dams; and, an examination of remote sensing issues associated with the LANDSAT D remote sensing satellite. In this context we may draw upon the work completed by the former Councils Committee on Materials and establish specific task groups for examination of issues related to materials research and development.

The Office is aware of both the potential and the limitations of the Smithsonian Science Information Exchange. My own activities in the last few months have included some work with the Office of Management and Budget, the Smithsonian Science Information Exchange, the Director of the National Technical Information Service (NTIS), and other such information activities to provide a better understanding of some of the current directions and current problems in science and technical information systems management. Whether or not the SSIE is the institution that could best obtain and develop information concerning materials research in industry is a question that will need detailed examination. I am in personal agreement with the finding in the draft GAO report concerning the need to mandate reporting procedures for the federal agencies. This has been an "open" issue for too many years and it is one I would hope to address in the near future. In the longer term the Executive Office will take a look at the SSIE, the NTIS and other Federal science and technology information activities with the view towards improved effectiveness. In this regard, Dr. Press has asked Dr. Jordan Baruch, Assistant Secretary of Commerce for Research and Development, to provide us assistance.

I hope that the information in this letter and the enclosures will provide you some sense of the direction of which the Office of Science and Technology Policy is moving in matters that relate to Congressional interest in materials research and development. I would be happy to meet with you and others of the GAO at any time and also members of Congress and staff to discuss these matters further. [See GAO note.]

Sincerely,



Philip M. Smith
Assistant Director
Natural Resources and
Commercial Services

cc: Dr. Frank Press

GAO note: The enclosures were deleted because the comments were incorporated in the body of the report.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

MAR 20 1978

Mr. Victor L. Lowe
Director
General Government Division
General Accounting Office
Washington, D. C. 20548

Dear Mr. Lowe:

Thank you for providing the Office of Management and Budget the opportunity to comment on your January 1978 draft report entitled "Management of Federal Materials Research Should be Improved". We defer to the Office of Science and Technology Policy and the Smithsonian Institution for substantive comments on many of the specific points made in your report. However, we have some general comments to make about what is being done in the Executive Branch regarding materials research and development; factors that should be considered in establishing a data base to be used for the management of materials research; the need for a new organization to manage materials research; and the matter of mandatory agency reporting.

Although we recognize the significance of materials research, a large part of this type of research is an integral part of the overall federal R&D program. In this regard, the management of materials research should be considered within the context of continuing efforts to improve the management of the total federal R&D program. There are, at present, review efforts underway in the Executive Branch related to materials research. For example, the Secretary of Interior is leading an inter-agency review of nonfuel minerals policy. The review was requested by the President and includes participation by the Office of Science and Technology Policy, the Office of Management and Budget, and other relevant departments. A portion of this study will assess the adequacy and effectiveness of existing nonfuel minerals R&D. The study will also assess the existing data base and policy analysis framework used in formulating nonfuel minerals policy, and evaluate possible alternatives for improving these systems. We also understand that the Committee on Materials of the Federal Coordinating Council for Science, Engineering, and Technology, will soon complete a report dealing with materials research conducted in the private sector.

Your report recommended that legislation be considered to recognize the Smithsonian Science Information Exchange (SSIE) as the official data center on all materials research and development and suggested that a single organization be established in the future by the Congress to oversee the nation's materials research. We have several comments to make regarding the establishment of the SSIE as the official data center. First, the real data needs related to the management of materials research have not yet been defined; it appears, therefore, premature to determine at the present time the most economical and effective means of satisfying such requirements. Second, we believe that data bases and information systems for policy decision-making should not be unnecessarily duplicated in the federal government. The need for such new systems should be clearly identified, and the design of new systems should be carefully considered in light of existing capabilities. Third, with respect to an institutional assignment for establishing a data base, we believe that, if such a data base were deemed desirable, the Smithsonian Science Information Exchange should be evaluated against other alternatives such as the National Science Foundation, and the National Technical Information Service. Such an evaluation should provide for the selection of the "best" alternative institutional assignment defined in terms of specifically identified needs of particular data users or decision-makers.

With regard to the organizational framework to oversee materials research, it appears to us that existing organizations have the capability to monitor materials research and development as well as other elements of research and development. The Office of Science and Technology Policy, the Office of Management and Budget, the National Security Council, and other entities in the Executive Branch continue to work together very closely in reviewing and coordinating research and development activities, and developing policies and executive budget proposals. It is not readily apparent that new legislation is needed to establish a single organization solely for reviewing and managing materials research and development.

We have noted your finding that many agencies have not regularly reported materials related information to the Smithsonian Science Information Exchange. We will look into the question of mandatory agency reporting on materials research and development as part of our more general concern of reorganizing Federal science and technology activities.

We hope these views are useful to you in preparing your final report for consideration by the Congressional Committees.

Sincerely,



James T. McIntyre, Jr.
Acting Director



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 27 1978

OFFICE OF
PLANNING AND MANAGEMENT

Mr. Henry Eschwege
Director, Community and Economic
Development Division
United States General Accounting Office
Washington, D.C. 20548

Dear Mr. Eschwege:

The Environmental Protection Agency (EPA) has reviewed your draft report entitled "Management of Federal Materials Research Should Be Improved" and wishes to provide the following comments.

We believe clarification is needed in Chapter 3 regarding the Smithsonian Scientific Information Exchange (SSIE). It should be noted that the SSIE is concerned with materials related to on-going research and development (R&D) activities. This report does not seem to emphasize the need for data on completed research which is or could be made available through the National Technical Information Service (NTIS) or other information systems. Further, if the SSIE and NTIS systems were developed in a compatible manner, then the policy planner or the researcher could quickly obtain a more complete picture of R&D activities in any given R&D area of interest. A total information system approach appears to have considerable merit.

The report states that the SSIE "can make available information on ongoing projects and projects completed within the last two years" (page 3-4, last sentence). This constraint, by its very nature, may lead to duplication if the R&D project report cannot be located within other data systems or has not been reported in the literature. Consideration should be given to extending the SSIE data base to include projects which have been completed 3 or more years if these projects have not been reported in the literature.

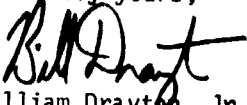
In reference to the section on "Viability," standardization of data elements to be entered into the SSIE system for materials R&D projects should be carefully defined so that optimization of data for materials R&D would not jeopardize the quality or utility of the same data for other R&D information purposes.

Chapter 4 indicates EPA's poor past performance regarding the submission of Notice of Research Projects to SSIE. It should be noted, however, that

this situation is now improving significantly. Enclosed is our suggestion for the paragraphs referring to this subject.

EPA concurs with the basic substance of the report and we feel these comments would enhance the final product. We appreciate the opportunity to comment on this draft report.

Sincerely yours,



William Drayton, Jr.
Assistant Administrator
for Planning and Management

Enclosure [See GAO note.]

GAO note: The enclosure was deleted because the comments were incorporated in the body of the report.



Department of Energy
Washington, D.C. 20545

MAR 7 1978

Mr. Monte Canfield, Jr., Director
Energy and Minerals Division
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Canfield:

We appreciate the opportunity to review and comment on the GAO draft report to Congress entitled "Management of Federal Materials Research Should be Improved."

The report does not contain specific recommendations for the Department of Energy. However, our general observation is that the establishment of a national programmatic data bank at the SSIE would be of limited value in the formulation of a national materials policy. The goals of research funded by such diverse organizations, as DOD and DOA, are generally diverse and, therefore, the materials research funded by these agencies is quite different. As such, information on each others programs would be of limited value. DOD and DOE have more nearly similar research goals. In these agencies program managers are generally aware of similar programs and the use of a central information exchange would be of less value than direct communication between program managers.

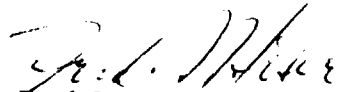
Implicit in this report seems to be the assumption that it is possible in programmatic or mission oriented efforts to establish priorities for materials R&D across a wide spectrum of programs, by those not involved in such programs. Yet, many such programs have needs which are really understood and appreciated only by those involved in carrying them out. Thus the recommendations of this report, if adopted, would operate to lessen the responsibility which program managers must have for identifying the materials research and development which is essential to the success of their programs. Materials research and development is of central importance to almost all high technology efforts. But it is of absolutely central importance to the advancement of nuclear programs. The lead which the U.S. now enjoys in materials aspects of civilian and military nuclear power development derives in large part from the attention accorded to materials research and development and to the authority which program managers themselves have had for establishing priorities and carrying out such efforts.

Also, we note that if the recommended mandatory reporting system is implemented, a means for controlling access to the information will have to be included. Alternatively, reporting could be screened to avoid premature release of

Mr. Monte Canfield, Jr.

information such as that which relates to applied technology which represents a national asset that should not be divulged freely to other countries.

Sincerely,



Fred L. Hiser, Director
Division of GAO Liaison

PRINCIPAL OFFICIALS RESPONSIBLEFOR ADMINISTERINGACTIVITIES DISCUSSED IN THIS REPORTTenure of officeFromToOFFICE OF MANAGEMENT AND BUDGET

DIRECTOR:

James McIntyre, Jr.	Sept. 1977	Present
Thomas B. Lance	Jan. 1977	Sept. 1977
James Lynn	Feb. 1975	Jan. 1977

OFFICE OF SCIENCE AND TECHNOLOGY POLICY

DIRECTOR:

Frank Press	Apr. 1977	Present
Vacant	Feb. 1977	Mar. 1977
H. Guyford Stever	Aug. 1976	Jan. 1977

SMITHSONIAN SCIENCE INFORMATION EXCHANGE, INC.

DIRECTOR:

David Hersey	Jan. 1972	Present
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