REPORT OF THE COMPTROLLER GENERAL OF THE UNITED STATES

Opportunities For Improved Management Of The Research Applied To National Needs (RANN) Program

National Science Foundation

The RANN program staff are highly qualified, have made a continuous effort to develop research efforts responsive to national needs, and have placed increased emphasis on use of research results.

Primary areas for improvement are in research program development (views of major public and private interest groups and Federal agencies are not always obtained), proposal evaluation (researchers suggested major changes in peer review system), and planning for use of research (early and active user involvement is needed).

MWD-75-84

NOV. 5, 1975

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

B-133183

The Honorable Edward M. Kennedy
Chairman, Special Subcommittee on the
National Science Foundation
Committee on Labor and Public Welfare
United States Senate

Dear Mr. Chairman:

Pursuant to your request of September 10, 1973, and subsequent agreements with your office, we have evaluated the management of the National Science Foundation's Research Applied to National Needs (RANN) program. As agreed, we obtained the views of the Foundation on our findings which are considered in the report.

The report provides considerable insight into the program's management methods used in the research and development processes; specifically, identification of priority problem areas and development of related research programs, the budgeting process, proposal evaluation, and utilization planning. A summary profile of the education and experience of key program officials is also provided. Several recommendations are made to the Foundation's Director to aid in (1) developing research programs responsive to societal needs, (2) improving the peer evaluation system, (3) planning for research use, and (4) hiring management officials.

We believe the contents of this report would be of interest to committees and to other Members of Congress. As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the House and Senate Committees on Government Operations not later than 60 days after the date of the report, and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report. We will be in touch with your office in the near future to arrange for distribution of the report to the agencies involved and to the four Committees to set in motion the requirements of section 236.

Sincerely yours,

Comptroller General
of the United States

Contents

ABBREVIATIONS

GAO	General Accounting Office
NASA	National Aeronautics and Space Administration
OMB	Office of Management and Budget
RANN	Research Applied to National Needs

COMPTROLLER GENERAL'S REPORT

OPPORTUNITIES FOR IMPROVED MANAGEMENT OF THE RESEARCH APPLIED TO NATIONAL NEEDS (RANN) PROGRAM National Science Foundation

D I G E S T

The National Science Foundation's management of its RANN program--Research Applied to National Needs--has made a continuous effort to develop research efforts responsive to problems of society and has placed increased emphasis on use of research results.

The program could be improved primarily by providing

--a wide variety of persons, organizations, and Federal agencies having related programs with the opportunity to participate in each phase of research development efforts and

--more formal planning that emphasizes early and active user involvement in research efforts and deals with potential barriers to implementing research results. (See pp. 5 and 70.)

GAO obtained the views of a number of researchers (those funded and those denied funding) on the program's evaluation of their research proposals. The responses suggest changes are needed in many areas of the program's proposal evaluation system, including establishing controls for objectivity in selecting reviewers, providing researchers with specific comments on their proposals including verbatim reviewer comments, and providing researchers with more explicit reasons for funding denials. (See pp. 54 to 67.)

Program management staff--although highly qualified--generally were hired directly by the Foundation without determining availability of professional personnel

qualified for Federal employment from the Civil Service Commission's registers. (See pp. 110 to 114.)

GAO recommendations to the Foundation's Director to strengthen program management include:

--Establishing formal procedures for developing the program's research efforts which would widely publicize its interest in a research area and provide a mechanism for obtaining a wide range of views during initial development efforts and in finalizing objectives and plans. (See p. 30.)

--Assessing the impacts of changes suggested by researchers on the program's research proposal evaluation system. (See p. 68.)

--Requiring that suggested program utilization planning guidelines be made mandatory when funding a proposal and that emphasis be added to the guidelines to provide for user involvement. (See p. 106.)

--Reviewing the program's ongoing research projects to insure they contain adequate utilization plans. (See p. 107.)

--Determining if program management officials could be obtained from the Commission's registers before using excepted hiring authority. (See p. 115.)

The Foundation generally agreed with GAO's recommendations except for the hiring of personnel. (See pp. 30, 68, 107, 115, and 170.)

The Foundation believes the most qualified applicants often will not appear on the Commission's registers and therefore does not plan to change the program's hiring practices. GAO does not believe qualified applicants should be arbitrarily eliminated from competing for Federal employment. As a minimum, the Foundation should establish and document an experience factor to show whether the Commission's registers include persons with appropriate background for the program.

CHAPTER 1

INTRODUCTION

At the request of the Chairman, Special Subcommittee on the National Science Foundation, Senate Committee on Labor and Public Welfare, we have reviewed the management of the National Science Foundation's program of Research Applied to National Needs (RANN).

RANN was established in March 1971 when the Foundation consolidated most of its problem-oriented research into a single program. The consolidation was to focus research more directly on selected environmental and social problems and on opportunities for future technological development to help solve major national problems.

Authority for the Foundation to support applied research at academic and other nonprofit organizations was granted in July 1968 with the enactment of 82 Stat. 360, which amended the National Science Foundation Act of 1950, 42 U.S.C. 1862. Before this amendment, the Foundation was authorized to support only "basic research," which is defined as a systematic, intensive study directed toward obtaining new knowledge rather than solving a specific problem. In contrast, "applied research" is defined as a systematic, intensive study to achieve a practical purpose.

In fiscal year 1970, in response to the added authority, the Foundation established the Office of Interdisciplinary Research. The office supported research dealing with problems associated with the environment, energy, waste products, and fire. In addition, the Foundation supported research pertaining to earthquake engineering and weather modification. In March 1971 the Foundation consolidated its problem-oriented research--environment, energy, waste, fire, weather modification and earthquake engineering, as well as several related projects from its basic research programs--to form the nucleus of RANN, which was established within the newly created Directorate for Research Applications.

Its expanded authority also allowed the Foundation to support at profit-oriented institutions applied research relevant to national problems, when directed by the

President. The authority was activated by Presidential directive on April 13, 1972.

While most of our field work was being conducted (Jan. to Sept. 1974), the Directorate for Research Applications consisted of the Office of the Assistant Director for Research Applications, four divisions, and five offices, which, except for the Directorate's Office of Intergovernmental Science and Research Utilization, make up RANN. The main responsibilities of each division and office follow.

Advanced Energy Research and Technology Division	Develops alternative energy sources and methods of energy conversion, storage, and transmission.
Advanced Technology Applications Division	Develops the knowledge base for new or improved technologies and their practical application.
Environmental Systems and Resources Division	Concerned with research for effective development of land and natural resources, while improving the environmental quality.
Social Systems and Human Resources Division	Supports research concerning the changing structure of society and human resources and for improving our social systems.
Public Technology Projects Office	Manages major projects as they evolve from basic and applied research to the point where the concepts being researched are proven.

Exploratory Research and Problem Assessment Office	Supports exploratory research to determine which national problems are amenable to solutions through science and engineering capabilities and technology assessments.
Systems Integration and Analysis Office	Provides overall systems integration and analysis support for the Research Applications Directorate.
Programs and Resources Office	Provides administrative support to all elements of the Research Applications Directorate, including managing personnel and financial resources and developing management systems and procedures.
Intergovernmental Science and Research Utilization Office	Helps State and local governments increase their capability to apply science and technology to problems, and helps communicate RANN research to public and private users.

On August 27, 1974, RANN was reorganized by disestablishing the Divisions of Advanced Technology Applications, Environmental Systems and Resources, and Social Systems and Human Resources. Their responsibilities were assumed by the Divisions of Advanced Environmental Research and Technology and Advanced Productivity Research and Technology. Because the reorganization occurred after most of our review had been completed, the report addresses RANN as it was organized before the reorganization.

In August 1974 a Western Projects Office was established in San Francisco as part of RANN. The office is intended primarily to help formulate and manage RANN projects conducted in the western United States.

The Research Applications Directorate primarily uses grants to support its research. Obligations for the directorate follow. Fiscal year 1975 obligations are estimated.

	Fiscal year				
	1971	1972	1973	1974	1975
	(millions)				
RANN	$34.0	$53.8	$69.9	$75.1	[a]$82.7
Intergovernmental Science and Research Utilization	$ .8	$ 1.1	$ 1.0	$ 1.0	$ 1.0

[a]Fiscal year 1975 RANN appropriations were $143.4 million; however, $51.4 million for solar and geothermal energy research was transferred to the Energy Research and Development Administration under the Energy Reorganization Act of 1974, $8.0 million was deferred to fiscal year 1976 to help reduce fiscal year 1975 outlays, and about $1.3 million was reprogramed to other Foundation programs.

CHAPTER 2

DEVELOPING RANN RESEARCH PROGRAMS

RANN does not have formal procedures for identifying broad problem areas for research or developing specific research programs within existing RANN problem areas. RANN officials have used special research studies and various coordinating committees to identify new problem areas for the RANN program as well as to reinforce the priority of existing program areas.

RANN's former deputy assistant director for Science and Technology said RANN relied on studies by the Foundation's staff, National Academy of Engineering's Committee on Public Engineering Policy, and former President Nixon's National Goals Research Staff in developing RANN's initial priorities in fiscal year 1972. Other major factors contributing to the continuous evolution of program priorities included (1) a 1973 study by the Committee on Public Engineering Policy and other special research studies, (2) the RANN Advisory Committee, Interagency Coordinating Committee, and panels and informal relationships with Federal agencies, (3) RANN's Office of Exploratory Research and Problem Assessment, and (4) unsolicited proposals. The views of the President, the Office of Management and Budget (OMB), and the Congress as expressed in the budget process are also major forces influencing RANN research priorities. The influence of the budget process is discussed in chapter 3.

As of April 1, 1974, approximately one-third of the research programs in RANN originated within another Foundation directorate. Studies by the Committee on Public Engineering Policy have influenced RANN in developing its criteria for selection of new program areas and techniques for program management. Development of new programs resulted primarily from a combination of the committee's general recommendations, the interest and experience of RANN staff, and the subjects of unsolicited proposals received by RANN from researchers. The Interagency Coordinating Committee appears to have a limited impact on program development.

In reviewing the development process of RANN research programs in land use and revenue sharing, we found that major public and private interest groups and some Federal agencies with related programs either did not have an opportunity to express their views on these programs or were not as fully involved in the development process as they desired.

Opportunities for people with a wide range of interests to participate in developing research programs must exist if research most responsive to national needs is to be supported. A full range of organizations interested in a problem area should be identified, and their participation should be requested in developing research programs and objectives. We believe the Foundation's Director should establish formal procedures for developing RANN research programs that would accomplish these goals.

COMMITTEE ON PUBLIC ENGINEERING POLICY

Research studies by the National Academy of Engineering's Committee on Public Engineering Policy have provided major input into developing RANN research priorities. During the spring of 1969, the Foundation asked the committee to suggest areas which the Foundation might support under its new applied research program. The request resulted in two 1970 reports, "Priorities in Applied Research: An Initial Appraisal" and "Federal Support of Applied Research." In mid-April 1972, the Foundation asked the committee to review national problem-oriented research priorities and their relationship to RANN. Its report, "Priorities for Research Applicable to National Needs," was published in 1973.

Although the first two reports preceded the official establishment of RANN in March 1971, specific programmatic recommendations, as well as recommendations pertaining to program administration and management, contributed to RANN's early development. The third report, essentially a continuation and updating of the first two, suggested certain changes in RANN's emphasis and direction and provided specific program recommendations for fiscal year 1974 planning.

"Priorities in Applied Research: An Initial Appraisal"

In developing this report the committee polled members of the National Academy of Engineering for suggestions on applied research projects. The resulting 700 suggestions were then clustered into 5 general problem areas each reviewed by a special panel. The 5 panels consisted of 40 members--18 from private industry, 17 from universities, and 5 from Federal agencies. The committee itself consisted of seven members from private industry, four from the academic community, and one from the National Academy of Sciences. Each of the five special panels produced specific recommendations on applied research. The committee then reviewed panel reports and formulated final recommendations.

For example, the committee believed that recommendations made by a panel on electronics were not necessary since existing research adequately met research needs in this area. The committee recommended that, in general, applied research be problem-oriented and interdisciplinary and that special attention be given to social values and goals and to developing reliable social and environmental indicators. The highest priority for future research was assigned to restoring and maintaining the quality of the environment. Other research areas mentioned in the study, in descending priority, were (1) applying social research and quantitative techniques to social problems, (2) increasing the lifespan of existing material, developing new materials, and recovering materials from secondary sources, and (3) developing quantitative techniques for monitoring the behavior, over time, of the performance of buildings and transportation systems.

As shown in figure 2-3 on page 32), RANN's fiscal year 1972 research programs in regional environmental systems, environmental aspects of trace contaminants, municipal systems and services, and social data and community structure generally embraced the committee's top two recommendations.

"Federal Support of Applied Research"

This report was prepared by a special eight-member ad hoc task force under the committee's direction. Five of the

eight members were from the academic community, two from private industry, and one from the Federal Government. The report, concerned primarily with administrative and management aspects of applied research, recommended that (1) administrative responsibility for the new program be assigned to a new entity within the Foundation and (2) the program be allocated 20 to 30 percent of an augmented Foundation budget. The task force also recommended the Foundation begin its new applied research program by limiting the program's selection and funding to perhaps two program areas rather than by trying to support several areas, thus making it impossible to fund any one of them sufficiently.

RANN's initial fiscal year 1972 program supported research in areas such as the environment, societal problems, energy, technological opportunities, disaster and natural hazards, and problem assessment.

The task force recommended several criteria to the Foundation for evaluating prospective program areas in applied research. These included (1) the probability that limited funds can successfully support a research program, (2) the potential impact that research can have on a wide variety of missions or agencies, (3) the likelihood that interdisciplinary research will generate new areas of scientific investigation, (4) the research's contribution to society's welfare, (5) the inadequacy of market forces or mission agency interests to meet the research needs, (6) the current state of the art, and (7) the state of American technology in the research area compared with that of other countries.

RANN's criteria for evaluating potential program areas, closely resembling that recommended by the task force, consist of the following: (1) importance of the problem, (2) prospective research payoff, (3) leverage of science and technology on the problem, (4) timeliness of the effort, (5) existing capability of institutions to support an effort, (6) need for Federal action, and (7) appropriate role of the Foundation.

Finally, the task force recommended a combined "top down" and "bottom up" approach to program management. It advised the Foundation to be selective in choosing projects

to support, and if necessary, actively seek and stimulate proposals to meet its objectives (the "top down" approach). The task force felt that the Foundation should concurrently maintain an open-door policy to encourage researchers to submit proposals in the selected program areas (the "bottom up" approach). RANN has used unsolicited proposals, and to a limited extent, program solicitations to further develop previously identified research areas. This use is discussed in chapter 4.

In another attempt to maintain an open door to the research community, RANN established the Office of Exploratory Research and Problem Assessment. This office supports initial research in certain innovative program areas which, because the probability for obtaining immediate benefits is less than acceptable to other RANN divisions, would otherwise not be supported. The office strives to develop such programs to a level of maturity where they can be transferred to a major RANN division or another Federal agency. As of January 1974, the office had supported 15 such research programs, each originally identified under the earlier Office of Interdisciplinary Research. Potential programs in telecommunications; law; science; technology; industrial automation; and transportation research have been transferred to other RANN divisions. One program, social and economic consequences of research and development, was transferred to the Foundation's National Research and Development Assessment program.

"Priorities for Research Applicable to National Needs"

To perform this study, the committee augmented its membership by including members from RANN's 1971 Advisory Committee, composed primarily of the academic community, to create an ad hoc steering committee. The 6 panels organized by the steering committee and attended by approximately 40 academic and 30 nonacademic participants developed an interim list of 130 recommended research topics. Panel chairmen and steering committee members, after consolidating and analyzing these recommendations, presented a final list of 31 topics to be incorporated in RANN's fiscal year 1974 program.

The final 31 recommendations were grouped under 6 problem areas: community development and human resources; environmental quality; conservation of energy, materials, and land; industrial and production processes; hazards and disasters; and exploratory development and technological opportunities. The 1973 report then ranked the 31 recommendations into 3 categories: those programs considered to be of highest priority (category A), those programs of next highest priority (category B), and those programs which the committee did not assign a priority due to lack of time or information (category X). Recommendations were not ranked within each priority category.

The report emphasized that time did not permit a study of national priorities and that the steering committee merely identified problem categories on which there seemed to be consensus.

The 31 recommendations by priority category are presented in the following schedule, figure 2-1.

Figure 2-1

Recommended Research Areas For Fiscal Year 1974 RANN Program

Problem areas	Priority categories A	B	X
Community development and human resources	Improving local service delivery systems	Social and organizational indicators Evaluation methodology of social programs and services Community growth, trends, and forces Regulatory implications and technological innovations for urban growth and population distribution Analysis and implications of changes in the socioeconomic sector	Communications and transportation
Environmental quality		Environmental effects of energy production Assessment of environmental research efforts Institutional arrangements and implementation processes related to environmental policy Research on the biological and physical environment	Agriculture and lightly managed ecosystems Research on the social and economic environment Decision-relevant research on environmental systems
Conservation of energy, materials, and land	Conservation and management of materials and land Energy consumption and conservation Institutional and regulatory systems as they affect energy		
New production processes	Industrial processes and manufacturing		Energy provision Enzyme technology Excavation and tunneling
Hazards and disasters	Optimizing the Nation's adjustment to natural hazards	Management of hazards caused by surface waters Fire research and a national fire-modeling facility Earthquake research program Weather hazard modification	Experimental short-range weather warning service
Exploratory development and technological opportunities	Technological opportunities Exploratory research and assessment of the future		National system of electronic storage and retrieval of the printed work Product safety, marketability, risk-benefit analysis

In addition, the report suggested certain shifts in RANN's emphasis. It emphasized that RANN should integrate applied social science, natural science, and engineering research to examine such major national problems as (1) functioning of society's policymaking institutions and (2) management of energy, environmental and material resources. The report also emphasized that RANN should (1) increase its support of solar energy research, (2) redirect the advanced modeling activities of the regional environmental systems program to developing sound empirical relationships rather than model building per se, and (3) expand the social science portions of the municipal systems and services program and integrate this research with the physical science and engineering research of other RANN programs.

A March 1973 memorandum from RANN's program manager responsible for the committee's study noted that a high correlation existed between the report's recommendations and RANN's anticipated program plans for fiscal years 1974 and 1975.

We did not perform a detailed comparison of the committee's recommendations with individual RANN programs or objectives. As shown in figure 2-3 (p. 32), however, RANN's fiscal year 1974 program contained each recommended problem area and many suggested priority topics. In addition, RANN's expansion of its solar energy program, as well as its transfer of the Urban Systems Technology program from Advanced Technology Applications to Social Systems and Human Resources appear responsive to the committee's recommendations.

OTHER STUDIES

Examples of additional studies considered in developing RANN's research priorities follow.

"Towards Balanced Growth: Quantity with Quality"

The former deputy assistant director for Science and Technology identified a 1970 National Goals Research Staff study, "Towards Balanced Growth: Quantity with Quality," as a major influence on RANN's initial development. The report's theme was to balance future growth and development with American desires for a higher quality of life.

It defined issues, analyzed debates, and examined alternatives in such areas as population growth and distribution, contamination of the environment, the role of education and basic science in a changing society, and technology assessment and consumerism. Although the report's discussion of national problems could serve as a source of general ideas for a new applied research program, the report itself did not present specific research recommendations.

"The Nation's Energy Future"

Issued in December 1973, this report is an example of a Government-wide study which had considerable impact on RANN fiscal year 1975 priorities. Commissioned by former President Nixon on June 29, 1973, the study objectives were to review Federal and private energy research and development activities and recommend an integrated energy research and development program. The effort included a series of workshops and panel reviews involving industry leaders, private consultants, and officials from 36 Federal agencies. The report recommended a broad research and development program for accelerated research in solar and geothermal energy and energy systems.

Studies of State research needs

Another effort to establish Federal research and development priorities included pilot studies in six States supported by the Office of Intergovernmental Science and Research Utilization. These studies were a response to former President Nixon's 1972 call for systematic ways to communicate priority needs of State and local governments to Federal agencies. Designed to develop Federal agendas for research and development, they were based on needs and priorities in Ohio, Georgia, Oklahoma, Pennsylvania, Alabama, and Puerto Rico.

As of November 18, 1974, studies for Georgia, Ohio, Pennsylvania, and Oklahoma had been completed. These studies generally involved issue papers and a 1- or 2-day conference discussing such areas as resources management, health care, housing, and transportation. Reports resulting from the conferences were sent to State science advisors, planning and liaison officials, and Federal agencies represented on RANN's Interagency Coordinating Committee.

Solar energy panel report

In January 1972 the Foundation and the National Aeronautics and Space Administration (NASA) jointly organized a Solar Energy panel of approximately 40 scientists, engineers, sociologists, and environmentalists. The panel was charged with assessing the potential of solar energy as a natural energy resource, assessing the state of technology in solar energy application, and recommending necessary research and development programs to further develop this potential. The panel's activities included all applications of direct solar energy, as well as power from wind, ocean thermal differences, and replenishable organic materials.

In its December 1972 report, "Solar Energy as a National Energy Resource," the panel recommended three broad areas of solar energy applications: heating and cooling of residential and commercial buildings; chemical and biological conversion of organic materials to liquid, solid, and gaseous fuels; and generation of electrical energy. The director of RANN's Advanced Energy Research and Technology program advised us that this report, together with the "Nation's Energy Future," were the major sources used to develop RANN's solar and geothermal energy programs.

THE RANN ADVISORY COMMITTEE

The Advisory Committee was formed on October 28, 1970, to advise the Office of Interdisciplinary Research. Since RANN had assumed the functions of this office by the time the committee held its first meeting, it met as the RANN Advisory Committee.

During its two meetings in 1971, the Advisory Committee was briefed on RANN's fiscal years 1972 and 1973 program plans. The committee reported to RANN in December 1971 and the National Science Board the following April that it unanimously believed that RANN should be encouraged to move in the general direction pursued to date. However, the committee believed, as had the Committee on Public Engineering Policy in 1970, that a more explicit attempt should be made to limit the type of research RANN supported. It stated that there was a serious risk of RANN becoming so diffused in the number of problems considered that it would fall

short of achieving significant results in any one program area. The Advisory Committee also recommended that RANN give more attention to soliciting judgments from scientists outside the Federal government. It believed that an appraisal of program definition and priorities by outside groups was highly desirable, especially in social systems research.

Although the Advisory Committee helped develop RANN's early research programs, it has not met since June 1972.

INTERAGENCY COORDINATING COMMITTEE

The former deputy assistant director for Science and Technology stated that the major force affecting RANN priorities was the role and position taken by other Federal agencies. Problem areas which are not clearly within the mission responsibility of any one agency, but which cut across the responsibilities of several agencies, or which call for such innovative or long-range research that mission agencies will not support it, are candidates for RANN support. RANN's appraisal of the role and positions of other Federal agencies is accomplished through the formal mechanisms of the Interagency Coordinating Committee and its associated panels, and the informal associations of RANN program managers with other Federal scientists. The formal mechanisms are discussed below.

On May 3, 1971, the chairman of the Federal Council for Science and Technology established a Committee on RANN Coordination to be chaired by the Office of Science and Technology with members representing the Foundation, OMB, the Office of Science and Technology, and those agencies with mission responsibilities which fall within the scope of RANN. The committee was to meet to review major programs proposed for RANN and to insure that they were complementary to those of mission agencies. Panels were to be formed under this committee to correspond to each major RANN program area. The panels were to be chaired by a Foundation representative and have as members representatives from the Office of Science and Technology and other agencies "affected in a significant way" by RANN-supported research. These panels were to be the principal means for carrying out ongoing interagency coordination.

Former President Nixon's Reorganization Plan 1 of 1973, effective July 1, 1973, abolished the Office of Science and Technology and transferred its functions to the Foundation. The original Federal Council for Science and Technology Committee on RANN Coordination has been reconstituted as the RANN Interagency Coordinating Committee, with the Foundation's assistant director for Research Applications as its chairman. As of July 1974, agencies represented on this latest committee included the Departments of Agriculture; the Interior; Transportation; Commerce; Labor; Justice; Treasury; State; Defense; Housing and Urban Development; and Health, Education, and Welfare; the Environmental Protection Agency; NASA; the Atomic Energy Commission; the Council on Environmental Quality; the Office of Telecommunications Policy; the Federal Energy Administration; OMB; and the Foundation.

The committee met in March 1973 to discuss fiscal year 1974 RANN program plans, specific realignments of RANN programs within its divisions, and general questions of research coordination and utilization. Between March 1973 and September 1974 the committee held only one informal meeting at which members were provided RANN's fiscal year 1975 budget. Minutes of the meeting were not kept. On July 17, 1975, the Foundation's Director advised us that the committee met in December 1974 and February 1975 for an overview of RANN's activities and its fiscal year 1976 program plans.

Three panels, corresponding to RANN's Environmental Systems and Resources, Social Systems and Human Resources, and Advanced Technology Applications programs, were established under the original Federal Council for Science and Technology Committee. Two panels, corresponding to the Environmental Systems and Resources and the Social Systems and Human Resources programs, continue to meet under the new RANN Interagency Coordinating Committee. The Advanced Technology Applications panel was dissolved early in calendar year 1974.

As of March 1974, the Environmental Systems and Resources panel had met three times in 1971, once in 1972, and twice in 1973 to discuss ongoing research programs, programs proposed in RANN's budget for the upcoming year, and general problems of coordination. As of August 1973, the panel had representatives from the Departments of Agriculture, the Interior, Transportation, Commerce, Defense, and Housing and Urban Development; the Department of Health, Education, and Welfare; the Environmental Protection Agency; NASA; the Atomic Energy Commission; and the Council on Environmental Quality.

As of March 1974, the panel corresponding to RANN's Social Systems and Human Resources Division had met twice in 1971 and once each in 1972 and 1973 to discuss program plans for the coming fiscal year as well as general questions of coordination between agencies. The March membership included representatives from the Departments of Agriculture; Transportation; Commerce; Labor; Justice; Housing and Urban Development; and Health, Education, and Welfare and the Environmental Protection Agency.

According to Foundation memorandums dated May 31, 1974, and August 13, 1974, Research Applications Directorate staff also participated on approximately 27 groups sponsored by other Federal agencies and 6 groups sponsored by the Foundation's Federal Council for Science and Technology relating to RANN-sponsored research. In addition, an April 16, 1975, memorandum by the deputy assistant director for Science and Technology listed about 20 additional interagency coordinating groups and task forces of which RANN program managers were members.

PROGRAM MANAGERS' IDENTIFICATION OF PROGRAMS' ORIGINS

The results of an April 1, 1974, questionnaire which we sent to all RANN program managers showed 37 program and subprogram areas being supported in fiscal year 1974. The 37 represent the total number of program areas identified by program managers as their respective primary areas of management responsibility. This number is slightly higher than RANN's official count of program areas because, in some cases, a RANN program area includes multiple areas of management responsibility.

Questionnaire responses indicated that approximately 35 percent of RANN's research programs originated in another Foundation directorate. These include the weather modification and earthquake engineering programs, programs transferred from the Office of Interdisciplinary Research, and programs transferred from the Foundation's Scientific Research Project Support program. The interest and experience of RANN staff was identified as the sole source of another 14 percent of RANN's research programs. A study on solar energy jointly sponsored by the Foundation and NASA accounted

for approximately 8 percent of the programs. In addition, 8 percent of the research programs resulted from miscellaneous sources.

Questionnaire responses also indicated that approximately 35 percent of RANN's fiscal year 1974 programs resulted from a number of interrelated factors. Analysis of these programs showed that, with one exception, none of these programs were transferred into RANN from another Foundation directorate. The most frequent factors giving rise to these new programs were unsolicited proposals, associated with approximately 35 percent of the new programs; discussions with other Federal agencies, associated with approximately 30 percent of the new programs; and the interest or past experience of RANN program managers, associated with approximately 20 percent of the new programs.

A more detailed listing of program origins is presented in figure 2-2.

Figure 2-2

Source of RANN Fiscal Year 1974 Programs
Active on April 1, 1974

	Transferred within the Foundation from		Committee on Public Engineering Policy	Joint Foundation-NASA solar energy study	"The Nation's Energy Future"	Federal Council for Science and Technology	Other interactions with Federal agencies	Unsolicited proposals	RANN staff's interest or past experience
	Office of Interdisciplinary Research	Other directorates							
Advanced Technology Applications:									
Fire Research	X	X	-	-	-	-	-	-	-
Earthquake Engineering	-	X	-	-	-	-	-	-	-
Industrial Processing	-	X	-	-	-	-	-	-	-
Industrial Automation	-	-	-	-	-	-	-	-	X
Instrumentation Technology	-	X	-	-	-	-	-	-	-
Tunneling and Excavation	-	-	-	-	-	-	X	-	-
Advanced Energy Research and Technology:									
Solar Energy:									
Heating and Cooling of Buildings	-	-	-	-	-	X	-	-	-
Thermal Conversion	-	-	-	X	-	-	-	-	-
Photovoltaic	X	-	-	-	-	-	-	-	-
Bioconversion	-	-	-	X	-	-	-	-	-
Wind Energy	-	-	-	-	-	X	-	-	X
Ocean Thermal	-	-	-	X	-	-	-	-	-
Geothermal Energy	-	-	-	-	-	-	X	X	-
Energy Conversion	-	-	-	-	-	-	X	-	-
Energy Resources	-	-	-	-	-	-	-	-	X
Energy and Fuel Transportation	-	X	-	-	-	-	-	-	-
Automative Propulsion	-	-	-	-	X	-	X	-	-
Environmental Systems and Resources:									
Regional Environmental Systems:									
Coastal Zone Management	X	-	-	-	-	-	-	-	-
Land Use	-	-	-	-	-	-	-	-	X
Management of Rural-Urban Environment	X	-	-	-	-	-	-	X	-
Weather Modification	-	X	-	-	-	-	-	-	-
Environmental Aspects of Trace Contaminants	X	-	-	-	-	-	-	-	-
Social Systems and Human Resources:									
Municipal Systems and Services:									
Urban Systems Technology	X	-	-	-	-	-	-	-	-
Telecommunications	-	-	X	-	-	-	X	X	X
Natural Disaster and Human Behavior	-	-	-	-	-	-	-	X	X
Government Structure	-	-	X	-	-	-	X	X	-
Transportation	-	-	-	-	-	-	X	X	-
Evaluation of Mathematical Model	-	-	-	-	-	X	X	-	-
Research Assessment in Municipal Systems	-	-	X	-	-	X	-	-	-
Human Resources and Services:									
Law, Science and Technology	X	-	-	-	-	-	-	-	-
Revenue Sharing	-	-	-	-	-	-	-	X	X
Research Assessment in Human Resources	-	-	-	-	-	-	-	-	X
Exploratory Research and Problem Assessment:									
Consumer Research	-	-	-	-	-	-	-	X	X
Minority Group Problems	X	-	-	-	-	-	-	-	-
Alternative Futures	-	-	-	-	-	-	-	-	X
New Problems and Projects	X	-	-	-	-	-	-	-	-
Technology Assessment	-	X	-	-	-	-	-	-	-

DEVELOPMENT OF RANN'S LAND USE AND REVENUE SHARING PROGRAMS

In identifying RANN's process for translating national needs into applied research priorities, we examined the development of two program elements, land use and revenue sharing, within the Environmental Systems and Resources, and Social Systems and Human Resources Divisions, respectively. RANN officials advised us there were no formal procedures governing development of new programs. Primary responsibility for development appears to rest with the program manager, subject to the continuous review and approval of the cognizant division director and, ultimately, the assistant director for Research Applications.

The cognizant division directors advised us that once the budget for a division's major programs was established, they were relatively free to allocate funds among individual program elements. Several factors considered in budget allocations are (1) the relative success of existing programs in meeting their objectives, (2) the ability of programs to maintain a satisfactory liaison between researchers and users, (3) the time frame for proposed research, (4) the number and quality of unsolicited proposals received, and (5) recommendations from conferences and studies.

Four stages of program development were found in both case studies: (1) origination of program ideas, (2) development of program plans, (3) assignment of priority, and (4) selection and funding of individual projects. In addition, the "RANN criteria" appears to be a master checklist of items informally considered throughout development. (See p. 8.)

Land use program

During fiscal years 1970 and 1971, the Office of Interdisciplinary Research supported exploratory environmental research in such areas as developing the "Big Sky" region of southwest Montana, the Lake Tahoe basin, and the Chesapeake Bay. The RANN Task Force, an interim group established before the formal establishment of RANN, formulated a regional environmental systems program based on earlier Foundation exploratory research and comments of advisory

committees. The large volume of Federal, State, and local land use legislation, together with RANN staff discussions, gave added impetus to developing a land use program.

An unsolicited proposal to identify land use research priorities resulted in two grants to the Dean, School of Architecture and Urban Planning, University of California at Los Angeles. The researcher, then a member of the RANN Advisory Committee, received the grants in September 1971 and March 1972. These led to a 2-week workshop during the summer of 1972.

Forty-six individuals, drawn from disciplines such as urban planning, environmental sciences, and economics, participated in the workshop and on its steering committee. Half of the participants were associated with academic institutions. Twelve were from private research organizations, seven represented Federal agencies, and four represented State and local governments. The cognizant RANN program manager said workshop candidates were identified by the grantee under RANN's general supervision. He further said suggestions made by professional planning associations, such as the American Society of Planning Officials, the American Institute of Planners, and the National Academy of Science's Highway Research Board, as well as the grantee's personal knowledge of the field, served as the basis for the final selection of candidates for the workshop.

At the workshop, 6 committees, each having 5 to 10 members, discussed such topics as the interrelationship between consumption of environmental resources and land use, the physical distribution of people and activities in urban and suburban areas, evaluation mechanisms for environmental assessment, institutions responsible for planning and implementing land use policies, data requirements, and the nature of research institutions in the area. These discussions produced a list of 60 recommended research topics, which was made available to RANN by October 1972. By May 1973 RANN had completed work on a program operating plan for land use.

RANN's program manager in charge of land use indicated that the workshop was one of several factors which influenced his development of a program operating plan. Between October 1972 and May 1973, he informally discussed the workshop's recommendations with the deputy science advisor to the

Secretary of Interior, the director of the Natural Resources Economics Division of the Department of Agriculture's Economic Research Service, and a senior economist on the Council on Environmental Quality. The emergence of new technologies, as well as the large volume of Federal, State, and local land use legislation then pending, were identified by the program manager as other factors contributing to the development of program plans. The program manager said he ultimately relied heavily on his personal judgment in developing RANN's land use program.

On February 16, 1973, RANN's division director for Environmental Systems and Resources presented the fiscal year 1974 regional environmental systems program, which included the land use program, to the division's panel and on March 5, 1973, presented the program to the Interagency Coordinating Committee.

The 1973 program operating plan defined RANN's general objectives and approach in land use, the program's current status, and proposed timing and funding of future research projects. The program's general objectives are to (1) reduce problems arising from land use legislation, (2) develop and demonstrate the capability for determining the impact of select activities on land use, as well as the impact of land use on environmental quality, (3) evaluate the implications of techniques for controlling land use, and (4) evaluate the role of select technologies in land use planning and management. The plan, informally reviewed within RANN, is being used to develop yearly financial operating plans and evaluate the relevance of research projects in the area. The program's objectives were published in a summary of RANN's fiscal year 1973 environmental awards released in the fall of 1973 and in a November 1973 brochure describing the division's program.

RANN's program manager indicated there were no formal procedures to accept or reject individual workshop recommendations. However, he estimated that approximately half of the 60 recommendations were ultimately incorporated within the program's second and third objectives.

Views on land use development

Minutes of the March 5, 1973, Interagency Coordinating Committee meeting revealed that committee members discussed coordinating RANN's land use research with Department of the Interior efforts. Minutes of the February 16, 1973, meeting of the committee's Environmental Systems and Resources panel revealed that the panel identified a specific office within the Department of the Interior for program coordination.

Meetings of the Interagency Coordinating Committee and its panel appeared to offer a very limited opportunity for Federal agencies to provide input into RANN's program development. The former deputy science advisor to the Secretary of the Interior, having attended the panel and the committee meetings, stated that agencies attending these meetings were presented with readymade RANN programs. He believed that the compressed time schedule and the infrequent meetings substantially reduced the impact other agencies could have on RANN programs. He stated that agencies would have a more meaningful impact if they were provided more opportunity to participate in program development. The Foundation stated that the committee's structure and RANN's and other agencies' time constraints sometimes limits program discussion and that early exchange of program plans would help.

The Environmental Protection Agency's acting administrator for Research and Development, having attended the March 1973 Interagency Coordinating Committee meeting, also believed that the meetings had little influence on the Foundation's program development. Another official, the administrator for Air, Water, and Soil Research of the Agricultural Research Service, Department of Agriculture, who had attended the February 1973 panel meeting, believed that his office was not given an opportunity to influence development of RANN's land use program.

Informal conversations between RANN's program manager and his personal contacts with other Federal agencies are not documented. Both the senior economist for the Council on Environmental Quality and the director of the Department of Agriculture's Natural Resources Economic Division told us they had reviewed individual land use research proposals. However, the senior economist stated that he had not been involved in the program's development and was not aware of the program's general objectives. The Department of Agriculture's division director stated that his organization also

had not participated in planning RANN's total land use program. The director believed there was insufficient review of RANN's program plans by outside groups.

RANN also had no procedures for formal systematic involvement of State and local governments and private industry in developing the land use program. In this respect, we contacted a number of organizations that had testified in 1970, 1971, or 1973 congressional hearings on pending national land use legislation.

An associate director for State Services, Council of State Governments' headquarters office, Lexington, Kentucky, stated that his office has been heavily involved with land use since late 1972. He said although his office would have liked to participate in program development, RANN had not contacted the office. He was not aware of RANN's procedures for developing new programs and assigning priorities and, from his vantage point, believed State governments were not sufficiently involved in RANN's development of a land use program.

We also contacted the following associations that testified at congressional hearings. The National Forest Product Association, representing about two-thirds of the industrial, private forest lands in the continental United States and Alaska, has been involved in land use planning since 1968. The National Grange, representing about 600,000 farmers and rural residents, has been concerned with the decline of agricultural land and land use since the 1960s. The National Association of Manufacturers, whose members produce approximately three-fourths of the Nation's manufacturing output, has been interested in the balanced use of land and the availability of natural resources for industrial use since approximately 1967. The American Mining Congress is involved in the surface mining aspects of land use. The National Water Resources Association, a federation of State associations, is involved in the development and use of water resources. Representatives of these organizations advised us they either did not know of RANN's existence or that RANN sponsored land use research.

Representatives of Federal agencies, State and local groups, and trade associations suggested that, to improve

RANN's contact with other organizations in developing programs, RANN

--increase its use of existing news media, such as the Federal Register, newsletters of public interest groups and trade associations; and special problem-oriented publications, such as private land use periodicals and

--conduct local seminars and regional conferences, thus permitting those with the widest possible array of interests to participate.

Revenue sharing program

On October 20, 1972, the State and Local Fiscal Assistance Act, better known as the Revenue Sharing Act, was signed into law. The act provided for allocating $30.2 billion to State and local governments over 5 years, beginning January 1, 1972. Congressional debates on renewal of the general revenue sharing program, set to expire December 1976, are expected during 1975.

A National Planning Association official estimated that as of December 1973 about $4 million had been invested in general revenue sharing research. RANN's research program in general revenue sharing, estimated at $2.7 million, represents a major effort to provide information for the 1975 congressional debates. The cognizant RANN program manager advised us that RANN supports this effort primarily because other Federal agencies, such as the Office of Revenue Sharing, Department of the Treasury, and the Advisory Commission on Intergovernmental Relations, although having an interest in the area, do not have the necessary research budget. The Foundation commented that the research is within the RANN criteria stated on page 8.

The Office of Revenue Sharing is responsible for distribution of funds, establishment of overall regulations, provision of the accounting and auditing procedures, evaluations, and reviews necessary to insure full compliance with the act. The Advisory Commission on Intergovernmental Relations, a permanent bipartisan organization of 26 individuals from the executive and legislative branches of Federal, State, and local governments, was requested by former President Nixon to monitor the program's impact on the various levels of government.

RANN's program manager in charge of revenue sharing said new research programs must (1) meet existing research needs, (2) not duplicate the work or fall within the mission responsibility of other Federal agencies, and (3) have been discussed with experts in the area. These decision rules are roughly comparable to certain elements of the RANN criteria. However, the program manager indicated that there were no formal written procedures governing development of new research programs. Programs often develop in an almost ad hoc manner within these general decision rules.

The program in revenue sharing began to develop between approximately September 1972 and February 1973 as the Social Systems and Human Resources Division received various unsolicited proposals for research in this area. Informal discussion within the division concerning these proposals led to a May 1973 grant for a revenue sharing planning conference.

Planning conference

The conference, held for 3 days in December 1973 and attended by 129 individuals, was conducted by the National Planning Association to assess the status of revenue sharing research and to develop an agenda of research topics which RANN might begin to support.

Conference participants, selected primarily by the grantee subject to RANN's general review, included researchers currently involved in revenue sharing, Federal agencies responsible for revenue sharing, and interested community groups identified by the private Center for National Policy Review. Approximately 45 percent of the participants were from the academic community, 25 percent from private research organizations, 20 percent from Federal agencies, and 10 percent from State and local governments.

They discussed such topics as the allocation formula and restrictions on the use of funds, revenue sharing's impact on government structure and organization and the public sector, and data and research methodologies necessary to test these topics. The conference resulted in a compendium of research in progress, reports of its proceedings, and a list of approximately 500 researchers involved in the area.

Program plan

RANN's program manager said a draft program plan for funding future research projects was prepared based on RANN's assessment of revenue sharing research already in progress, topics recommended by the conference, and the availability of data. The plan called for the creation and analysis of revenue sharing data files, a national survey of State and local officials, an analysis of alternative allocation formulas, and small projects which fill the gap in ongoing research efforts.

A final program plan has not been developed. The plan's latter two objectives, however, were further refined through a program solicitation and announcement.

Program solicitation and announcement

RANN's program solicitation asked for research proposals on the feasibility of using alternative allocation formulas for achieving certain identified goals. The goals included splitting funds between State and local governments to reflect variations in States responsibility for service delivery, providing more assistance to cities and counties with the greatest needs, and designing a formula which makes allocations less susceptible to fluctuations.

The program announcement identified 13 high priority topics on such general policy questions as the impact of general revenue sharing on local intergovernment cooperation and relations between State and local governments, the costs and consequences of restrictions on local governments' use of funds, and citizens' involvement in deciding the use of general revenue sharing funds.

In June 1974 drafts of the solicitation and announcement were reviewed by Foundation officials and 50 reviewers from other Washington, D.C., based organizations. About two-thirds of the non-Foundation reviewers were congressional staff members or representatives of Federal agencies involved with revenue sharing. Twenty-two percent represented such public interest groups as the National Governors Conference, and 12 percent represented such groups as the National Association of Social Workers and the League of Women Voters.

Slightly less than half these 50 reviewers had attended the December 1973 planning conference.

The reviewers were allowed 10 calendar days to respond. RANN's program manager advised us that approximately 20 of the 50 non-Foundation reviewers responded within this time frame. Eighty percent of the respondents were from Federal agencies or congressional staffs.

The former director of the Social Systems and Human Resources Division stated the short time allowed for reviewer comments resulted from the difficulties RANN experienced in resolving potential conflict-of-interest problems and RANN's desire to provide timely information for congressional hearings which were then expected to be held in the spring of 1975. He said although all interested parties should assist in identifying broad research areas, those expected to submit competing proposals in response to a solicitation cannot participate in planning the solicitation since their involvement would create a conflict of interest. Since RANN identified the academic community, representatives of State and local governments, and public interest groups as potential proposers under the solicitation, these groups were not initially asked to help draft the solicitation. In late May 1974, however, RANN decided to exclude State and local governments and public interest groups from the competition since the objectivity of their research reports might be questioned.

Views on revenue sharing's development

Minutes of meetings held by the Interagency Coordinating Committee and its Social Systems and Human Resources panel do not mention developing a revenue sharing program. RANN, however, has actively encouraged participation of Federal agencies and congressional committees intricately involved in formulating and administering general revenue sharing. RANN has also involved many researchers representing major organizations, such as the Brookings Institution and the University of California, at its planning conference to minimize potential duplication of research.

It appears that the way RANN's revenue sharing program developed did not provide for full involvement of groups representing State governments and the interests of poor and

minority citizens. Representatives of these groups, who had attended RANN's revenue sharing conference, advised us that they had not been involved in the program's development since the conference, were not aware of the program's plans, and generally believed they should have been involved before program plans were finalized. In addition, the director, National Revenue Sharing Project, Center for National Policy Review, said from his vantage point RANN's development of new programs was essentially a closed process.

RANN did request major State and local groups, such as the National Governors Conference, National League of Cities, the Municipal Finance Officers Association, and the International City Management Association, to review drafts of its revenue sharing program announcement and solicitation. However, the 10-day limitation on reviews presented problems in obtaining comments. For example, the deputy director of the National Governors Conference said the time limitation prevented him from soliciting the opinions of individual State budget directors, and because he served as a liaison between Federal agencies and State officials rather than an expert on State views, his own cursory review of RANN's program plan was not an effective involvement of State governments. An associate director for State Services, Council of State Governments, also emphasized the importance of involving regional and State groups in program development. The associate director also believes that RANN should involve these State groups before, rather than after, the decision is made to develop a new research program.

CONCLUSIONS

RANN does not have formal procedures for identifying problem areas for research or for developing specific research program objectives within problem areas. As of April 1, 1974, approximately one-third of RANN's research programs originated from another Foundation directorate. Studies by the Committee on Public Engineering Policy have heavily influenced RANN's development of criteria for selection of new program areas and techniques for program management. The development of new research programs has resulted primarily from a combination of the Committee on Public Engineering Policy's general recommendations, the interest and experience of RANN staff, and the type of unsolicited proposals received. The Interagency Coordinating Committee appears to have a very limited impact on RANN's development of programs.

Planning conferences, such as those used by RANN's land use and revenue sharing programs, can be an effective means of developing and coordinating research ideas. The success of such conferences depends heavily upon the initial identification of organizations and individuals to participate in the conferences. Such conferences are one phase of program development. A number of organizations interested in land use and revenue sharing were not provided the opportunity to participate in RANN program development. Also, organizations that were invited to planning conferences were, in many cases, not provided the opportunity to review the draft program plans developed by RANN. With due consideration to conflict-of-interest problems, organizations interested in a proposed program area should have the opportunity to be involved in program development, both before and after these conferences.

If RANN is to support research which is most responsive to national needs, it must provide the opportunity for those with a wide variety of interests to participate in developing new programs. Formal systematic procedures for developing research programs would aid RANN in insuring that interested organizations have opportunities to participate in developing new programs.

RECOMMENDATION

We recommend that the Foundation's Director require that formal procedures be established for developing RANN's research programs which would widely publicize its interest in developing a program area. The procedures should also provide communication mechanisms with interested persons, organizations, and Federal agencies having related programs to obtain their views during initial program development stages and in finalizing program objectives and plans.

AGENCY COMMENTS

By letter dated July 17, 1975, the Foundation agreed with our recommendation and stated that RANN will experiment with new ways of obtaining user and public input. (See app. VII.) In this respect, regional seminars were taking place to acquaint a broad spectrum of users, scientists, and the public with RANN programs and plans and to obtain

their feedback. RANN also planned further experiments, as part of a strategic planning and evaluation process, with the objective of developing prototype systems to better obtain input from scientists, users, and the public. RANN plans to select the most cost-effective prototype systems as part of its strategic planning process.

The Foundation commented that the cost effectiveness of alternative procedures for obtaining input from scientists, users, and the public must be considered because obtaining such data is costly and time consuming, but agreed that such data is necessary. We believe cost considerations should be part of the determination for selecting effective procedures that enable a wide variety of interests to provide input into the development of RANN's programs.

Figure 2-3

Research Applications Directorate
Fiscal Years 1972 to 1974 Program Awards

	Fiscal year		
	1972	1973	1974
	(millions)		
Advanced Technology Applications:			
Disaster and natural hazards:			
Fire research	$ 1.45	$ 2.00	$ 1.65
Earthquake engineering	2.82	4.77	7.91
Technological opportunities:			
Instrumentation technology	2.21	2.26	1.21
Industrial processing	.56	3.13	2.05
Industrial automation	-	-	1.61
Excavation and tunneling technology	.71	2.90	1.08
Enzyme technology	1.47	-	-
Urban technology	.75	-	-
Conversion technology	2.77	-	-
Transmission systems and materials	1.30	-	-
Plant siting methodology	2.73	-	-
Energy research and technology:			
Energy conversion	-	2.00	-
Energy systems	2.03	2.95	-
Energy resources	.04	2.96	-
Energy fuel and transportation	-	2.13	-
Solar energy	-	3.38	-
Engineering chemistry and energetics	-	-	.39
Total	18.84	28.48	15.90
Advanced Energy Research and Technology:			
Solar energy:			
Heating and cooling of buildings	-	-	2.87
Thermal conversion	-	-	1.38
Photovoltaic	-	-	2.29
Bioconversion	-	-	1.79
Wind energy	-	-	1.59
Ocean thermal	-	-	.73
Geothermal energy	-	-	3.68
Energy conversion	-	-	2.52
Energy resources	-	-	1.33
Energy and fuel transportation	-	-	1.70
Automotive propulsion	-	-	.43
Total	-	-	20.31

Public Technology Projects:			
Solar energy (heating and cooling of buildings)	-	-	4.09
Systems Integration and Analysis:			
Energy systems	-	-	3.53
Environmental Systems and Resources:			
Regional environmental systems:	10.02	10.89	-
Coastal zone management	-	-	1.71
Land use	-	-	4.28
Management of rural-urban environment	-	-	1.71
Weather modification	4.51	5.19	3.72
Environment aspects of trace contaminants	4.95	6.46	5.33
Total	19.48	22.54	16.75
Social Systems and Human Resources:			
Municipal systems and services	6.95	7.81	8.49
Urban systems technology	-	.08	-
Human resources and services	-	4.42	.44
Social data and evaluation	3.60	1.33	1.37
Total	10.55	13.64	10.30
Exploratory Research and Problem Assessment:			
Problem assessment and exploratory research:			2.63
Technology and the economy	-	1.79	-
Human needs	-	1.02	-
Alternative futures and institutional innovation	-	.20	-
Other societal problems	-	1.35	-
Technology assessment	-	.66	1.06
Total	4.59	5.02	3.69
Intergovernmental Science and Research Utilization:			
Intergovernmental science programs	-	-	.09
Government science assistance	-	.23	.32
Local government science utilization	-	.41	.41
Research utilization activities	-	.16	.02
Legislative body assistance	-	.18	.01
Total	1.05	.98	.85
Projects administered by RANN but funded through interagency transfers	.13	.17	1.23
Others (international travel, personnel mobility assignments, training, symposium, etc.)	.46	.01	.68
Total	$55.10	$70.84	$77.33

CHAPTER 3

RESEARCH BUDGET DEVELOPMENT

The budgeting process is a major step in determining RANN research priorities and in implementing programs. The process begins about 1-1/2 years before the start of the fiscal year being budgeted, and the outcome is influenced mainly by the Foundation, Presidential views as expressed through OMB, and the Congress. Figure 3-1 on page 41 shows the development of the fiscal year 1975 RANN research budget as it evolved from the initial budget estimates, prepared by RANN division and office directors for their respective areas of responsibility, to approval by the Congress. The budget as approved by the Congress was essentially a continuation of the fiscal year 1974 programs with a major added thrust in energy which resulted from Presidential desire to accelerate energy research as part of a response to the Nation's energy needs.

Following is a description of the process for developing the fiscal year 1975 RANN budget, including the assumptions that influenced the budget development at various stages of the process and their impact on RANN programs.

BUDGET PROCEDURES AND ASSUMPTIONS

The general steps in developing the fiscal year 1975 RANN budget were the preparation of preliminary program budget estimates by the assistant director for Research Applications and his division and office directors, and program managers; review and approval of the budget estimates by the Foundation's Director and the National Science Board; submission of the budget request for OMB's review; revision of the budget to reflect its funding priority in the President's proposed annual budget; and the Congress' review of the proposed budget through its annual budget hearings and subsequent approval of authorized funding levels and appropriation of funds.

Initial program budget estimates

The preparation of the fiscal year 1975 budget began in November 1972 with the Foundation Director's request to the

assistant director for Research Applications and other Foundation officials to develop preliminary program budget estimates for the budget year and the following 4 years. The Director requested that estimates be prepared by major program activities at high funding levels that reflected a judgment of valid scientific need and at low funding levels that could reasonably be expected to be obtained. He explained that the low estimate for the Foundation should be prepared on the basis of an expected fiscal year 1974 Foundation program of $658 million; however, priority changes would be considered not to exceed a lower level fiscal year 1975 target of $700 million. At this time (Nov. 1972) the Foundation's fiscal year 1974 budget was being considered by OMB; the RANN program request for research funds totaled $72 million out of a total Foundation request for program funds of $683.8 million.

RANN's general approach for developing the initial budget estimates is for program managers and division and office directors to develop initial plans, for each division and office, to be finalized by the assistant director for Research Applications for submission to the Foundation's Director.

Figure 3-1, column one, shows the estimates as developed at the division or office level. Column two shows the estimates as approved by the assistant director and submitted to the Foundation's Director in January 1973. A comparison of these estimates reveals differences in perceptions by the RANN division and office directors and the assistant director for Research Applications for each division and office at high and low funding levels.

The Foundation's acting director, Planning and Resources Management Office, said the initial estimates provided by the divisions and offices included costs to continue or complete existing programs and to fund new initiatives in fiscal year 1975. He said the revisions made by the assistant director for Research Applications reflected his views of scientific need and RANN priorities. Figure 3-2 is an analysis of the RANN program areas where differences existed between the two estimates.

The assistant director for Research Applications' revisions of the RANN division/office director's initial budget estimates provided, in most cases, additional funding for existing or new research programs. In this respect, some examples of the program content at the high level of funding suggested by the assistant director follow.

--Transportation systems--Initial research support, to develop alternative energy systems for transportation systems, leading to experiments to prove the concepts of the energy subsystems.

--Regional environmental systems--Included increased support for research projects leading to experiments to prove project concepts concerning reclaiming surface-mined lands, alternatives for handling and disposing solid residues, processing sewage effluent via biological food chains to yield a commercial product, and recycling industrial wastes.

--Productivity, work and industrial organization--Determine relationships between productivity and variables such as industrial use of technological innovations, social and economic organization or production processes, and worker performance and satisfaction and demonstrate major improvements in some industrial/service areas.

Foundation Director's and National Science Board's reviews of budget estimates

The Director's and the Board's reviews concern program balance within the RANN program in relation to scientific needs, and programs are also reviewed in relation to other Foundation programs to determine their funding priority.

The assistant director for Research Applications' preliminary RANN program budget estimates, as revised by the Foundation's Director and submitted to the National Science Board in April 1973, are shown in figure 3-1, column three.

The Foundation's deputy director, Office of Planning and Resources Management, said the Director's assumptions for three levels of funding presented to the board were a high

level of $131 million reflecting scientific need, a low level of $106 million, and $81.5 million which was the amount the Director thought could be obtained. The amount obtainable was based on guidance from OMB as well as congressional intent on the fiscal year 1974 expected funding level. At the time of the Director's review of the fiscal year 1975 preliminary budget estimates (Jan.-Apr. 1973), the RANN fiscal year 1974 budget request of $79.2 million was being reviewed by the Congress.

In acting on the fiscal year 1974 budget request, the Congress authorized, via Public Law 93-96, approved August 16, 1973, $91 million for RANN, including at least $25 million for energy research and $8 million for earthquake engineering. The Congress provided in the appropriation act, Public Law 93-137, approved October 26, 1973, that the RANN program not receive more than $72 million of the Foundation's fiscal year 1974 appropriation.

The Foundation's former assistant director for Administration said RANN's fiscal year 1975 budget submission of $82 million to OMB in September 1973 was influenced by OMB's instructions to minimize the budget request because of inflation and indications that congressional action on the fiscal year 1974 budget would result in a ceiling of $72 million and approval for accelerating energy research. The $82 million budget submitted to OMB consequently reflected the expected fiscal year 1974 $72 million funding ceiling with the addition of $10 million for energy research as part of the Foundation's lead agency responsibilities in solar energy assigned by OMB in April 1973. The budget submission also reflected congressional views for minimum funding levels for energy research ($25 million minimum plus $10 million for accelerating research) and $8 million for earthquake engineering.

The OMB and congressional influences primarily affected the assistant director for Research Applications' plans for RANN growth, as shown in the high level of his preliminary program estimates (fig. 3-1, column two). Figure 3-3 compares the new programs and the programs planned for increased support in the assistant director's estimated high level of funding to the level of funding for the programs in the budget submission to OMB.

The budget request submitted to OMB, as shown in figure 3-1, column four, reflected the views and approval of the board.

OMB's budget review

Generally, at this point in the budget process OMB's views are already known to an agency, on the basis of prior positions and informal contact. Frequently these views are reflected in the budget prior to formal submission to OMB. OMB's budget review is concerned mainly with the reasonableness of the request in relation to total funds available and with the President's decisions to increase or decrease emphasis in a research area.

OMB's review of the submitted RANN budget resulted in a $67.6 million increase for energy research based on the President's decision to accelerate energy research as part of a major effort concerned with the Nation's energy problems. The RANN budget submission had requested $35 million for energy research. The total energy funds approved by OMB ($102.6 million) exceeded the assistant director for Research Applications' preliminary high level energy estimates ($47 million) by $55.6 million. Most of OMB's energy add-on funds were reflected in the congressional budget submission for solar and geothermal energy conversion research and environmental effects of energy.

OMB's review also resulted in a net increase of $2 million in the nonenergy programs; namely, a $1.7 million reduction for the fire research program proposed for transfer to the National Bureau of Standards and a $3.7 million increase for programs concerned with environmental systems and resources and social systems and human resources.

In summary, OMB's review of the RANN budget submission resulted in an approved budget of $151.6 million, increasing the RANN budget request by $69.6 million--$67.6 million for energy research and $2 million for nonenergy programs.

Congressional budget review

The RANN budget as submitted to the Congress in February 1974, is shown in figure 3-1, column six. The Foundation's

acting director, Planning and Resources Management Office, said the difference of $2.7 million--between OMB's mark of $151.6 million and the budget request to the Congress of $148.9 million--represented funds that would be requested in the Foundation's budget for its administrative costs, such as staff salary and travel, to support the increase in energy activities.

The amounts budgeted for the RANN divisions and offices in the congressional budget submission reflected the changes resulting from OMB's review as well as adjustments by the Foundation within the totals approved by OMB. For example, the decrease of $1.2 million in advanced technology applications resulted from the proposed transfer of the $1.7 million fire research program to the National Bureau of Standards and the $0.5 million addition of a new program in socio-economic response to national hazards. The $5.5 million increase in Environmental Systems and Resources was primarily to support research in energy effects on the environment. The $2.5 million increase in Social Systems and Human Resources included research support of $1.6 million for public regulation and economic productivity, $0.6 million for productivity of State and local governments' organizations for delivery of services, and $0.3 million for municipal systems and services.

In Public Law 93-413, approved September 4, 1974, the Congress authorized fiscal year 1975 appropriations of $148.9 million for RANN. Of the amount authorized for RANN, not less than $1 million was for fire research, which reflected an apparent congressional intent that RANN continue fire research, and not less than $8 million was for earthquake engineering research. These mandates are shown under Advanced Technology Applications in figure 3-4, which compares RANN's budget as submitted to the Congress and as revised after congressional action.

The Congress in Public Law 93-322, approved June 30, 1974, appropriated $101.8 million for fiscal year 1975 to the Foundation for energy research. The head of the Foundation's Budget Office advised us that $93.4 million of the energy appropriation was for RANN's direct energy program--energy research such as solar, geothermal, coal, oil, and gas--which was 100 percent of the direct-energy funds requested. The

$93.4 million is reflected in figure 3-4 under Energy Research and Technology.

The balance of RANN's budget request of $55.5 million ($148.9 million minus $93.4 million, direct energy) was considered separately by the Congress. This portion of the budget request was for the nonenergy RANN programs, but included $9.5 million for research indirectly supporting energy programs--$1.5 million for basic research in energy systems and $8 million for research in environmental effects of energy. The Congress provided in Public Law 93-414, approved September 6, 1974, that not more than $50 million of fiscal year 1975 funds appropriated under this act be available for the RANN program request. This action deleted $5.5 million of requested funds and provided the Foundation's Director with a ceiling for RANN's nonenergy programs.

In summary, the Congress provided RANN with fiscal year 1975 appropriations of $143.4 million ($93.4 million for direct energy and a $50 million ceiling for other programs), which was $5.5 million less than the $148.9 million authorized. As shown in figure 3-4, the RANN total budget was revised to $142.1 million, or $1.3 million less than the $143.4 million appropriated. A Foundation budget analyst said the Foundation's Director had determined to allot only $48.7 million of the nondirect-energy funds appropriated under Public Law 93-414 to RANN because of higher priorities elsewhere in the Foundation. The director of RANN's Office of Programs and Resources said the assistant director for Research Applications and his deputy assistant directors determined where the congressional budget cut of $5.5 million and the Foundation Director's cut of $1.3 million would be applied to RANN. As shown in figure 3-4, the environmental effects of energy had the largest cut--$6.8 million.

Figure 3-1

Highlights In Developing RANN'S Fiscal Year 1975 Research Budget

RANN program area	(1) RANN preliminary budget estimates: Division/ office directors High	(1) Division/ office directors Low	(2) RANN assistant director High	(2) RANN assistant director Low	(3) Foundation's Director High	(3) Foundation's Director Target	(3) Foundation's Director Expected	(4) Budget submitted to OMB	(5) OMB's mark	(6) Budget request to the Congress	(7) Congressional review: Funds authorized	(7) Congressional review: Funds appropriated
	(millions)											
Advanced Technology Applications:												
Energy (note a)	$ 43.9	$ 37.6	$ 47.0	$ 38.8								
Other	30.5	18.1	32.9	20.4								
Total	74.4	55.7	79.9	59.2	$ 71.4	$ 60.4	$ 38.0	$15.5		$ 14.3		
Energy Research and Technology (note a)	-	-	-	-	-	-	-	35.0		94.9		
Environmental Systems and Resources	31.8	26.7	39.7	22.9	28.6	23.6	23.0	17.2		22.7		
Social Systems and Human Resources	15.5	13.5	27.5	16.8	23.5	15.5	14.0	10.5		13.0		
Exploratory Research and Problem Assessment	9.5	6.5	10.8	6.5	7.5	6.5	6.5	3.8		4.0		
Total	$131.2	$102.4	$157.9	$105.4	$131.0	$106.0	$81.5	$82.0	$151.6	[b]$148.9	$148.9	$143.4

[a] RANN energy research was budgeted for under Advanced Technology Applications until the Advanced Energy Research and Technology Division was created in September 1973 to manage direct energy research programs.

[b] The difference of $2.7 million between OMB's mark and RANN's research budget request to the Congress represented administrative costs associated with increased energy funds provided by OMB that were subsequently budgeted for in the Foundation-wide budget for administrative costs.

Figure 3-2

RANN Division/Office Director's Preliminary Fiscal Year 1975 Budget Estimates Revised By The Assistant Director For Research Applications

RANN division/office and program area	Division/office director's initial budget estimates		Assistant director research applications' budget estimates		Differences (note a)	
	High	Low	High	Low	High	Low
	(millions)					
Advanced Technology Applications:						
Energy resources	$ 4.0	$ 2.4	$ 3.6	$ 3.6	$ .4	$ 1.2
Transportation systems	0.5	-	4.0	-	3.5	-
Earthquake engineering	9.8	7.6	12.1	9.9	2.3	2.3
Instrumentation technology	4.0	1.9	3.4	1.9	.6	-
Excavation and tunneling technology	6.7	3.4	7.4	3.4	.7	-
Environmental Systems and Resources:						
Regional environmental systems	11.8	10.8	18.1	10.8	6.3	-
Weather modification	6.0	5.4	6.1	5.5	.1	.1
Trace contaminants	7.0	6.5	8.3	6.6	1.3	.1
Integrated agricultural pest management	4.0	4.0	4.2	-	.2	-4.0
Social Systems and Human Resources:						
Municipal services, operations, and organizations	11.5	10.5	13.5	10.5	2.0	-
Human resources and services	2.6	2.6	3.0	2.6	.4	-
Social data processing, evaluation and utilization	.4	.4	3.7	3.7	3.3	3.3
Productivity, work, and industrial organization	1.0	-	7.3	-	6.3	-
Exploratory Research and Problem Assessment:						
Technology assessment	2.5	1.7	3.8	1.7	1.3	-
Total	$71.8	$57.2	$98.5	$60.2	$26.7	$ 3.0

[a]Differences preceded by minus signs denote decreases between the assistant director, Research Applications' budget estimates and the division/office director's initial budget estimates.

Figure 3-3

Comparison Of Assistant Director For Research Application's Preliminary Fiscal Year 1975 High Level Budget Estimates And Budget Request To OMB

	(1) RANN assistant director's estimates		(2)	(3)
	Increase support	New programs	Budget submitted to OMB	Differences (2 minus 1) (note a)
	(millions)			
Advanced Technology Applications:				
Fire research	$ 4.0	$ -	$ 1.7	$ -2.3
Earthquake engineering	12.1	-	8.0	-4.1
Advanced industrial processing	6.0	-	3.45	-2.55
Instrumentation Technology	3.4	-	1.25	-2.15
Excavation and tunneling technology	7.4	-	1.1	-6.3
	32.9	-	15.5	-17.4
Energy Research and Technology:				
Energy systems	5.7	-	3.0	-2.7
Energy resources (includes geothermal)	3.6	-	4.7	1.1
Solar Energy	28.3	-	24.1	-4.2
Transporation energy	1.1	-	.9	- .2
Energy conversion	2.8	-	2.3	- .5
Energy use in transportation systems		4.0	-	-4.0
Energy conservation in existing structures	-	1.5	-	-1.5
	41.5	5.5	35.0	-12.0
Environmental Systems and Resources:				
Regional environmental systems	18.1	-	7.7	-10.4
Weather modification	6.1	-	3.6	-2.5
Trace contaminants	8.3	-	5.9	-2.4
Integrated pest management	-	4.2	-	-4.2
Options for environmental management	-	3.0	-	-3.0
	32.5	7.2	17.2	-22.5
Social Systems and Human Resources:				
Municipal services, operations, and organizations	13.5	-	8.6	-4.9
Human resources and services	3.0	-	1.4	-1.6
Social data processing, evaluation & utilization	3.7	-	.5	-3.2
Productivity, work, and industrial organization	-	7.3	-	-7.3
	20.2	7.3	10.5	-17.0
Exploratory Research and Problem Assessment:				
Technology and the economy	2.0	-		
Human needs	2.4	-	2.1	-3.2
Transnational problems	-	.9		
Technology assessment	3.8	-	1.2	-2.6
Alternative futures	.7	-	-	- .7
Other societal problems	1.0	-	.5	- .5
	9.9	.9	3.8	-7.0
Total	$13[illegible].0	$20.9		
	$157.9		$82.0	$-75.9

[a]Differences preceded by a minus sign denote decreases between the budget submitted to OMB and the RANN assistant director's estimates.

Figure 3-4

Fiscal Year 1975 RANN Budget As Submitted To The Congress And Revised After Congressional Action

	(1) Budget request	(2) Revised	(3) Differences (2 minus 1) (note a)
	(millions)		
Advanced Technology Applications:			
Earthquake engineering	$ 8.0	$ 8.0	$ -
Fire research	-	1.0	1.0
Socioeconomic response to natural hazards	.5	.4	- .1
Technological opportunities	5.8	6.1	.3
Total	14.3	15.5	1.2
Energy Research and Technology:			
Solar energy	50.0	50.0	-
Geothermal energy	22.3	22.3	-
Energy conversion and storage	10.7	10.7	-
Energy systems	6.2	4.7	-1.5
Energy resources	3.8	3.8	-
Advanced automotive propulsion	.9	.9	-
Energy and fuel transportation	1.0	1.0	-
Total	94.9	93.4	-1.5
Environmental Systems and Resources:			
Environmental effects of energy	8.0	1.2	-6.8
Regional environmental systems	5.9	7.6	1.7
Environmental aspects of trace contaminants	4.8	4.8	-
Weather modification	4.0	3.9	- .1
Total	22.7	17.5	-5.2
Social Systems and Human Resources:			
Municipal systems and services	8.9	8.3	- .6
Human resources and services	2.0	2.0	-
Social data and evaluation	.5	-	- .5
Public regulation and economic productivity	1.6	1.5	- .1
Total	13.0	11.8	-1.2
Exploratory Research and Problem Assessment:			
Technology assessment	1.4	1.4	-
Selected research topics	2.1	2.0	- .1
New problems and projects	.5	.5	-
Total	4.0	3.9	- .1
Total	$148.9	$142.1	$-6.8

[a] Differences preceded by minus sign denote decreases between revised and budget request figures.

CHAPTER 4

RANN'S RESEARCH PROPOSAL EVALUATION PROCESS

Rann research proposals are generally classified as unsolicited or solicited. Unsolicited proposals are the major basis for RANN awards and usually result from funding requests submitted at the researcher's initiative in response to general literature or personal contacts with Foundation officials. Solicited proposals are those submitted in response to program solicitations or requests for proposals. The solicitations provide for more definitive objectives than general literature used for unsolicited proposals, with requests for proposals being the most detailed of the announcements for proposals used in RANN.

This chapter describes the devices used to communicate RANN programs and encourage or solicit proposals and the procedures used in evaluating proposals requesting funding from the RANN program. It also presents the views on RANN's policies, procedures, and practices for evaluating proposals by a sample of researchers who had proposals funded or were declined funding by the RANN program.

The researchers suggested major changes in RANN's system for proposal evaluation. Because the success of the program depends partially on its rapport with the research community, we believe the Foundation should provide for a study to assess the potential impact of the suggested changes.

UNSOLICITED PROPOSAL PROCESS

Unsolicited proposals are the major source of RANN awards. Of the 1,829 RANN awards made during fiscal years 1971-74, about 93 percent, or 1,710 awards, resulted from unsolicited proposals.

Unsolicited proposals are funding requests sent to RANN largely on the initiative of the proposer. These proposals generally are evaluated on their own merits, rather

than by being compared to other proposals covering the same or similar proposed research. The proposals basically are submitted in response to general Foundation or RANN literature or result from personal contacts between program officials and the research community and require cost sharing by the proposer.

Communication of RANN priorities

The following table lists the primary Foundation and RANN publications for communicating RANN research priorities and the estimated general circulation of each. The estimated circulation is based on either the number of copies printed of the example used or the number of addressees from mailing lists. The dates of examples used ranged from 1973 to 1975.

Publication (and coverage)	Description	Types of recipients and total copies expected to be distributed
Annual Report (Foundation)	Covers Foundation accomplishments during reporting year and announces future goals and policies. Contains the Foundation Director's introductory statement and a more detailed description of the activities for each major component.	Heads of Federal agencies, current members of the National Science Board, Members of Congress, science writers, scientists, presidents of colleges and universities, research administrators, congressional staff members, and the general public upon request (5,000).

Publication (and coverage)	Description	Types of recipients and total copies expected to be distributed
Guide to Programs (Foundation)	Annual communication of objectives and anticipated scope of research of each Foundation research program. Also contains brief guidelines to proposers concerning submittal deadlines, eligibility requirements, and program development criteria.	Professional journals, science writers, Federal coordinators of colleges and universities, research administrators, academic institutions, profit and nonprofit organizations, and Federal agencies (6,101).
Monthly Bulletin (Foundation)	Report of Foundation happenings, including research program and proposal submittal information.	Colleges and universities, junior colleges, current and former members of the National Science Board, State Governors, Governors' science advisors, Federal-State coordinators, scientific attaches, and the general public upon request (13,000).
Weekly Newsletter (Foundation)	Communicates research program information, organization and personnel changes, research accomplishments, and upcoming Foundation events.	Colleges and universities, junior colleges, current and former members of the National Science Board, Governors, Governors' science advisors, Federal-State coordinators, and the general public upon request (7,958).

Publication (and coverage)	Description	Types of recipients and total copies expected to be distributed
Guidelines for the preparation of Unsolicited Proposals (RANN)	Contains a listing and brief description of RANN program elements and indicates that a brochure giving more specific information of any of the listed topics will be provided on request.	National Academy of Science mailing list; RANN's general mailing list which includes universities, colleges, Federal agencies, profit and nonprofit organizations; and the general public upon request (16,000).
Proceedings of the First Symposium on RANN (RANN)	Contains detailed discussions of three major RANN research interests--energy, productivity, and the environment--with discussions of the nature of national problem research accomplishments to date and anticipated research requirements for each major research area.	RANN's general mailing list, which includes universities, colleges, Federal agencies, profit and nonprofit organizations, and the general public upon request (10,000).
Program Brochures (division or office)	Contains general division or office research objectives, which are more specific than those of of either RANN or the Foundation and background information on the national problem or problems involved.	For example, the program brochure for the Office of Exploratory Research and Problem Assessment was distributed using the office's general mailing list, which includes universities, Federal agencies, profit and

Publication (and coverage)	Description	Types of recipients and total copies expected to be distributed
Program Brochures (division or office) (con't.)		nonprofit organizations; the mailing list of the National Academy of Science; attendees of the RANN Symposium; and the general public upon request (11,000).
Summary of Awards (division or office)	Contains annual summaries of awards for grants and contracts and background information on the issuing office or division.	For example, the Division of Social Systems and Human Resources' 1973 Summary of Awards was distributed using the division's general mailing list, which includes universities, Federal agencies, profit and nonprofit organizations; members of the Federal Council for Science and Technology, current division principal investigators; social science news media; and the general public upon request (2,105).
Abstracts of Awards (division or office)	Collection of award summary sheets compiled for Smithsonian Institution's Science Information Exchange.	Attendees of the RANN Symposium, the interagency mailing list, and the general public upon request (5,500).

Publication (and coverage)	Description	Types of recipients and total copies expected to be distributed
Program Announcement (division or office)	Invites unsolicited proposals for a clearly defined program element. Contains anticipated program funding level, objectives to be achieved, number and duration of awards, and legislative and other background information.	For example, the program announcement "Technology Assessments in Selected Areas" was distributed using: professional journals, Federal coordinators of universities and colleges, current members of the National Science Board, universities and colleges, research administrators, profit and nonprofit organizations, Governor's science advisors, schools of business administration, foreign journals, and the Office of Exploratory Research and Problem Assessment's general mailing list (26,000).

RANN officials may also communicate research interests through personal contacts which may arise through organized meetings, response to inquiries, or informal or chance discussions with scientists and other potential researchers.

Proposal evaluation

Program managers are assigned responsibility for particular areas of RANN scientific interest and the evaluation of proposals falling within those areas. Proposal evaluation consists of the following major sequential processes: (1) initial determination of a potential research project's scientific merit and applicability to RANN objectives

through consideration of informal inquiries or preliminary proposals or through preliminary review of formal proposals; (2) formal review by the program manager and others (usually peer reviewers), (3) determination by the program manager to recommend award or declination, (4) review of the evaluation and program manager's recommended action by the division or office director and Research Application Directorate's Grant Review Board, and (5) final review and action at the Research Application Directorate and Foundation levels.

Throughout the first three processes, the program manager relies heavily on his own judgment in evaluating proposals. At his discretion, he may obtain peer review comment and comments of interested Federal officials to help him assess informal inquiries and preliminary proposals and review formal proposals.

Proposals are evaluated in terms of (1) applicability to RANN program needs and objectives, (2) scientific merit, (3) expected usefulness of the research results, (4) the plan for managing the research project, (5) plans for distributing and utilizing results, (6) qualifications of the research team, (7) relationship to other RANN projects within a given program area, (8) reasonableness of costs to benefits, and (9) funds available in the program area. These criteria are used by the program manager throughout the evaluation process and usually are the basis for comments provided to the program manager by peer reviewers and others.

A detailed description of RANN's guidelines for unsolicited proposal contents and its procedures for evaluating unsolicited proposals are in appendix I.

SOLICITED PROPOSAL PROCESS

RANN proposal solicitations consist of program solicitations and requests for proposals.

Program solicitations

A Grants and Contracts Office official advised us that, in late calendar year 1972, program solicitations were developed to request proposals from certain segments of the

research community. The program solicitations generally state research objectives more specifically than the general publications used by RANN for attracting unsolicited proposals. Other general differences from unsolicited proposals are that solicitations apply for a limited time, as opposed to the more open-ended program announcements and brochures, and that proposals for the same general scope of work, as outlined in the solicitation, directly compete with each other. Also, awards based on solicited proposals do not require the awardee to participate in the cost of the research unless cost sharing is specifically required in the program solicitation.

The Foundation's former assistant director for administration, in a January 31, 1974, letter to the staff of the House Committee on Science and Astronautics, said the Foundation's policy was to publicize the issuance of a program solicitation as widely as possible and to disseminate the solicitation document to all potential performers. He cited the RANN "Human Resources" solicitation which was published in synopsis form in the Commerce Business Daily on March 12, 1973, and was mailed out 8 days later to some 20,000 recipients.

An official of the Foundation's Grants and Contracts Office told us no formal regulations existed for program solicitations; rather, prior experience was used in developing each new solicitation. He said developing formal guidelines for preparing program solicitations should begin during fiscal year 1975, subject to staff availability. In the interim, precedents set in developing previous Foundation solicitations will be used.

As of October 14, 1974, RANN had issued 14 program solicitations, which are highlighted in the following table. Their content is shown in appendix II.

Fiscal year	Number of program solicitations issued	Number of proposals received in response	Number of grants awarded	Number of contracts awarded	Total amount of grants and contracts awarded
					(millions)
1971	-	-	-	-	$ -
1972	-	-	-	-	-
1973	4	766	42	12	5.5
1974	7	1,248	37	15	8.8
1975 (note a)	3	37	-	-	-
Total	14	2,051	79	27	$14.3

[a]Through Oct. 14, 1974.

The steps in program solicitation development and evaluation of proposals received in response to the solicitation are: (1) determining the need for the solicitation, (2) solicitation development, evaluation, and distribution, (3) panel review of proposals to select awardees, (4) Source Selection Board's review of proposed awards and declinations, (5) Executive Committee, Grant Review Board's review of proposed declinations, and (6) final review and action at the Research Applications Directorate and Foundation levels. These steps are described in detail in appendix III.

Requests for proposals

Requests for proposals solicit bids for a specific project, are generally more specific than program solicitations in stating work and objectives, and directly compete with each other for that project. As of October 14, 1974, RANN had issued 15 requests for proposals, which are highlighted in the following table. Their content is shown in appendix IV.

Fiscal year	Number of requests for proposals issued	Number of proposals received in response	Number of contracts awarded	Awarded amounts
				(millions)
1971	-	-	-	$ -
1972	1	1	1	.125
1973	5	64	8	2.064
1974	6	9	5	.672
1975 (note a)	3	8	1	.133
Total	15	82	15	$ 2.994

[a]Through Oct. 14, 1974.

Developing requests for proposals and evaluating responding proposals is very similar to the program solicitation process and is described in appendix V.

RESEARCHER AND PROGRAM MANAGER VIEWS ON RESEARCH PROPOSAL EVALUATION

We solicited the views of researchers by mailing a questionnaire to the 2,103 individuals and organizations that had submitted formal research proposals to RANN as of June 30, 1974. Of these, 908 were awarded at least 1 RANN grant or contract, and 1,195 were not successful. Our data was based on the first 465 responses from successful proposers and the first 418 responses from unsuccessful proposers, of which 130 successful and 120 unsuccessful were randomly sampled and analyzed. This provided a 95-percent level of confidence that the survey results were representative of the 465 successful and 418 unsuccessful respondents within a maximum error rate of plus or minus 7.5 percent.

We also solicited by questionnaire the views of 57 officials, serving as RANN program managers as of April 1974,

on RANN's research proposal evaluation processes. Our data was based on responses from 52 of the program managers.

Respondents did not always answer each question; however, the number who failed to answer a given question was, in most cases, insignificant. The questionnaire results that follow are expressed as percentages of the persons who actually responded to the question.

Informal inquiries and preliminary proposals

Questionnaire data indicate that responses to researchers' informal inquiries and initial review of preliminary proposals act as filters in the evaluation process by screening out proposals inconsistent with RANN program objectives and those lacking sufficient scientific merit. This process saves the researchers time ordinarily spent in developing a formal proposal. Initial contacts by the researchers can also serve to communicate RANN research priorities to the scientific community.

We asked the researchers how responsive RANN officials were to their informal inquiries, and they replied as follows:

Questionnaire choice	Percent of respondents	
	Successful	Unsuccessful
Very responsive	68.2	28.2
Somewhat responsive	16.7	15.4
About as responsive as unresponsive	.8	11.1
Somewhat unresponsive	2.4	11.1
Very unresponsive	2.4	7.7
Did not ask for information	9.5	26.5

The results indicated that most researchers found RANN officials responsive to their inquiries. Also, about 27 percent of the unsuccessful researchers did not make informal inquiries, which, if made, could have possibly saved their costs in preparing the research proposal and RANN's cost in reviewing the proposal.

We also asked the researchers how helpful the RANN program manager was in formulating their research proposals, as

program managers may provide informal feedback to the researchers when reviewing preliminary and formal proposals. The results follow.

Questionnaire choice	Percent of respondents	
	Successful	Unsuccessful
Very helpful	37.0	5.3
Generally helpful	30.7	13.3
About as helpful as not	7.9	8.9
Little or no help	7.9	42.5
A hindrance	2.4	3.5
No help needed	11.8	22.1
Do not believe help should be provided	2.3	4.4

The results conflicted in that the majority of successful researchers found the program managers helpful while about 46 percent of the unsuccessful proposers found the program manager of little help. The differences in responses between successful and unsuccessful may be attributable to the reaction of the program manager in determining the value of a research proposal to RANN and responding accordingly.

A RANN official said the review of preliminary proposals is based on the program manager's judgment. Program managers responded, as follows, to our question asking if they were assisted in the evaluation.

Questionnaire choice	Percent of respondents
The program manager only	25.0
The program manager, assisted by other program managers within RANN	44.2
The program manager, supplemented by limited review within and outside RANN	30.8
	100.0

The results showed that about 75 percent of the program managers were obtaining assistance in evaluating preliminary proposals.

Researchers responded as follows to a question on whether views of multiple RANN staff members should be obtained in deciding to decline a preliminary proposal.

Questionnaire choice	Percent of respondents	
	Successful	Unsuccessful
Never	3.2	1.7
Only in exceptional cases	20.6	10.2
On request by the proposer	43.6	32.5
As a standard procedure	29.4	49.6
Other	3.2	6.0
	100.0	100.0

Successful and unsuccessful proposers greatly supported having multiple opinions in determining that a proposal should be declined.

Selection of peer reviewers

RANN program managers generally use their professional judgment in selecting peers to review research proposals. The program managers advised us that the following factors, listed in order of frequency of use, were considered in selecting peer reviewers: the reviewer's expertise, personal referrals, personal acquaintances, the reviewer's past performance, and selection through publications.

Researchers' views on the method of selection of peer reviewers follow.

Questionnaire choice	Percent of respondents	
	Successful	Unsuccessful
Only by the RANN program manager	9.4	3.5
Jointly by the RANN program manager and the researcher	31.5	26.1
By a separate evaluation group, independent of the RANN program manager	3.1	11.3
Whenever possible, by the RANN program manager from a list of independently chosen reviewers	39.4	20.9
Whenever possible, by using an unbiased procedure to select from a list of independently chosen reviewers	15.0	29.5
Other miscellaneous responses	1.6	8.7

The results showed that researchers preferred that peer reviewers be selected through methods providing some degree of control for objectivity. Very few of the researchers favored the RANN practice of selection solely by the program manager.

We asked program managers to indicate the percentage of peer reviewers they had selected during the past year who fell into each of the six following categories: the academic coummunity, Federal agencies, State and local agencies, public interest groups, private industry, and research institutions. Their responses showed that an average of about 63 percent of their peer reviewers were from the academic community and Federal agencies, and about 23 percent were from private industry and State and local governments. The program managers also said that in about 61 percent of their awards, the users identified in the research proposal utilization plan participated in evaluating the proposal.

The Foundation's Director stated in April 1974 that the ultimate user of RANN research is most often a State or local government agency, private industry, or an industrial market. In this respect, it appears that RANN could give more consideration to selection of peer reviewers from user groups to better insure applicability of the research to their needs rather than apparently placing emphasis on the views of the academic community and Federal agencies.

Number of reviewers selected

According to the Research Applications Grants and Contracts Manual, the size of the proposal budget is an important guide in determining the number of peer reviewers. Program managers said they most frequently considered the following factors, with the most frequent listed first: complexity of the proposed research, dollar amount of the proposal, type of proposal (such as a planning grant, or state-of-the-art survey), and proposal innovativeness.

Over 75 percent of the program managers said they normally selected from 5 to 12 reviewers when using a mailing process or peer review panel. About 11 percent of the program managers--all from the Office of Intergovernmental

Science and Research Utilization--stated they generally selected 21 or more reviewers when using the mailing process. The office's deputy director stated a large number of reviewers is preferred to enable a thorough review and to disseminate research ideas to others and possibly spark new ideas.

The mail review process was the most frequently used form of peer review by program managers, in that about 62 percent of the program managers used peer mail review in evaluating over 80 percent of the formal research proposals. Conversely, about 67 percent of the program managers used panels in evaluating 20 percent or less of the formal proposals.

Peer reviewers' comments

Foundation policy is to provide a summary of peer review comments to proposers to protect the identity of each reviewer. Foundation officials said peer review comments were solicited gratuitously and confidentially to encourage candid reviews.

Nearly 100 percent of the researchers responding to our questionnaire believed that on request they should be given the reviewers' comments. Also, as shown in the following table, they preferred to receive more specific comments than were normally provided under the Foundation's policy of protecting the reviewer's identity. The responses are arranged in increasing degree of specificity.

Questionnaire choice	Percent of respondents	
	Successful	Unsuccessful
A short summary	11.1	12.4
A detailed summary	12.8	9.8
Specific descriptions of each reviewers comments	12.0	15.9
Edited text of each reviewer's comments	22.2	16.8
Verbatim text of each reviewer's comments	41.9	45.1

We asked the researchers how RANN officials could best insure the quality of reviewers. The researchers were requested to select as many choices as they believed appropriate. Their responses follow.

Questionnaire choice	Percent of respondents	
	Successful	Unsuccessful
Rely on the judgment of the program manager	26.2	15.8
Require periodic analysis of each reviewers performance	36.5	38.6
Maintain anonymity, but require the reviewers to evaluate each other's comments	36.5	28.9
Contract for and pay for a quality review	29.4	23.7
Miscellaneous	5.6	20.2

The responses indicated that researchers preferred an established, systematic method for evaluating a reviewer's performance as opposed to the RANN practice of relying on the program manager's judgment.

Reviewers normally provide comments without compensation, and RANN policy is to not compensate them, except in unusual circumstances. 1/ As about half the applicants for RANN funding have served as reviewers, we asked them if providing an honorarium for evaluating research proposals would affect the quality of review comments. Their responses follow.

1/Panel reviewers for RANN solicitations and reviewers making site visits for unsolicited proposals receive expenses and sometimes receive a consulting fee.

Questionnaire choice	Percent of respondents	
	Successful	Unsuccessful
Substantial improvement	28.0	33.3
Marginal improvement	43.2	39.0
No change	25.4	25.7
A slight degradation	1.7	1.0
A substantial degradation	1.7	1.0

About 30 percent of the researchers believed that an honorarium would substantially improve the quality of reviewers' comments and about 40 percent estimated marginal improvement. The remainder believed an honorarium either would have no effect or would result in degradation in the quality of review comments.

We also asked the researchers in our sample who had served as reviewers of RANN research proposals to indicate whether they believed certain areas of RANN's peer review procedures were sound or lacking. The responses follow.

Questionnaire choice	Percent of respondents (note a) believing that RANN peer review is: Sound	Lacking
In providing adequate instructions and guidance to the reviewers	84.1	9.7
In insuring that the reviewers are limited to their areas of expertise	49.5	19.4
In providing sufficient time to conduct the review	69.2	11.8
In advising the reviewers of the final outcome	17.8	68.8
In providing each reviewer an opportunity to consider the substance of all review comments	5.6	62.4
In allowing reviewers to see subsequent revisions to the proposal	13.1	41.9
In insuring that continuation proposals are evaluated in the same manner as initial proposals	15.0	19.4
Miscellaneous	5.6	10.8

a/Two separate questions (one for sound and one for lacking) were used to gather the data. The response percentages do not total 100 because the same number of persons did not respond to each question.

The responses indicated that reviewers were provided adequate instructions and time for review but would prefer more feedback on other reviewers' comments, whether the proposal was funded or not. Reviewers also felt that RANN should advise them if the proposal they reviewed was funded. Since there was no preponderance of opinion for other parts of the question, they were not clearly interpretable.

Reasons for declinations

The universe for response to questions under this caption consisted of the unsuccessful proposers and about one-fourth of the successful proposers who previously have had at least one proposal declined. About 60 percent of these researchers responded. This group of researchers advised us on the degree of detail provided by RANN officials in declining their proposals. A summary of their responses follows.

Questionnaire choice	Percent of respondents
A general statement	56.5
A summary analysis	13.0
Specific criticisms about the proposal as a whole	12.0
Specific criticisms related to particular parts of the proposal	18.5

We asked the same researchers whether the criticisms given by RANN officials provided a reasonable basis for the declination. As shown in the following table, over 60 percent indicated that the criticisms did not provide a reasonable basis. An additional 14 percent expressed some degree of dissatisfaction by noting that, about as often as not, RANN provided a reasonable basis for the declination.

Questionnaire choice	Percent of respondents
Yes	10.3
Generally yes	13.8
About as often as not	13.8
Generally no	17.3
No	33.3
Criticisms were so vague that they could not be evaluated	11.5

Time for proposal review

Researchers said the time consumed by RANN officials in reaching a disposition of their research proposal was important in planning their work. As shown in the following table, over 60 percent of the researchers could wait from 3 to 6 months for a decision on a formal proposal and about 30 percent could wait less than 3 months.

Questionnaire choice	Percent of respondents	
	Successful	Unsuccessful
Less than 3 months	31.7	30.4
From 3 to 6 months	65.1	60.9
Over 6 months to a year	2.4	7.0
Over a year	.8	1.7

RANN officials gave us data on their time for completed actions (award, declination, or withdrawal) on formal proposals for the period July 1, 1971, to March 5, 1974. We categorized the data into time intervals as presented below.

Number of Actions and Percent of Total

Disposition of proposal	Months for processing				
	Less than 3	3 to 6	Over 6 to 9	Over 9	Total
Awards	627	361	195	46	1,229
	(51)	(29)	(16)	(4)	
Declinations	382	403	176	83	1,044
	(37)	(38)	(17)	(8)	
Withdrawals	53	65	44	62	224
	(24)	(29)	(19)	(28)	
Total	1,062	829	415	191	2,497
	(43)	(33)	(17)	(7)	(100)

The data showed that about 80 percent of RANN's awards and 75 percent of its declinations took less than 6 months to process and thus were within the time researchers stated they could wait for a decision. However, about half of the withdrawals took longer than 6 months to process and about one-fourth took more than 9 months.

These statistics, however, may not be indicative of the total processing time involved. A RANN official said the above data did not include the time for responding to informal inquiries or reviewing preliminary versions of the proposal, both of which could, however, reduce the processing time for formal proposals because of the program manager's prior experience with the proposal.

Researchers' intent to submit further proposals

Researchers advised us as follows on their intentions to submit further research proposals to RANN.

Questionnaire choice	Percent of respondents	
	Successful	Unsuccessful
Yes	58.9	27.4
Probably yes	29.5	24.8
Not sure	6.2	18.8
Probably no	3.9	17.9
No	1.5	11.1

We asked the researchers who checked "probably no" or "no" to provide a reason for the response. About 86 percent of this group provided reasons. The most frequent reply was dissatisfaction with the reasons or lack of reasons given by RANN management for not funding a proposal. As shown on page 64, over 60 percent of the researchers in our sample believed RANN officials did not provide a reasonable basis for not funding their research proposal. Other reasons given by the researchers included dissatisfaction with the length of time to evaluate the proposal, beliefs that RANN had preconceived policies on the type of researcher and organization it will support which exclude the unknown researcher, and uncertainty about RANN's research interests.

CONCLUSIONS

The researchers' responses to our questionnaire indicate they would prefer major changes in RANN's policies, procedures, or practices for evaluating research proposals. Areas of change suggested by the researchers included controls for objectivity in selecting peer reviewers, a systematic method for evaluating quality of reviews, receipt of specific comments on their proposals with many researchers asking for verbatim text of reviewers' comments, more explicit reasons for their proposals not being funded, and some improvement in the processing time for their proposals.

The Foundation should consider the changes suggested by the researchers, as the success of the program depends partially on its rapport with the research community, which influences its ability to attract the best researchers. Because the changes may have Foundation-wide applicability, the potential impact of the suggested changes should be studied under the Foundation's Office of Planning and Resources Management, whose responsibilities include Foundation-wide policy considerations and program evaluation.

RECOMMENDATION

We recommend that the Foundation's Director require that a study be made to assess the potential impacts of changes to RANN's research proposal evaluation system as suggested by researchers.

AGENCY COMMENTS

The Foundation agreed with our recommendation and stated that certain actions suggested by researchers for improving peer review could be taken immediately while other changes would require further review and experimentation. Specifically, RANN plans to:

--Establish procedures for informing peer reviewers of research proposals of awards made.

--Increase documentation of reasons for declining to fund a research proposal and make documentation available to the applicant.

--Evaluate cost effectiveness of additional checks on selection of RANN unsolicited preliminary proposals and select alternatives where required to increase the reliability and validity of program managers' selections of proposals for funding consideration.

--Conduct analysis and experiments on the review of unsolicited proposals to increase review quality and reduce potential bias. The study will include more formal checks on the objectivity of the peer review process, in addition to checks currently provided by RANN's Grant Review Board.

On June 30, 1975, the Foundation's Director announced that the National Science Board had adopted a resolution re-emphasizing that proposals be evaluated as fairly as possible, that there be wide participation of qualified individuals in the review process, and that the review process be conducted as openly as possible. In addition, the Board's resolution provided that:

--The Foundation would publish annually a list of all reviewers used by each division.

--Program officers should seek broadly representative participation of qualified individuals as reviewers.

--Verbatim copies of peer reviews requested by the Foundation after January 1, 1976, not including the identity of the reviewer, would be made available to the principal investigator/project director upon request; and the question of including the identity of the peer reviewer would be considered further by the Board.

--The Foundation, upon request, would inform the principal investigator/project director of the reasons for its decision on the proposal.

The Foundation's Director stated that items two and four had always been done but that items one and three were changes.

CHAPTER 5

PLANNING FOR UTILIZATION OF RESEARCH RESULTS

RANN management has increasingly emphasized dissemination and utilization activities to promote and plan for applying research results. Changes in this respect include increased funding for these activities and implementing detailed utilization planning guidelines for researchers submitting unsolicited proposals.

Our review of six unsolicited research projects funded before implementing the detailed utilization planning guidelines showed a general lack of thorough utilization planning, which could hinder application of research results. Problems in planning were highlighted by a lack of early identification of (1) potential barriers to implementation, (2) specific users to participate in determining feasibility of concepts being researched, and (3) secondary users for fostering widespread application.

These problems continued for projects funded after the revised planning guidelines were implemented. The planning guidelines provide for consideration of barriers to implementation and user involvement. We believe, however, that the utilization planning information suggested by the guidelines should be required of a researcher having an unsolicited proposal funded by RANN. In addition, the guidelines should be further revised to provide emphasis on early user involvement to assist in project planning and to aid in fostering maximum use of research results.

RANN has not established utilization planning aids for program solicitations. Emphasis on utilization planning in solicitations was not uniform, and provisions for user involvement during the research varied considerably. We believe that utilization planning requirements should be developed for program solicitations.

NEED FOR UTILIZATION
PLANNING REQUIREMENTS

RANN program managers, Office of Intergovernmental Science and Research Utilization officials, and project researchers are responsible for insuring utilization of RANN research results. The RANN program manager, in cooperation with the researcher, is primarily responsible for planning for initial application of the research as part of RANN's role of developing the research through the phase where project concepts are validated. The Office of Intergovernmental Science and Research Utilization is responsible for secondary application of the research results with the assistance of the cognizant RANN program manager.

The need for user involvement in early firm planning for use of problem-oriented applied research was stated by the Committee on Public Engineering Policy in its 1973 report entitled "Priorities for Research Applicable to National Needs." The report stated:

> "* * * The unique nature of the RANN mission poses problems related to the very functioning of what we have termed the applied research delivery system. These are the issues of how to organize, manage and utilize applied, problem-oriented, multidisciplinary research in such a way as to achieve the most fruitful relationship between research sponsors and managers, research performers and potential users. * * *"
>
> * * * * *
>
> "* * * The follow-up and application of information, methods of problem solving, and technology developed through RANN programs depend not upon RANN but others, most usually Federal agencies and state and local governments and also upon the private sector. The recommendations in this document, therefore, rest on the assumption that potential "users" both exist and have been identified. By and large this report concludes that research funded by RANN, and therefore committed to a problem orientation, should be

planned and conducted in close association with the potential "users" so as to assure an understanding of their needs and to increase the likelihood that recommendations will be usefully implemented."

RANN's guidelines for utilization planning entitled "Interim Description and Guidelines for Proposal Preparation" were established in September 1971 and were applicable to unsolicited proposals. The guidelines stated:

"* * * It is particularly important to identify the potential beneficiaries or users of the anticipated research results and to plan for effective information transfer to them. It is essential in this connection that the beneficiaries or users be involved in the planning and/or implementation of the research in all appropriate and practical ways. Moreover, in addition to publication through normal scientific channels, proposals should indicate possibilities for communicating with a larger, non-scientific, audience."

These guidelines provided a policy statement for RANN officials and researchers in planning for utilization.

Utilization planning for six projects under the interim guidelines

The RANN program has depended on unsolicited proposals to form the bulk of its research. For fiscal years 1972 through 1974, approximately 93 percent of RANN awards and 92 percent of its expenditures resulted from funding unsolicited proposals.

We reviewed the utilization planning for six research projects funded in response to unsolicited proposals. The projects involved either large or small expenditures and were selected from five of the Research Applications Directorate's divisions or offices. For the most part, users were involved at some stage of the research project for the initial demonstration of the project's feasibility, but involvement for secondary applications generally did not

exist. There appeared to be little initial planning to identify potential barriers to implementation. Consideration of barriers to implementation seemed to be on an exception basis as problems arose, which, in many cases, was after the project had been underway for several years.

Initial research proposals did not contain a separate section for utilization planning. Elements of utilization planning that existed, such as workshops, were scattered throughout the proposal. We believe that the utilization plan in the research proposal should be a distinct part to aid reviewers in evaluating planned utilization. We noted improvement in this respect when project continuation proposals were submitted, but some elements of utilization planning were still not stated in the proposals' utilization planning sections.

An overview of utilization planning for the six projects follows, with a more detailed description of the projects' utilization planning in appendix VI.

Evaluating the application of telecommunications to health care delivery in nursing homes

This project provides for operating an experimental health care delivery system under which nurses, rather than physicians, would make routine and emergency visits to nursing homes and transmit medical data by telecommunications for physician assistance. As of February 1975, the project had received one grant, of $373,700, from the Social Systems and Human Resources Division.

Our discussions with the researcher and the RANN program manager showed that a major obstacle to widespread application of this system is obtaining reimbursement for medical services provided by nurses. In general, to qualify for reimbursement under Medicare, services of a nurse practitioner or other physician assistant must be related to a physician's professional services and be under the physician's immediate personal supervision. The researcher said he was not aware of any State Medicaid program, with one possible exception, that would reimburse for nurse services without the presence of a physician for supervision. Hospitals and

nursing homes were not interested in replicating the experiment because of this problem.

The research proposal did not discuss the reimbursement problem; however, the RANN program manager said he had been aware of the problem while the project was being considered for RANN support. Utilization planning in the research proposal identified general types of users; however, it failed to identify specific users possibly willing to implement the research results. According to the plan, the research team planned to identify Medicare and Medicaid officials for active involvement, but their potential roles were not specified.

The proposal was reviewed primarily by Federal officials with some academic, research institute, and consultant participation, but primary user groups, such as hospitals, nursing homes, and medical care reimbursement organizations, were not requested to evaluate the proposal. Comments received indicated that the utilization plan should be strengthened. One reviewer characterized the plan as passive and recommended preparing a detailed plan to replicate the project elsewhere. Subsequently, two conferences were added to the project plan. Although conferences are dissemination mechanisms, we do not believe they adequately satisfy the need for an active utilization plan as recommended by proposal evaluators. We did find, however, that the research team had performed several dissemination and utilization activities, including publishing a journal article and publicizing the project through the local media. Finally, it was working with Massachusetts Medicaid officials to obtain reimbursement for medical services provided by nurses.

We believe that utilization planning should consider the views of potential users more extensively. This would assist RANN management in deciding whether to fund the project and in forming user connections for achieving timely and sufficient use of the research to benefit health care delivery. Known potential problem areas should be documented in the proposal to allow peer reviewers to comment on potential problems while considering the worthiness of the proposed research.

The interaction between urbanization and land: quality and quantity in environmental planning and design

This project, managed by the Environmental Systems and Resources Division, was to develop models or methods for use in evaluating the impact of projected urbanization on metropolitan area lands and environmental resources. Through this effort the researchers hoped to develop capability for furnishing decisionmakers with analytical data about typical suburban problems, such as conflicts in land use and impacts of major capital improvements. Through January 1975, RANN had awarded five grants totaling $914,200 for this project.

Officials of Massachusetts, where the research is being performed, said the State had not yet committed itself to using the models since determination of whether they were superior to other decisionmaking techniques had not yet been completed. Problems such as training of technical personnel, development of user instructions, model validation, computer availability, and implementation funds were cited by Massachusetts officials. Such problems were not considered in the researcher's initial proposal. Other problems were noted by proposal reviewers who, in addition to seeking identification of user groups, were not certain the results would be usable in other geographic areas. Other States have not been actively involved with the project.

Although progress has been made toward resolving some of these problems, others have not been adequately addressed. Early in 1974, RANN supported a workshop to test the models' performance against real world problems. A supplementary benefit was the training of technical staff to use the developed methodology should the State decide to implement it. Additionally, a user handbook was to be prepared summarizing how component models could be linked and applied to real problems.

A remaining problem, the source of funds for implementation, was initially raised in February 1973 by a Massachusetts official who reviewed the research proposal for the second year of the project. As of January 1975, the project was being reviewed for a final year of funding; however, this issue had not yet been resolved.

The initial proposal, although not containing formal utilization planning, did contain scattered references to involvement by individuals possessing expertise applicable to the research. Massachusetts officials did not review the project until the second year of funding was being considered in January 1973. At that time, the RANN program manager said the lack of user review needed to be addressed soon to keep the project focused on real problems. The reviewers of the proposed second-year efforts recommended establishing an advisory committee. A committee of Massachusetts representatives was formed and met initially in June 1974, over a year later.

A proposal for the third and fourth years of funding provided for involvement in the project by Massachusetts officials and local government officials, although these officials were not specifically identified. The research team also made a commitment to continue interacting with user groups after completing the research effort.

Utilization planning became more extensive as the project progressed. Several Massachusetts departments and ranking officials have indicated interest in the project, and two officials have served on an advisory committee. Although Massachusetts is apparently interested in the results, we believe failure to obtain early involvement by other States could slow extensive model application since secondary users would not be familiar with model capabilities. In addition, extension of user involvement could have helped establish the level of demand for this decisionmaking research.

Community development study

This study included two related projects on the role of the Mission Coalition Organization--a federation of community organizations in San Francisco's Mission District--in community development. A further objective involved determining how public agencies could be more responsive to community needs. In exchange for technical assistance to secure cooperation from the community organization, the researchers were allowed to study interactions between the organization and public agencies. The research was expected to provide data useful to the scientific community and

government decisionmakers involved with programs having an impact at the community level. Managed initially by the Division of Social Systems and Human Resources and subsequently by the Office of Exploratory Research and Problem Assessment, RANN has provided five grants totaling $864,000 as of January 1975 for this study.

Utilization planning for the first project did not specify how the research results would be conveyed to potential users. The researchers did state that the results would be useful to other similar communities. Subsequently, RANN funded a conference to disseminate and discuss project findings and identify future research needs. The proposal for the second project contained a plan to make the findings available to various user groups, but the question of applying the research to other community organizations was not resolved.

In contrast to reviewers of the first project, who did not comment on the projected usefulness of the results to other localities, several reviewers of the second project generally felt that because the Mission Coalition Organization was not typical of community organizations, the research might not have been usable by other community organizations. One reviewer claimed that research was relevant to policy determination only if the organization studied was representative of community organizations in general. Believing that the organization was not typical, the reviewer claimed that this nonrepresentativeness would detract from the study's potential contribution to a national need. Another reviewer, claiming that the technical assistance provided to this community organization restricted comparisons with other community groups, advised that generalizations from this project could lead to serious mistakes in policy determination if the uniqueness of this organization was ignored.

Although some reviewers were concerned about the potential for widespread use of the results, reviewers generally felt that the proposal was timely and addressed a major national concern. The researchers said there was no such thing as a typical community organization and their findings would be partially transferable to other community groups.

Three reviewers of the second project suggested solutions which could allow generalizations to be made between community organizations. Suggestions included participation by community organizations from various localities, comparison of findings to situations in other communities, and performance of several additional case studies. In January 1975 the RANN program manager, noting that the project would be completed in March 1975, said validation would be useful but RANN was not planning any verification efforts in other communities.

We believe that utilization planning should consider how extensively the research results would apply to other community organizations. Such data would help RANN determine the amount of funds, if any, to invest in a project.

In addition, utilization planning should have provided for followup to determine the use made of the research. This information would aid RANN in determining the benefits derived from the project and provide information on lessons learned for consideration in funding future projects.

Seismic design decision analysis for eastern metropolitan areas

This project was to determine if buildings in eastern metropolitan areas were constructed with an adequate level of earthquake (seismic) resistance. If not, the researchers proposed to make recommendations to insure optimum protection levels. Long-range objectives included preparing cost benefit analyses of alternative strategies for reducing the consequences of earthquakes. Foundation funding as of January 1975 had accumulated to $954,100 over four grants. The project was managed by the Advanced Technology Applications Division.

Although there was evidence of user involvement in guiding and conducting the research, little opportunity was extended to users to comment on the proposals. Reviewers were exclusively from academic institutions or were other RANN officials. Utilization planning was not accomplished until the fourth award, approximately 3½ years after the initial award. Although the earlier awards did not contain utilization plans as such, evidence of user involvement was

scattered throughout the proposals. Involvement with other researchers and a local engineering firm has been an element of user involvement since the initial proposal.

Major involvement with users capable of implementing the research was first addressed in the proposal for a fourth award. The researchers planned to assist a committee of engineers to evaluate Boston's building code provisions through staff studies. In return, the researchers wanted committee members' reactions and suggestions concerning their research results.

The chief engineer of Massachusetts' Office of Code Development said results dissemination to his office by the research team had been very good and that the office had used a significant amount of the team's research. He noted that its results had enabled the code committee to lower the earthquake risk classification for certain buildings and soil conditions in the Boston area.

The proposal for the fourth award included workshops for extending the developed results to other eastern cities. These, however, have not been held because they might duplicate efforts of another project RANN supported through the National Bureau of Standards to develop a model seismic building code. Building code officials were being encouraged to interact with the other project group since their objective was to revise building practices to incorporate recent earthquake engineering research results. The proposal did not, however, indicate how results of this research project would be transferred to the other project to give building officials access to the results.

As a substitute for the workshops originally planned, the researcher had tentatively agreed to meet with local engineers, planners, and building officials and sponsor one or two instructional workshops to be attended by officials of other eastern metropolitan areas. Although such activity had not been provided for in this or earlier proposals, the research team had prepared numerous reports, participated actively on professional committees, task forces, and seminars, and lectured before various user groups.

Since project funding does not expire until 1977, this project could foster additional use of the seismic design methodology to reduce earthquake damage. Although utilization planning improved as the project progressed, earlier planning to identify and involve users willing to implement successful results would have provided RANN management with better assurance of the degree of utilization expected from the project.

Research coordination and utilization--the Tahoe Basin

The proposal provided for establishing a Research Coordination Board to inventory the results of research performed on the Lake Tahoe Basin, developing a prioritized research agenda for the basin and encouraging that this research be performed, establishing a research information system, and coordinating research efforts by reviewing proposals for research in the basin.

The proposal for this project was submitted by two groups that would serve on the proposed board--the Tahoe Regional Planning Agency, a bi-State public agency responsible for developing a conservation plan for the Lake Tahoe Basin, and the Lake Tahoe Area Council, a nonprofit organization interested in preserving the basin. The planning agency said the project was proposed because the overall research effort and results in the basin lacked direction, coordination, availability, and utility. This project, under the Office of Intergovernmental Science and Research Utilization, had been awarded two grants totaling $164,000 as of January 1975.

Several major problems could hinder project success, including the board's lack of authority to require its review of research proposals and the need to obtain continued funding when Foundation support is discontinued. Although these barriers were recognized by Foundation staff and proposal reviewers before funding the project, a specific plan for overcoming these obstacles was not developed.

The board planned to function as a research coordinator by reviewing research proposals and influencing the research being performed to meet basin needs. Before the initial

award, the Foundation's program manager told the planning agency that submission of research proposals for the board's review would be voluntary. The proposal, however, did not state what procedures the board would implement to insure it received all proposals for review. In January 1975 the program manager said although the board had requested that research institutions and research-sponsoring agencies allow it to review their research proposals, formal agreements had not been made. He said the board was responsible for convincing Federal agencies sponsoring research in the basin to have their grantees cooperate with the board. As of January 1975, the board had reviewed about 12 research proposals, which represented all the proposed research known to the board.

Before project funding, the Foundation's program manager advised the planning agency of his concern about a permanent source of funding. The response was that the area council's successful record of obtaining funds for research needed in the basin was ample evidence of ability to provide future services. Board personnel said contacts with prospective identified funding sources were being withheld until the planned project evaluation in about May 1975.

We recognize that obtaining a commitment for continuing support of project activities may be difficult and perhaps not practical until the project is proven successful. However, because permanent funding is necessary for success of the project, we believe that funding sources should be contacted before project approval to find out if any real interest in supporting the project existed. Such sources should be kept advised of project status to provide for timely and efficient transfer.

Environmental management research in the Lake Tahoe Basin

This project concerns the analysis of environmental consequences of alternative land use strategies on water quality. The researchers selected the Lake Tahoe area to study because extensive urbanization, creating increased sewage effluents and soil erosion, was threatening water purity. The researchers planned to determine (1) what human activities contribute to lake deterioration and (2) if man

is willing and able to control the process through social and political action. This project has received six grants from the Foundation, the three most recent of which were from RANN for cumulative funding at January 1975 of $1.8 million. The project was managed by the Environmental Systems and Resources Division.

This project, ongoing since 1970, lacked a formal systematic utilization plan. Various utilization activities were scattered throughout the initial three proposals. The fourth proposal contained a section generally describing planned distribution of results and provision of assistance to public agencies and other interested parties; however, it did not address how this would be accomplished for specific user groups. Peer reviewers criticizing utilization planning stated that more user involvement and closer coupling with the Tahoe Regional Planning Agency and other local users would have been desirable. The RANN program manager described attempts to develop liaison between the researchers and the planning agency, the major and most appropriate user group, as arduous since both groups were reluctant to work closely together. Coordination with other federally supported research and addition of communications personnel was also suggested by reviewers.

Major criticisms of the fifth proposal were the need for a more systematic utilization plan and more contact with the planning agency. A program manager from the Office of Intergovernmental Science and Research Utilization stated the research team was active in a variety of activities to achieve dissemination and promote utilization. He believed, however, that a formal utilization plan to meet user needs would be valuable. Reviewers also recommended establishing a user advisory committee to include membership from the newly formed Research Coordination Board. (See p. 80.)

The sixth proposal planned direct contact with local users and contact through publications on the national level. The user advisory committee recommended by reviewers of the fifth proposal was formed but the meetings had not been well attended. Consequently, this function had been transferred to the Research Coordination Board. Additionally, the researcher conducting the project was serving on the Science Advisory Panel of the board, thus providing him immediate access to the basin's research coordination function.

Reviewers of the proposal commented on the failure to have an orderly approach to research dissemination with one advocating that the project staff include a regional planner. No detailed plan, however, was prepared.

The research team has provided technical assistance to numerous user groups, such as advice on whether specific building sites should be authorized, and has been active in a variety of ways to disseminate results of the research project. We believe that regardless of how interested a grantee may be in promoting use of his results, formal utilization planning should be accomplished. Even with flexible planning, which may sometimes be desirable, this procedure would enable RANN to measure performance against established criteria. RANN would therefore be more able to evaluate the potential for user implementation of research results.

Utilization Planning for four projects under the formal guidelines

RANN's interim guidelines for unsolicited proposals were revised in November 1973 and formalized in May 1974. The section on dissemination and promotion of research results was expanded to include more specific guidance within the overall philosophy of encouraging user involvement and disseminating research results. The guidelines state:

> "* * * An essential feature of the RANN program is a commitment to the practical application of knowledge in the solution of national problems. Each RANN proposal is expected to include a utilization plan which describes the steps necessary to ensure the use of research results by the relevant public or private sector communities. * * * In some instances extensive user involvement might be premature or the practical application of results in some projects may be so simple, obvious and direct, as to require no elaborate plan. * * * The proposer will be expected to develop a utilization plan based on the nature of the project, anticipating the factors that might hinder acceptance and use and suggesting means of mitigating them.

"The utilization plan should generally include the following elements:

(1) User Group Identification--The plan should identify the specific groups and individuals that might be expected to use the projected results. If representatives of user communities have participated in defining the problem to which research is to be addressed, their role and inputs should be explained. Potential users who have been, or will be, involved in the planning, conduct or oversight of the proposed research should be identified. Users might include Federal agencies, cities, states, regional units, industry, unions, trade associations, national organizations, professional societies, universities, citizen groups, legislative groups, judicial units, and others.

"The extent to which the potential user communities perceive the need for solutions to the problems addressed by the research is important. Evidence of such interest should be included in the proposal.

"(2) User Demand Description--Where a specific product or process is identifiable as an expected result of the proposed research, the plan should estimate the nature of the existing and long-range potential demand. The plan should identify the various parties who could affect the use of the results and possibilities for their beneficial involvement. Barriers anticipated to achieving full use should be identified along with possible ways of surmounting such barriers. The plan should estimate the extent of user demand and the actions required to achieve utilization. In estimating user community demand or size, consideration should be given to potentially competitive techniques, products, and programs; and the circumstances under which the output of the proposed project would be preferable should be explained.

"(3) Utilization Process Description--The plan should describe in logical sequence the specific steps needed to provide for dissemination and use of research results. The plan should indicate when the steps will be taken, the level of effort to be expended and an identification of the parties (e.g., proposing organization, users, other groups, etc.) that will be responsible for implementing the plan.

"The plan should also indicate willingness of the proposer to participate in the utilization process subsequent to completion of the research. This might include dissemination activities such as speaking, writing, teaching, user training, or technical assistance, or follow-on awards to the proposer or third parties for further testing and experimentation.

"(4) Utilization Budget--Costs of utilization activities, including technical assistance and information dissemination, may be provided for under RANN awards. The cost components associated with the research utilization process should be clearly indicated * * *. Adequate funding to cover cost of implementing utilization plans should be requested in the budget."

The guidelines are intended to aid RANN management and researchers in planning for use of research. Inclusion of the information suggested by each element of the guidelines in the research proposal is not mandatory. To determine if the revised guidelines resulted in improved utilization planning, we reviewed the utilization plans for four unsolicited proposals which resulted in awards during August 1974.

The review of these proposals indicates that emphasis on utilization seems to be increasing, because, with one exception, these proposals did contain more detailed dissemination plans than the earlier proposals we reviewed. However, only one proposal contained a utilization plan that was formatted so that the utilization plan elements suggested in the guidelines were easily recognizable. While two of the remaining three proposals contained utilization plans,

the utilization elements were scattered through the proposals rather than being summarized in a formatted utilization plan. One proposal did not contain any utilization plan.

A description of the four projects and the utilization planning in the proposals follows.

A study of aerodynamic methods to reduce fuel consumption by present and future tractor trailers

This is a two-phase project to develop design modifications for tractor trailers to decrease fuel consumption. Phase one involves developing aerodynamic modifications to existing tractor trailers. Phase two involves developing new designs for tractor trailers. Current funding is $184,500 for an 18-month effort which expires on June 30, 1976.

Details of the utilization plan follow.

"* * * User Group Identification The results of the research * * * are intended for the use of governmental, industrial, and commerical interests * * * involved in the conduct or regulation of freight transport by tractor-trailers. To insure that the activity will produce results that will find immediate and practical application by the user group, the research activity will be carried out in consultation with a board of reviewers chosen to represent the user groups. The Review Board includes two members from each of the following organizations or industries:

The National Science Foundation
The Department of Transportation
The American Trucking Association
Tractor Manufacturers
Trailer Manufacturers

"* * * User Market Description * * * There are on the order of one million tractor-trailer units on the road in the United States today. The operators of each of these vehicles is a potential user of the

aeromodifications that will be developed during * * * this research effort. Precluding the influence of future legislation, the user demand will be stimulated, via the dissemination process, by the cost benefit that would result from the application of aeromodification concepts.* * * The potential demand for the application of the advanced design concepts that will evolve from this research activity is equal to the number of tractor-trailers produced in the United States each year. The incentive for manufacturers to produce vehicles of advanced design will be provided, if not dictated, by the widespread acceptance of the concept of aeromodification of existing vehicles by the commercial trucking industry."

"* * * Utilization Process Description The utilization process is a very important component of this research activity. The effective communication of the research results will, barring legislation, be the impetus for the acceptance and immediate application, of the aeromodifications and advanced design concepts developed in this investigation. To accomplish that end, the utilization process will include Review Board Meetings, the publication of technical reports, the publication of articles in trade journals and magazines, the production of promotional publications, and the conduct of workshops. * * *"

"* * * The Review Board will meet periodically to review the progress of the research, to offer necessary criticism, and to provide required information. * * *"

"* * * At the completion of each major task, technical reports will be written to describe the appropriate research results. These will be published * * * and will be distributed to the appropriate user groups. * * *"

"* * * The technical reports will form the basis for the publication of articles in journals and trade magazines utilized by the user groups."

"* * * Promotional publications will be prepared at the conclusion of the aeromodification development phase, and at the end of the advanced design phase. These documents are intended for the effective dissemination of the total results of each phase to a broad spectrum of the tractor-trailer industry. The content of these publications will be designed to summarize and publicize the results of the investigations and to strongly emphasize the benefits that would follow the implementation of the final recommendations. The publications will be written and illustrated so as to be easily understood by a reader with a limited technical background * * *."

"* * * workshops will be conducted during the course of the investigation to provide for the effective interchange of information between the research team and the user group. * * *"

As can be seen by the foregoing information, the utilization plan for this proposal was formatted in accordance with the guidelines. All utilization elements were brought together in one easily recognizable section which facilitated review and should be helpful to program managers and peer reviewers who have limited time for reviewing proposals.

Although the utilization plan will not guarantee that the research will be successful or that ultimate utilization will be effective, in our opinion it does establish that there is a potential demand for the research results, a group willing to implement the results of the research, and a process for transmitting the research results to the users. In addition, it gives RANN management an expected result against which it can measure progress and implementation.

Evaluation of seismic safety of buildings

This project proposes to evaluate the degree of protection from earthquakes provided by a structure's design. If accomplished, the proposed research would provide a better measure of the safety actually provided by earthquake design, a comparison of the advantages of alternative design methods, and a sound basis for improving design procedures

and building-code provisions. The results are to be related to typical real world buildings to aid the practicing engineers and code-writing agencies to understand the results of the study. RANN funding of $236,500 will expire in February 1977.

The proposal did not contain a utilization plan; however, several statements scattered throughout the proposal hinted at utilization. Examples follow.

> "Every effort will be made to present the results in clear terms so that application by code-writing agencies and practicing engineers can be accomplished with a proper understanding of all the factors involved in the seismic safety analysis."
>
> "Close cooperation is planned with engineers on the West Coast currently involved in seismic design case studies on some eleven existing buildings."
>
> "It is expected that the result will be a series of recommendations regarding the applicability of these methods to practical design."
>
> "If this study is successful, it will yield valuable practical information about (i) the required variation in load factor to provide the same seismic safety by different procedures and (ii) the extent to which the variation in load factor affects seismic safety for a given procedure. It will also allow one to draw useful conclusions regarding the safety provided by conventional procedures."

The project files provided no indication that potential users had either assisted in establishing research objectives or were to be involved in the planned research activity. A Federal agency and a city official had reviewed the proposal, but engineering firms had not.

In presenting this proposal to the Grant Review Board for approval, the RANN program manager said results were to be incorporated in another RANN-supported project which was preparing new seismic building provisions and would provide

design criteria for professional engineers. Wide distribution was to be achieved through technical journals and two clearinghouses for research, one which was specifically designed for distribution of the results of earthquake engineering research.

Thus, utilization planning in the proposal was vague and did not cover the utilization elements suggested in the guidelines. The cognizant RANN program manager advised us that a detailed utilization plan as provided for in the May 1974 guidelines was not necessary since his experience with the researcher indicated that adequate attention would be given to use of the research. We believe that, a researcher's past performance notwithstanding, formal utilization planning should be part of sound research grant management.

A technology assessment in the area of mobile communications

This project concerns the social impact and policy analysis of mobile communications, such as two-way radios. Principal emphasis was on long-range policy implications of new technology presently coming from research and development organizations and likely to be used within the next decade. Noting that their research would concentrate on mobile communications, the researchers expected that, by remaining aware of the broad range of problems associated with the communications field, the experience gained would also apply to other communications problems. Project funding by RANN was $140,000 for approximately 15 months with a March 31, 1976, expiration date.

This proposal did not contain a utilization plan formatted in accordance with the guidelines; however, it did contain a section titled "Form of Research Output and Dissemination." This section stated that the results would be in the form of:

> "1. A monograph integrating the various parts of the completed assessment. This work will be substantive and comprehensive and will form the final project report. It is expected that this monograph will be published.

"2. Annual reports detailing the overall activity of the interdisciplinary research group. These reports will combine discussions of project design and management with synergistic discussions of the ongoing group research.

"3. Journal articles in various professional serials. These articles will detail the various members' research findings as these findings relate both to their disciplines and to the work of the entire group."

The section also stated that:

"A timetable for delivery of these materials must (with the exception of the annual reports) be dependent on the progress of individual research projects within the larger group, but we expect a stream of publicly available documents which we will disseminate as quickly as possible to all identified users.

"A major effort will be devoted to communicating with Federal, State, and local agencies that have responsibility in telecommunications. We expect to visit the FCC [Federal Communications Commission], OTP [Office of Telecommunications Policy], Commerce Department, and other organizations that can help us increase the significance of our work to public policy. Once research results emerge from our study, we will be responsible for written versions of the material in forms accessible to interested people in public agencies and private groups. We shall be available for consultations and explanations to any who can use the results of our work. As the result of our earlier work on technology assessment in the communications area, we have already established substantial contacts with government and industrial personnel; these contacts will be used throughout the proposed study."

Another section of the proposal provided for a three- or four-member review committee representing industry,

government, consumer-oriented groups, and universities. Although the review committee planned to meet once or twice annually, the researchers expected to maintain continual contact with committee members. A third proposal section advised that the research team was considering the desirability of holding one or two workshops to be attended by a small group knowledgeable in this research area.

In several sections of this proposal, the researcher recognized potential problems with more extensive usage of mobile communications that would be considered during the research. These included social, economic, and legal impacts as well as possible misuses of the technology, such as privacy invasion and criminal conduct.

The proposal did not contain all the utilization elements suggested in the guidelines. While it stated how dissemination was to occur, it did not estimate user demand and did not specify steps to promote decisionmaker awareness and involvement in the project. Although a detailed utilization budget was not contained in the proposal, consideration was given to publication and dissemination costs.

The cognizant program manager said the proposal had been submitted before the guidelines were formalized in May 1974, and it was decided not to revise utilization plans as provided for in the guidelines. He believed, however, that in a general sense, the proposal satisfied the elements of utilization planning in the guidelines.

The implications of alternative interpretations of the floor and ceiling provisions of the State and Local Fiscal Assistance Act of 1972

This project was funded for approximately 1 year for $85,500. The researcher, in his proposal, stated that the legislation which provided for allocating revenue sharing funds had at least two interpretations as to how funds should be distributed within a State. Preliminary analysis indicated that significant allocation differences could occur depending on which interpretation was used. The research objective of the project therefore was to analyze the effects of these alternative interpretations and to suggest a final interpretation and possible redrafting of the law.

A utilization budget of $15,950 was requested with the utilization plan contained in the formal proposal, as follows:

> "Utilization will take on several forms. First, the research results will be made generally available in the form of a research monograph which details the alternative legal interpretations and their empirical significance. Distribution of the monograph will be through several sources: first, the Institute for Research in the Social Sciences at Chapel Hill has agreed to be a central repository for the research. Second, monograph copies will be distributed to the various clearinghouses on revenue sharing research that are being set up. Third, availability will be advertised through The Review of Public Data Use and Data Access News. Fourth, copies will be deposited with NSF [National Science Foundation] and members of the advisory panel. Fifth, scholarly publication of the results will be sought.
>
> "The second research output, a series of computer programs, will be deposited with the Institute for Research in the Social Sciences at Chapel Hill which has agreed to distribute them at a nominal charge. Announcement of their availability will be through the above described channels.
>
> "It should be noted that efforts will be made to make available to Congressional staffs the research findings. For example, it is anticipated that a member of the Joint Committee on Internal Revenue Taxation staff will serve on the advisory panel and will provide a conduit for research findings."

Other planned utilization activities were scattered throughout the proposal. For example, the researcher reported that user interest had been identified and referred to informal contacts with staff members of the Joint Committee on Internal Revenue Taxation and two major public interest groups--the National League of Cities and the U.S. Conference of Mayors. Peer reviewers verified that substantial interest existed in the Congress and elsewhere.

The utilization plan did not identify user demand, barriers to utilization, or the specific steps which would lead to implementation of the research results. Also, utilization planning for this project was not formatted in accordance with the utilization elements suggested in the guidelines. Determining the extent of utilization activity planned for this project requires the reviewer to extract from the proposal those specific statements relating to utilization. This is a very time-consuming process to expect of RANN's peer reviewers.

The cognizant program manager said because the Congress was the intended user a detailed utilization plan as suggested by the May 1974 guidelines was not necessary. Also, this project was one of nine similar RANN research projects and a separate project would be funded to bring together and disseminate the results of all the RANN-sponsored general revenue sharing research.

Program solicitations

As discussed in chapter 4, RANN has made limited use of solicitations, which are more definitive than general program announcements for unsolicited proposals to request research proposals. As of October 14, 1974, 14 have been issued, resulting in 79 grants and 27 contracts totaling $14.3 million. Appendix II lists the solicitations.

RANN has not established utilization planning requirements for the program solicitations. The program manager responsible for the solicitation was to establish the extent of utilization activities for the researchers to follow. Our review of 10 solicitations showed that emphasis on utilization planning was not uniform and provisions for user involvement during the research activity varied considerably.

Little apparent user involvement

One program solicitation requested proposals for determining the technical and economic feasibility of potential concepts for large ocean-based power plants and for developing a related test program. In addition, proposals were requested to study design and performance of key

components and subsystems for various concepts of these powerplants. The solicitation requested that the researcher, as part of his proposal, discuss the potential benefits of the research. The solicitation did not require the researcher to plan for user involvement during the projects. Dissemination and utilization activities required by the solicitation included quarterly progress reports and a final report suitable for distribution outside the Foundation. Timely publication of technical papers covering significant and recently completed research project segments were encouraged. Additionally, the solicitation stated that an annual workshop-seminar was planned to discuss progress and that special workshops and evaluations would be conducted periodically. The solicitation informed researchers that all awardees would be expected to participate, as appropriate, at these functions.

We recognize that this solicitation may be considered as a feasibility study project; however, we do not believe this alleviates the need for active user involvement for assurance of consideration of their needs and demand for the research.

Extensive user involvement

Another solicitation requested proposals to develop policy tools, analyses, or evaluations to aid local governments in service measurement, service pricing, and capital planning. Award objectives were to provide the knowledge needed to improve the delivery of local government services by evaluating or analyzing alternative policies and practices related to the measuring, pricing, and planning of services and to foster extensive use of validated alternatives among local governments. Required dissemination and utilization activities were as follows:

--Demonstrate the degree of interaction with user groups during the proposal planning stage and during the project to provide assurance that the the research focuses on user problems.

--Consider problems in implementing research results, explain how options would be evaluated for usefulness to users, and explore ways for use of research results by other users.

--Research results were to be designed for use by users with limited resource capability and include a comprehensive report and user handbook.

--One-third of the emphasis in evaluating the research proposals was to be on the utility to the user community considering quantity and quality of user interaction, effectiveness of design for use, applicability to users with limited analytical staff, quality of validation design, and researchers' willingness to commit themselves to utilization activities.

We believe that RANN should develop utilization requirements for program solicitations to aid program managers in developing solicitations that will provide emphasis on utilization activities, such as the May 1974 guidelines for unsolicited proposals.

UTILIZATION BUDGET

Before formalizing the guidelines in May 1974, the RANN program did not require researchers to distinguish between research and utilization funds within their proposals. The guidelines, however, state that the cost components associated with utilization activities should be clearly indicated in the proposal.

The director of the Office of Intergovernmental Science and Research Utilization informed us that, during fiscal year 1973, about $5.3 million was expended on utilization. This amount, 7.5 percent of the RANN budget, was determined by RANN officials reviewing their awards and estimating the amount spent on utilization.

In response to our request, the Research Applications Directorate estimated on January 28, 1975, that its fiscal year 1975 expenditures for utilization activities would be about $18.3 million, approximately 12.7 percent of the fiscal year 1975 appropriation. A RANN official said the estimate included utilization activities associated with solar and geothermal energy projects which were being transferred to the newly created Energy Research and Development Administration.

We did not attempt to verify the accuracy of either of RANN's estimates for utilization activities.

VIEWS OF RANN RESEARCHERS AND THE RESEARCH USERS

We used questionnaires to ask recipients of RANN research awards and the research users questions concerning dissemination and utilization activities of the projects with which they were affiliated. Their responses collectively showed limited involvement by research users in RANN projects, which, considering the problems we documented in reviewing RANN research projects, indicates further that RANN management needs to place increased emphasis on involving specific initial and secondary users early in planning for utilization of research.

As of June 30, 1974, the Foundation had awarded RANN program grants or contracts to 908 individual researchers. Our questionnaire data was based on responses from 465 of the researchers, of which 130 questionnaires were randomly sampled and analyzed, which provided a 95-percent level of confidence that the survey results were representative of the 465 researchers within a maximum error rate of plus or minus 7.5 percent.

The Foundation does not have a management information system to identify users of RANN research; however, at our request RANN officials, from their personal knowledge, provided us a list of about 500 users affiliated with RANN research projects. Our analysis of questionnaire data is based on the first 150 users responding to our questionnaire.

Respondents did not always answer each question for the 130 researcher questionnaires and the 150 user questionnaires which we analyzed; however, the number of respondents who failed to answer a given question, in most cases, was insignificant. Percentages stated in the following analysis of the questionnaire results are expressed as a percentage of the persons who actually responded to the question.

Utilization planning

About 83 percent of the researchers said their research proposal approved by RANN management had a utilization plan and 17 percent stated no plan was developed. Only about one-half of the researchers with a utilization plan identified a specific user. In addition, of the researchers with a utilization plan, only 47 percent planned to keep users informed of all ongoing research, less than 31 percent planned to have users involved in evaluating the results, and only about 34 percent planned to demonstrate the results to users.

RANN program managers said user involvement in program planning, evaluation, monitoring, and dissemination was the most effective method for disseminating and encouraging the use of research results. The questionnaire data provided by the researchers, however, indicated limited user involvement in the research projects. For example, the following percentage of researchers provided for user involvement in the research project processes:

Research process	Percent of researchers
Preparing the proposal	35
Evaluating the proposal	38
Monitoring the award	14
Disseminating results	53
Promoting replication of use	39

The questionnaire data obtained from the users also indicated their involvement in the research projects was limited and that they would prefer more involvement. For example, the following schedule shows the percentage of users stating they were requested by the researcher or RANN officials to provide assistance in the research project processes and the percentage of users who believe they should have been involved.

Research process	Users requested to assist	Users wanting to assist
	(percent)	
Identify specific user needs	47	52
Develop proposal and research plan	32	45
Evaluate research proposal	56	70
Identify barriers to implementing research results	24	48
Conduct research program	28	31
Monitor research progress	38	53
Evaluate results	34	76
Disseminate results	22	52

We asked the users how they became involved with the research. About 50 percent stated they were either contacted by the research team or RANN officials, and the remaining 50 percent became involved through indirect contacts, such as referrals by other government officials, trade associations, workshops, or conferences. A majority of the users answering our questionnaire stated that the more effective mechanisms for obtaining the views of users were through their inclusion in the research proposal evaluation and their participation in planning conferences and workshops. In addition, about 46 percent of the users identified reviewing RANN's established program areas as an effective mechanism.

Utilization funding

Forty-six of 117 respondents funded by RANN advised us that their project budget separately identified funding for utilization activities. Of the 46, 33 believed the funding was adequate; the other 13 believed it was inadequate or did not express an opinion.

We asked the RANN research users how much the RANN program should spend for the implementation/utilization phase of the RANN research project they were affiliated with compared to funding for performance of the research. About 23 percent said they had no basis for judging. Of the remaining users, about 42 percent indicated the amount should be more than the research funding, about 13 percent said an amount equal to the research funding, and about 22 percent

said an amount less than the research funding. If such views were implemented by RANN officials, at least half the RANN research budget would be allocated to implementation activities--a significant change from current budgeting/ program practices.

Barriers to implementation

We asked the RANN research users to rate the following possible barriers to implementation from their experience with technology made available through the RANN research project with which they were affiliated. The number of respondents who expressed an opinion ranged from 76 to 96 for the individual barriers. Their responses, which follow, indicate that RANN users were having some degree of problem in each possible barrier. Although there are no instances in which the majority of users were confronted with serious barriers to implementing research technology, RANN should give consideration in its proposal review process to those barriers which a substantial percent of users have acknowledged as being somewhat serious or definitely serious problems to the user's implementation of research technology.

Possible barriers	Percent of respondents to an individual barrier who checked				
	Little or no problem	Somewhat of a problem	Moderate problem	Somewhat of a serious problem	Definitely a serious problem
Technological forecasting:					
Lack of good methodology for technological forecasting	46	20	9	9	16
Lack of involvement of the user organization's planning management in technological forecasting	47	16	13	11	13
Accurate and timely technological forecasts	40	18	15	13	14
Market forecasts:					
Uncertain or inaccurate market predictions	38	11	23	17	11
Unforeseen adverse changes in the market condition	40	12	22	14	12
Market's unwillingness to make necessary adjustments for the utilization of innovations	32	8	16	21	23
Impact constraints:					
Lack of effort in predicting and overcoming the undesired impacts of the innovation	46	14	18	18	4
Public resistance because of uncertainties, lack of information, and apprehension associated with major or sensational technological innovations	32	13	16	26	13
Resistance to technogical advances by protectionists and special interest groups	28	20	20	12	20
Regulatory and legal constraints	34	22	15	12	17
Social and political constraints--innovations that conflict with certain myths, cultural values, or old traditions, and political ideologies	35	10	20	23	12
Public distrust created by former abuses	43	19	18	12	8
Educational incapacities--former learning or training conflicts with information or knowledge required for acceptance and operation of the innovation	45	16	16	12	11

Resistance to change:					
Organizational resistance attributed to devaluation of former investments, decisions, markets, knowledge, skills, and echelons of responsibility	29	16	19	25	11
Failure of the system to reorganize to exploit the technology	32	14	20	22	12
Requirements for new investments, facilities, equipment, training, skills, marketing and operating procedures	19	15	20	26	20
Excessive emphasis on reducing costs and improving performance and productivity by modifying existing services and products rather than by replacing them with an innovative alternative or a new concept	37	23	16	12	12
Financing:					
Disproportionate investments in R&D when compared to utilization or application	43	15	14	19	9
Disproportionate underinvesting in high risk, high payoff, and highly capitalized systems	52	10	16	15	7
Difficulty in obtaining venture capital	39	14	16	14	17
Lack of attractive amortization periods	50	10	13	18	9
Incentives:					
Insufficient return on investment	47	11	21	10	11
Lack of direct or indirect Government subsidies	48	15	11	11	15
Exclusive rights to offer the innovation	64	5	11	10	10
User capabilities:					
Requirement for indoctrinating potential users	36	23	21	14	6
Limited availability of people knowledgeable in the state of the art	29	29	13	17	12
Limited capabilities of users to learn or adopt the innovation	35	18	22	18	7
Technological obsolescence of workforce	46	21	15	10	8
Knowledge, concepts, and information required to know the new innovation are not considered in the curriculum of the educational system	40	22	10	15	13

EVALUATION OF PROJECT RESULTS FOR IMPLEMENTATION

Before December 1974 the RANN program did not have a formal system for postevaluation of projects. Project evaluation activities, for the most part, were conducted during the initial funding of research proposals, renewal funding, monitoring of the research being conducted, and review of progress and final reports.

On November 26, 1974, we met with RANN's director of the Office of Programs and Resources and his deputy to discuss a draft of a management circular establishing a formal evaluation system for RANN research programs and projects. The circular proposed formal procedures for program evaluation, project evaluation, and product evaluation, such as a final technical report. During our discussion with these officials, we found that the circular did not include provisions for determining the extent of implementation of research results. We said RANN should have a formal system for ascertaining how extensively its results were used. We advised the officials that such mechanisms were necessary for RANN management to determine how effectively the program is fulfilling its mission of applying research to national needs.

The final circular, issued December 19, 1974, was modified to provide for utilization evaluation, as follows:

> "* * * Utilization Evaluation. At intervals which allow for potential utilization of RA [Research Applications] results a follow-up utilization evaluation will be conducted by the RA Evaluation Committee on a sampling basis. This utilization evaluation will compare the actual use of project results with those anticipated and analyze the factors contributing to or inhibiting such utilization. This information will be fed back to program areas for possible use in current or planned projects."

In December 1974 RANN officials also issued a request for proposals to develop a prototype program evaluation system. The request for proposals provides for developing criteria for evaluating RANN program elements, including evaluating the applicability of project results to identified national needs and readiness of project results for use by the target user. A manual for evaluating RANN programs is to be prepared and tested on RANN programs.

OTHER UTILIZATION ACTIVITIES

The Research Applications Directorate has established a library, administered by the Office of Intergovernmental Science and Research Utilization, to accumulate reports of research projects it has supported. The library, which is open to the public, had accumulated 960 final or interim reports as of the beginning of October 1974. The number of reports available by division or office was as follows:

Advanced Energy Research and Technology	356
Advanced Technology Applications	247
Environmental Systems and Resources	102
Social Systems and Human Resources	44
Exploratory Research and Problem Assessment	51
Intergovernmental Science and Research Utilization	160
Total	960

We were informed that, because the library was established approximately 2-1/2 years after RANN began, it may not have a complete collection of RANN reports. However, retrieval of earlier issued reports was continuing.

In addition to being incomplete, the library has not provided all the RANN reports to the National Technical Information Service, a principal channel through which secondary distribution of research reports is achieved. The service, established in 1970 by the Secretary of Commerce, is a clearinghouse for technical information to simplify and improve public access to scientific and technical reports published by Federal agencies and their contractors. It is the United States center for public sale of Government-funded research and development reports and other analyses prepared by Federal agencies and their contractors or grantees.

About two-thirds of the 960 reports had been provided to the service. The remaining one-third were backlogged because brief summaries or abstracts of the reports as required by the service were not available. An Office of Intergovernmental Science and Research Utilization official informed us that the Research Applications Directorate did not have sufficient inhouse resources to eliminate the backlog. The official responsible for the library said that on occasion, he had prepared report abstracts when concerns about specific scientific areas were expressed through the media. At the time of our review, RANN was considering alternative measures for preparing abstracts of those reports not yet submitted to the service.

The directorate has established procedures which, if implemented, should prevent further backlogs of reports. On May 21, 1974, the directorate established an interim requirement that all final technical reports and selected progress reports, when believed beneficial to potential users, should be forwarded to the service through the library and that program managers were to require their awardees to prepare abstracts and other information necessary to submit reports to technical information and dissemination systems.

CONCLUSIONS

Management of the Research Applications Directorate has increasingly placed more emphasis on means to obtain utilization of RANN research results. This is evidenced by the establishment of more detailed guidelines for utilization planning for unsolicited proposals; a report library; requirements for submitting reports to the National Technical Information Service; increased funding for utilization activities; and a formal evaluation system for programs, projects, and research products. Further improvements are needed, however, to help assure that RANN research results will be used to the fullest practical extent.

There was a general lack of thorough utilization planning for the six research projects we reviewed which, for the most part, were initially funded and renewed under RANN's 1971 interim guidelines for unsolicited proposals. Users for the initial application to determine concept feasibility were not always identified in the projects' early stages, and user involvement for secondary applications generally did

not exist. Also, there appeared to be very little initial planning to identify potential barriers to implementation. In addition, elements of utilization planning were often scattered throughout the proposals, making it difficult to determine the scope of planned utilization activities.

Our review of four projects funded under RANN's revised May 1974 guidelines for unsolicited proposals showed that emphasis on utilization planning seemed to be improving. However, only one of the projects met the utilization planning elements of the revised guidelines. One project did not contain a utilization plan. To insure adequate emphasis on utilization planning, the information suggested by the guidelines for unsolicited research proposals should be a prerequisite for having a research project funded by RANN.

Utilization planning guidelines have not been established for research proposals submitted in response to program solicitations. Our review of 10 solicitations showed inconsistent and sometimes inadequate emphasis on utilization planning. Utilization planning requirements for solicited proposals should be developed.

A sample of RANN researchers and RANN research users showed little user involvement in the research project processes, which could indicate that this problem may be widespread.

RECOMMENDATIONS

We recommend that the Foundation's Director require that:

--The information suggested by the May 1974 utilization planning guidelines for unsolicited proposals be made mandatory and emphasis be added to the guidelines providing for early identification and active involvement of initial and secondary users.

--Utilization planning requirements be developed for proposals submitted in response to program solicitations.

--Ongoing unsolicited and solicited research projects' utilization plans be reviewed against the May 1974 guidelines and the recommended requirements for solicited proposals, respectively, to determine if the plans need modification.

--Utilization plans in research proposals be a distinct, separate part.

AGENCY COMMENTS

The Foundation generally agreed with our recommendations but stated that it was concerned about the cost effectiveness of more extensive utilization planning at the project level and that the degree of utilization planning must be a function of overall program design.

In response to recommendations one and four above, the Foundation required that the RANN utilization guidelines of May 1975 (essentially a reprint of the May 1974 version) be mandatory in that evidence of intended research use be stated specifically and systematically in the research proposal.

The Foundation commented, however, that the cost effectiveness of extensive utilization planning at the beginning of a project must be considered and that planning must be judged in terms of overall program design. Some RANN proposals, therefore, may contain heavy utilization activity at one point in time and others little. In this respect, the Foundation believes that much more vigorous utilization planning for program elements, such as environmental systems and resources or social systems and human resources, must be done and that it plans to develop a utilization plan for each program element. The Foundation further commented that it does not have many validated predictors of utilization performance and that RANN is analyzing the utilization performance of 120 projects to establish better predictors.

We recognize that the degree of utilization planning for a research project may vary for a variety of reasons, including type of research (basic versus applied) and project significance; accordingly, we would not expect each project to have extensive utilization planning. However, each project should clearly identify its intended user group and market--the basic data requested of researchers by the May 1975 RANN utilization guidelines. Also, the plan should provide for some degree of contact with users throughout the project. Utilization planning at the program level, as suggested by the Foundation, should help determine the appropriate degree of utilization planning for each of the program's research projects.

A priori program utilization plans, however, are no substitute for effective utilization planning at the project level. The Foundation commented that RANN program utilization plans will show the expected users and the expected flow of product over time to the users. Specific user involvement will apparently continue to occur primarily with research projects funded under the program, necessitating effective utilization planning at the project level.

The Foundation commented that as research progresses utilization activity may change from the initial plan. It cited examples from projects we had reviewed for utilization planning, generally showing that, as research progressed, utilization activity increased beyond what had been provided for in the utilization plan. The Foundation's point was that it may be more cost effective to provide for more intensive utilization activities as the research progresses rather than developing extensive utilization plans at the start of a project. RANN's study of utilization performance for 120 research projects will further consider this point.

Nevertheless, we believe utilization planning should be systematic--not left to chance--and should provide for user involvement. In general, the RANN research projects we reviewed, funded under RANN's interim utilization guidelines, lacked such utilization planning and barriers to implementation apparently were considered as problems arose which, in some cases, was after a project was ongoing for several years. Emphasis on utilization planning seemed to increase, however, with the issuance of RANN's May 1974 utilization guidelines. RANN's requirement that its utilization guidelines will be mandatory should also provide for systematic utilization planning.

The Foundation commented that our report does not adequately reflect the complexity of research utilization as there are many factors besides research that enter into user decisions and therefore the contribution of RANN research must be judged on an incremental basis. We agree there are other factors affecting decisions to use research and that RANN research may be used with other research results or data to satisfy a user's need. The complexity of research utilization highlights the need for utilization planning involving users at the early stages of a program or project to determine how the research results will help meet their specific needs and to identify early the barriers to implementation, such as financing or user capabilities, so that timely action can be planned to overcome such barriers.

In response to our recommendation that utilization planning requirements be developed for solicited proposals, RANN plans to emphasize that proposed program solicitations must have a specific utilization design to be evaluated as part of the solicitation review process. We believe this requirement will improve understanding of expected utilization and provide a better basis for determining the degree of user involvement to be provided for in individual research proposals funded under the solicitation.

To insure that ongoing RANN research projects contain utilization plans conforming to RANN's May 1974 guidelines, we recommended that each project's utilization plan be reviewed to determine if modifications were necessary. RANN agreed to review all projects funded before the May 1974 guidelines. Our limited review of projects funded under the guidelines showed that not all projects conformed with the guidelines. For example, one project funded for $236,500 to evaluate seismic safety of buildings did not contain a utilization plan. Therefore, we believe that projects funded under the May 1974 guidelines should also be checked for adequate utilization planning.

CHAPTER 6

RANN MANAGEMENT STAFF

Because of interest expressed by the Senate Special Subcommittee on the National Science Foundation, we reviewed the formal education and job experience of RANN management officials and RANN staff recruiting policies, procedures, and practices. Since the Office of Intergovernmental Science and Research Utilization is responsible for promoting use of research results generated by RANN, we included the key management officials of this office in our review. The personnel in each division and office in the Research Applications Directorate will be hereafter cited as RANN personnel.

Our review concerned RANN personnel on board as of June 30, 1974, and included program managers--the officials responsible for the daily activities of awarding and managing research grants and contracts--and top management officials--the assistant director for Research Applications and his deputy directors, division directors, and office directors. These key officials accounted for 80 of the 145 individuals on the RANN staff. Program analyst and clerical positions were not reviewed. Figure 6-1 shows the key management position for each RANN division and office.

The key officials in total were highly educated in the various scientific disciplines, having considerable working experience in public, private, and academic organizations. Engineering degrees accounted for 61 of the staff's 184 total degrees. The Federal Government accounted for 413 of 1,208 total years of work experience, followed by industrial organizations and academic institutions with 327 years and 308 years, respectively.

RANN officials prefer to recruit their staff through personal referrals of RANN employees and have much used the Foundation's excepted hiring authority--the authority to hire personnel directly without complying with competitive hiring procedures established by title 5, U.S. Code, and Civil Service Commission regulations.

The Commission said it has professional and technical personnel on its registers of qualified personnel seeking Federal

employment. We believe the Foundation's Director should determine if desired personnel are available from these registers before using the excepted authority.

FORMAL EDUCATION

The 80 RANN key management officials hold 184 degrees--44 doctorate degrees, 59 master's degrees, and 81 bachelor's degrees; a few hold more than 1 master's degree or bachelor's degree. Of the total degrees, 61, or 33 percent, are in engineering; 58, or 32 percent, are in physical sciences; 32, or 17 percent, are in social sciences; and 33, or 18 percent, are in nonscientific disciplines, such as business and public administration. Figure 6-2 shows the total number of degrees by field of study, and figure 6-3 shows the degrees by field of study held by personnel in each RANN division or office.

WORK EXPERIENCE

From the Foundation's personnel records, we summarized the work experience of RANN's 80 key management officials from January 1, 1946, until RANN employed them. As shown in figure 6-4, the officials had a total of 1,208 years of work experience in various organizations that included Federal, State, and local governments and academic, industrial, research, and consulting organizations. The most dominant prior employer was the Federal Government with 413 years followed by industrial organizations and academic institutions with 327 years and 308 years, respectively.

STAFF RECRUITING: AUTHORITY AND PROCEDURES

Section 14(a) of the National Science Foundation Act of 1950, as amended, authorizes the Foundation's Director to employ personnel under title 5, U. S. Code. This title governs competitive appointments to Government service, job classification and pay rates. However, section 14(a) also provides that the Director may employ, as he deems necessary to discharge his responsibilities, technical and professional personnel and determine their salaries without complying with the competitive hiring provisions of title 5. Appointments under this latter authority are called excepted appointments.

The competitive appointments as governed by title 5 and the Civil Service Commission's regulations generally provide for position classification according to Government General Schedule pay schedules (such as GS-1), competitive examination, and a probationary employment period. The Foundation's Director, by exemption from these requirements, has considerable flexibility in hiring and dismissing personnel and in determining compensation.

Most of the 80 RANN key management officials were employed through excepted appointments. For example, as of June 30, 1974, 59, or 87 percent of the 68 RANN officials employed by the Foundation, had been hired by excepted appointment; 9, or 13 percent, had been hired through competitive appointment procedures. The remaining 12 were acting as program managers on their temporary assignments to the program--3 from other Federal agencies and 9 under the Intergovernmental Personnel Act of 1970, which provides for temporary assignment of personnel between the Federal Government, State and local governments, and institutions of higher education.

Of the 68 RANN officials employed by the Foundation, 27 had transferred to RANN directly from other Foundation programs--22 of the transferees were hired on excepted appointments and 5 were on competitive appointments. The transferees came into RANN about the time it was created in March 1971 from the following Foundation organizations--Research Directorate, 15; National and International Directorate, 5; Institutional Directorate, 6; Foundation Director's Office, 1.

Various RANN division and office directors said they preferred to recruit RANN professional personnel from personal referrals by other RANN officials, although other sources, such as responses to job announcements, referrals from Foundation officials other than RANN officials, referrals from the Civil Service Commission, and walk-ins, were also used.

The general RANN procedures for hiring professional staff follow. The Foundation's Director interviews all candidates for a top management position such as assistant director and deputy assistant directors. He then makes a final selection from these candidates.

Applications for a middle management position such as directors or deputies of divisions and offices are reviewed by RANN deputy assistant directors. Their recommendation is forwarded to the assistant director for Research Applications for his approval and subsequent concurrence by the Foundation's deputy director.

The hiring procedures for a position of program manager are somewhat different for reviewing applications for excepted appointments and competitive appointments. For excepted appointments, the division or office director with the vacancy will recommend a candidate to the RANN program assistant director and assistant deputy directors for Research Applications for their concurrence. In addition excepted appointments are approved by the Foundation's deputy director. For competitive appointments, an ad hoc panel initially evaluates applications; members, designated by the Foundation's Personnel Office, include representatives from RANN. The panel's recommendation is provided to the applicable RANN division or office director for his approval and subsequent concurrence by RANN's assistant director and assistant deputy directors for Research Applications, and the assistant director for Administrative Operations.

Figure 6-5 provides a classification of the 68 RANN key management employees by type of appointment and grade level for each RANN division and office. The grade levels for the excepted appointments are classified by the Foundation to correspond with the equivalent General Schedule salary ranges for competitive appointments.

The excepted hiring authority gives RANN management more freedom to use top Government salaries (such as supergrades GS-16 through 18) to attract personnel than under competitive hiring authority. For example, the Civil Service Commission controls the number of supergrade positions alloted to an agency under competitive hiring procedures. The Foundation's personnel officer said the Foundation has not requested supergrade positions from the Commission because individuals can be hired under the excepted appointment authority at salary levels equivalent to supergrades.

The number of competitive appointments and excepted appointments is, however, subject to employment ceilings

established by OMB. In fiscal year 1974, OMB approved a ceiling of 1,190 positions for the Foundation. The Foundation's deputy director alloted 150 positions to the assistant director for Research Applications. The 12 RANN key management officials on temporary assignment are not included in the allotment. In accordance with guidance from OMB, the Foundation's Director also established an average grade ceiling of 10.4064 for the 1,190 positions. The assistant director for Research Applications was alloted 1,482 gradepoints. Excepted appointments would be considered at the equivalent General Schedule level in determining an average grade ceiling; each General Schedule level would equal one point--GS-1 equals one gradepoint.

The assistant director for Research Applications allots positions and gradepoints to his division and office directors. Figure 6-6 shows the personnel allotments and their status as of June 30, 1974 for each RANN division and office.

Availability of professional and technical personnel

According to the manager of the Civil Service Commission's Washington area office, the Commission has on its registers technical and professional personnel who have qualified for Federal employment under competitive appointment procedures.

Our view on recent proposed legislation containing provisions excluding personnel from the provisions of title 5, U.S. Code, governing appointments in the competitive service, is that there should be some statutory ceiling on salaries and it should be possible to obtain qualified technical and professional personnel within the General Schedule pay rates.

CONCLUSION

The RANN program has obtained a highly qualified staff to fulfill its mission. Most of this staff was hired by using the Foundation's excepted hiring authority. RANN should consider the availability of professional and technical personnel through the Civil Service Commission to fill its personnel needs before using the excepted hiring authority.

AGENCY COMMENTS

The Foundation believes persons most qualified for RANN's professional positions often do not appear on Civil Service Commission's registers and that RANN's time frame for recruitment makes use of the registers impractical. However, when the type of position requirement makes it advantageous, RANN will use the Commission's registers.

As previously stated, RANN has made little use of competitive appointment under title 5, U.S. Code; 87 percent of its key management officials on board as of June 30, 1974, had been hired through excepted appointments. The Commission's Washington area office has qualified technical and professional personnel on its registers. We see no reason for RANN to arbitrarily eliminate these persons from competing for its professional positions. As a minimum, RANN should establish and document an experience factor to demonstrate that persons with the education and experience it is seeking do not usually appear on the Commission's registers.

RECOMMENDATION

We recommend that the Foundation's Director require that a determination be made of whether desired personnel are available from the Civil Service Commission's registers before using the Foundation's excepted hiring authority. 1/

1/On September 26, 1975, the Foundation requested the Comptroller General to interpret the provisions of Section 14(a) of the National Science Foundation Act of 1950 concerning the extent of authority to hire personnel without regard to title 5, U.S. Code, governing appointments in the competitive service. This decision is pending; however, regardless of the interpretation reached, we believe as a matter of policy the Foundation should consider the availability of professional and technical personnel from the Commission's registers in hiring its staff.

Figure 6-1

RANN Key Management Officials
As of June 30, 1974

Division or office	Assistant director	Deputy assistant directors	Office or division directors	Office or division deputy directors	Program managers	Staff associate	Total
Office of the Assistant Director	1	4	-	-	-	-	5
Advanced Technology Applications	-	-	1	1	7	-	9
Advanced Energy Research and Technology	-	-	1	2	13	1	17
Public Technology Projects	-	-	1	2	2	-	5
Environmental Systems and Resources	-	-	1	2	8	-	11
Social Systems and Human Resources	-	-	1	1	8	-	10
Exploratory Research and Problem Assessment	-	-	1	-	4	-	5
Programs and Resources	-	-	1	1	-	-	2
Systems Integration and Analysis	-	-	1	1	5	-	7
Intergovernmental Science and Research Utilization	-	-	1	1	7	-	9
Total	1	4	9	11	54	1	80
Total expressed as a percent	1	5	11	14	68	1	100

Figure 6-2

Degrees Held By Field Of Study
For RANN Key Management
Officials

Field of study	Type of Degree				
	Ph. D.'s	Master's	Bachelor's	Total	As a percent
Physics	6	9	7	22	12
Chemistry	2	1	5	8	4
Biology	2	1	3	6	3
Other physical sciences	6	8	8	22	12
Aeronautical Engineering	1	2	2	5	3
Other engineering	13	18	25	56	30
Economics	5	6	6	17	9
Sociology	3	4	3	10	5
Other social sciences	2	-	3	5	3
Business or public administration	1	4	4	9	5
Other	3	6	15	24	13
Total	44	59	81	184	100

Figure 6-3

Distribution of RANN Key Management Officials
Degrees by Division and Office

Division or office	Number of key management officials	Total degrees held	Physics	Chemistry	Biology	Other physical sciences	Aeronautical engineering	Other engineering	Economics	Sociology	Other social sciences	Business or public administration	Other disciplines
Office of the Assistant Director	5	13	5	-	1	-	3	3	-	-	-	-	1
Advanced Technology Application	9	22	3	-	-	-	-	18	-	-	-	-	1
Advanced Energy Research and Technology	17	41	10	2	-	5	2	16	-	-	-	2	4
Public Technology Projects	5	8	-	-	-	1	-	6	-	-	-	-	1
Environmental Systems and Resources	11	28	2	2	3	10	-	4	2	-	-	1	4
Social Systems and Human Resources	10	24	-	-	-	-	-	1	7	5	4	2	5
Exploratory Research and Problem Assessment	5	11	-	2	2	2	-	-	-	5	-	-	-
Programs and Resources	2	2	-	-	-	-	-	-	-	-	1	-	1
Systems Integration and Analysis	7	17	2	-	-	4	-	5	5	-	-	-	1
Intergovernmental Science and Research Utilization	9	18	-	2	-	-	-	3	3	-	-	4	6
Total	80	184	22	8	6	22	5	56	17	10	5	9	24

Figure 6-4

RANN Key Management Officials
Work Experience by Type of Organization

Division or office	Number of key management officials	Federal Government	Industrial	Academic	Research performing	State and local government	Consulting	Other organizations	Total
		(years)							
Office of the Assistant Director	5	35	25	17	3	-	-	-	80
Advanced Technology Applications	9	33	50	59	5	-	1	-	148
Advanced Energy Research and Technology	17	100	69	84	37	1	-	-	291
Public Technology Projects	5	4	81	12	-	-	-	-	97
Environmental Systems and Resources	11	80	21	45	27	-	4	-	177
Social Systems and Human Resources	10	33	11	22	20	8	-	-	94
Exploratory Research and Problem Assessment	5	30	9	12	16	-	-	4	71
Programs and Resources	2	19	-	5	-	-	-	-	24
Systems Integration and Analysis	7	13	28	44	3	-	-	-	88
Intergovernmental Science and Research Utilization	9	66	33	8	-	31	-	-	138
Total	80	413	327	308	111	40	5	4	1,208

Figure 6-5

Appointment Classification of
RANN Key Management Officials (note a)

Division or office	Excepted appointments							Competitive appointments			
	GS-18	GS-17	GS-16	GS-15	GS-14	GS-13	Total excepted	GS-15	GS-14	GS-13	Total competitive
	(number of RANN officials)										
Office of the Assistant Director	4	1	-	-	-	-	5	-	-	-	-
Advanced Technology Applications	-	-	2	5	-	-	7	1	-	-	1
Advanced Energy Research and Technology	-	-	3	7	1	-	11	1	-	-	1
Public Technology Projects	-	-	3	-	1	-	4	-	-	-	-
Environmental Systems and Resources	-	1	2	4	1	-	8	1	2	-	3
Social Systems and Human Resources	-	1	1	5	1	1	9	-	-	-	-
Exploratory Research and Problem Assessment	-	-	1	2	-	-	3	1	1	-	2
Programs and Resources	-	-	1	1	-	-	2	-	-	-	-
Systems Integration and Analysis	-	-	2	1	2	-	5	-	-	1	1
Intergovernmental Science and Research Utilization	-	1	1	2	1	-	5	1	-	-	1
Total	4	4	16	27	7	1	59	5	3	1	9

[a]Excludes 12 RANN program managers on temporary assignment from other Federal agencies, State or local governments, or academic institutions.

Figure 6-6

Status of RANN
Personnel Ceilings as of June 30, 1974 (note a)

Division or office	Fiscal year 1974 ceilings		Personnel on board June 30, 1974	
	Grade-points	Positions	Grade-points	Positions
Office of the Assistant Director	134	10	135	10
Advanced Technology Applications	188	16	156	14
Advanced Energy Research and Technology	346	32	264	27
Public Technology Projects	106	8	75	7
Environmental Systems and Resources	233	20	218	19
Social Systems and Human Resources	190	16	176	15
Exploratory Research and Problem Assessment	121	11	102	9
Programs and Resources	138	14	127	13
Systems Integration and Analysis	120	10	100	8
Intergovernmental Science and Research Utilization	147	13	125	11
Total	1,723	150	1,478	133

[a]On June 30, 1974, RANN's staff totaled 145, which included 12 persons on temporary assignment not included in the Foundation's personnel ceilings.

CHAPTER 7

SCOPE OF REVIEW

Our review was directed at evaluating RANN's procedures, practices, and policies in

--developing its research components;

--preparing its research budget;

--evaluating solicited and unsolicited proposals submitted for funding;

--disseminating and using its research results; and

--hiring its management officials.

In conducting the review, we

--reviewed the legislative history and organizational structure of RANN to ascertain the program's authority and functional responsibilities;

--identified the major factors, such as committees, public and private organizations, and individuals, contributing to the development of RANN's research programs and also studied, in detail, the development process for two of its programs--land use and revenue sharing research;

--analyzed the process for developing the fiscal year 1975 RANN program budget and the assumptions that influenced the budget development at the various stages of the process and their impact on the program;

--reviewed the policies and procedures pertaining to evaluating solicited and unsolicited research proposals;

--analyzed the policies and procedures for disseminating and using RANN research results and made detailed reviews of utilization planning in research projects resulting from unsolicited proposals and in program solicitations requesting research proposals;

--reviewed the formal education and job experience of RANN management officials;

--interviewed RANN management personnel, RANN researchers, and users of RANN research from public interest groups; private organizations; and Federal, State, and local agencies.

In addition, we used questionnaires to obtain the views of:

--RANN management personnel; successful and unsuccessful applicants for RANN grants; and RANN research users on the policies, procedures, and practices used by RANN officials for evaluating research proposals, administering grants and contracts, and disseminating and using research results.

--All RANN officials serving as program managers as of April 1974 and about 500 users affiliated with RANN research projects.

--908 individuals who were successful in being awarded a RANN grant or contract and 1,195 individuals who were not successful as of June 30, 1974.

Our review was made at the Foundation in Washington, D.C., and at locations of selected RANN-sponsored research projects in the Boston, Sacramento, San Francisco, and Lake Tahoe areas. Our field work was done from February 1974 to January 1975.

APPENDIX I

RANN'S GUIDELINES FOR UNSOLICITED RESEARCH PROPOSALS CONTENT AND ITS PROCEDURES FOR EVALUATING THE PROPOSALS

PROPOSAL CONTENT

RANN's Guidelines for Preparation of Unsolicited Proposals set out format and content suggestions for unsolicited proposals. The guidelines were originated in September 1971 and revised in May 1974. The director of the Office of Programs and Resources told us the guidelines (1) were not requirements and that proposals not adhering to the guidelines would not be automatically rejected and (2) served as an inducement for researchers to upgrade the quality of their research proposals.

The 1971 guidelines, in general, provided for discussions of (1) the need to which the proposal is addressed, (2) the project research plan, (3) the project management plan, (4) related programs and activities, (5) dissemination of the research results, (6) vitae and bibliographies of the principal and senior investigators, (7) current support, (8) a research budget, and (9) applications to other Federal agencies.

The guidelines were revised in May 1974 to reflect RANN program experience since the prior version. Changes included adding discussions of (1) the applicability of the guidelines, (2) who may apply for support, (3) when applicants should submit proposals, (4) the use of incremental funding, (5) the Foundation's policy on its use of data and inventions developed through RANN support, (6) forms of RANN awards, (7) the use of student participants and the expected benefit to them, and (8) the RANN proposal review process. Additions to the guidelines which pertained to suggested proposal format and content were: (1) a table of contents, (2) a proposal summary, (3) a utilization plan to replace the old section on dissemination of anticipated research results, (4) sections on project evaluation, proprietory information, potential patents resulting from RANN support, and policies and procedures concerning first-time applicants, and (5) an abbreviated format for continuation proposals.

PROPOSAL EVALUATION PROCEDURES

The following identifies the sequential proposal evaluation steps, the possible proposal disposition at each step, and the RANN officials involved in each evaluation step.

Informal inquiries

Applicants seeking RANN grants frequently make initial informal inquiries concerning their ideas for projects by telephone usually, but occasionally by personal visits. RANN officials attending research conferences, symposiums, or workshops may also discuss with potential applicants contemplated research and its applicability to RANN research objectives.

As a result of an inquiry, the RANN official may encourage or discourage submission of a research proposal or refer the person to another funding source. RANN officials said lack of applicability to program objectives is the usual reason for not encouraging a proposal submission. The inquirer, however, can submit a proposal notwithstanding the outcome of the initial contacts.

Preliminary proposals

The guidelines encourage applicants to send in a brief preliminary proposal before submitting formal proposals. This is to enhance the acceptability of formal applications and avoid the submission of formal proposals that may not coincide with RANN's current needs. The RANN program manager, in informally reviewing the preliminary proposal, may discuss with the proposer such topics as the importance of the research topic to prospective users and to the Nation, the technical soundness of the idea or the approach, the identification of potential users for a successful result, the suitability of the research topic to RANN criteria (see p.), the appropriateness of the proposed research team's qualifications and resources for the task, and the availability of other support from Federal or private organizations. The program manager may obtain the concurrence of his superiors or other program managers in his judgment of the proposal.

If the program manager encourages the proposer to submit a formal proposal, initial review is usually facilitated because the program manager may have already provided a considerable amount of input to the proposer in reviewing the preliminary version. The program manager may also discourage the proposer due to inappropriateness to program objectives or a lack of scientific merit. According to a RANN official, most program managers seek concurrence in discouraging a proposal for lack of merit. A proposer who has been discouraged may withdraw his proposal, or he may develop a formal proposal and seek formal review by RANN.

The program manager informs the applicant of the decision, documents his action; and provides this documentation to RANN's Office of Programs and Resources, which is responsible for monitoring the processing of preliminary proposals. Possible notations on this documentation include "told not appropriate to RANN," "formal proposal requested," "discouraged," or "proposal withdrawn by applicant."

Initial actions on formal proposals

The RANN program manager is responsible for initially reviewing formal proposals and may review with or without assistance from the responsible division or office director or other RANN, Foundation, or outside experts. The decision on the depth of review required is made separately for each proposal by the program manager and division or office director. In some cases, formal proposals which were preceded by preliminary proposals may not be initially reviewed, since reviewing a preliminary proposal normally accomplishes the same purpose.

An Office of Programs and Resources official told us the program manager, as a result of his initial review, may take the following actions: (1) encourage withdrawal by suggesting to the proposer that the proposal has little or no chance of success, (2) suggest changes which the program manager believes are necessary before formal review commences, or (3) begin formal review because he believes the proposal has at least a reasonable chance of being funded in its present form.

The Office of Intergovernmental Science and Research Utilization also initially reviews the formal proposal for adequacy of the utilization plan.

Formal review

In carrying out the evaluation function, the program manager has at his disposal a number of review methods, including his judgment, staff judgment, peer review, site visits, and consultation with other funding agencies. The program manager can use the accumulated expertise within the Research Applications Directorate. A summary of each recommended proposal is distributed to all RANN division and office directors so they can comment when appropriate.

The Office of Intergovernmental Science and Research Utilization reviews the utilization plan of all unsolicited formal proposals requesting funding of at least $150,000. RANN officials told us the purpose of this review is to insure application of the results and that participation of potential users has at least been considered during the project planning.

Peer review is a major evaluation tool used by the program manager, in which the views of recognized experts in the various disciplines or interdisciplinary areas addressed by the proposal are requested. The program manager uses his judgment in selecting reviewers.

Peer review is usually conducted by mail or panels. Panels may be convened on an ad hoc basis. Panel review is used extensively in evaluating solicited proposals, and some programs managers also evaluate unsolicited proposals through peer panels. For large dollar proposals, some program managers have used both mail and panel review to obtain the benefits each provides--the larger number of opinions possible through mail review and the interaction between proposer and reviewers possible through panel review.

According to RANN officials, site visits probably are the best proposal evaluation technique available to the program manager. Not only do site visits allow for interchange between the research team and reviewers, but they provide the

program manager an opportunity to evaluate the organization's resources and management. Program managers may conduct site visits alone or with assistance from peer reviewers or other researchers, users, or Foundation officials. The RANN officials stated that the number of proposals received and budgetary constraints have prohibited extensive use of this technique.

A 1973 study conducted by the Foundation's Management Analysis Office states that coordination with other Federal agencies is often necessary in cases of multiple proposal submission, use of Government-owned facilities, unusual logistic support requirements, or possible overlap of program responsibility. In such cases, the program manager may request the agency(s) to provide formal or informal peer review comments for use in evaluating the proposal.

The program manager evaluates and summarizes the review comments. The summary is communicated to the applicant, and possible changes to the proposal are discussed. If an award is unlikely, the applicant may be given the option of withdrawing the proposal since all subsequent dispositions are limited to declination or awards, both of which are formal Foundation actions.

The justification required for a formal declination letter is less extensive than that for an award. A standard letter signed by RANN's deputy assistant director for Science and Technology is sent to the applicant advising of the action and encouraging further proposals. Specific reasons for declination are not stated. A RANN official said the program manager, at his discretion, may informally advise the applicant of the reasons for the declination. The cognizant division or office director must approve the declination. If the division or office director does not concur, the proposal is returned to the program manager for reconsideration. If division concurrence is obtained, the proposed declination the submitted to the Office of Programs and Resources for review by the Grant Review Board's Executive Committee. If the committee does not concur with the recommendation, it is returned to the division level for further consideration. After concurrence by the committee, the deputy assistant director for Science and Technology signs the approved declination letter.

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For a proposed award, the program manager prepares a specified package of information for review and approval by his division director and by the Grant Review Board, which includes:

1. A proposal cover sheet stating the type of proposal, sponsoring division or office, project title, principal investigator's name, name of the sponsoring institution, total proposed budget, and summary of review comments.

2. An abstract of the research project to be provided to the Smithsonian Science Information Exchange for reference.

3. A proposal summary, which includes the research project and overall program objectives, the research plan, the organization and management plan, the utilization plan, and related projects.

4. The program manager's recommended action.

5. A detailed proposed project budget.

6. A runout cost worksheet (future funding implications of proposed awards).

7. A list of other sources from which the applicant has requested funding and the results of such requests.

For renewal of an existing grant, an abbreviated format is used. The Research Applications Directorate's Grants and Contracts Manual specified that continuation proposals contain brief summaries of:

1. Research objectives, noting any changes from the previous award.

2. Research plan, noting changes.

3. Project accomplishments to date.

4. Work statement and expected results for the continuation period.

5. Actual compared to planned progress.

6. Changes in the organization and management plan.

7. Changes in personnel.

8. Related programs.

9. Utilization plan, noting changes and significant completed actions to date.

Approval authority for all proposed awards and declinations in the Research Applications Directorate resides in the assistant director for Research Applications, who has created the Grant Review Board to help him assure thorough consideration. At the time of our review, the board was composed of the following RANN officials (first four) and two Foundation officials:

--Deputy assistant director for Science and Technology, chairman.

--Deputy assistant director for Analysis and Planning, vice chairman.

--Director, Office of Programs and Resources.

--Program analyst, Office of Programs and Resources, executive secretary.

--Representative of the Office of General Counsel.

--Representative of the Office of Grants and Contracts.

In a typical Grant Review Board session, the cognizant program manager and division or office director present both the proposal and a recommended disposition to the board. The board may act on the recommendation in several ways: it may approve the recommended action without comment or with minor comments (approvals); it may give tentative approval, subject to revisions to the proposal, changes in documentation, or elimination of legal or other obstacles (holds); it may suggest that a proposal be revised and resubmitted for board consideration (recycles); or it may decide not to approve a recommended award (rejects). From June 18 through

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December 11, 1974, the board considered 248 recommended awards and approved 181, held 21, recycled 43, and rejected 3. This may not be indicative of the second half of fiscal year 1975 because, according the RANN officials, in the past most proposals have been submitted to the Grant Review Board during the latter half of the fiscal year.

The full Grant Review Board reviews all recommended awards requesting $150,000 or more and those which in the opinion of the division director require a broad management review. Other proposed awards requesting smaller budget amounts and all proposed declinations are reviewed by the board's Executive Committee, which, at the time of our review, consisted of the following RANN officials:

--Deputy assistant director for Science and Technology, chairman.

--Deputy assistant director for Analysis and Planning.

--Director, Office of Programs and Resources.

--Program analyst, Office of Programs and Resources, executive secretary.

Recommended actions which are approved by the board are subject to additional directorate level concurrence. The assistant director for Research Applications or his deputy sign all awards of $50,000 or greater, and the chairman of the board's Executive Committee may sign all those under $50,000 and all declinations. All awards must also be approved by the Foundation's Director or his designee, the Grants and Contracts officer. Also, the Foundation's National Science Board must approve awards which involve expenditures of at least $500,000 in a single year or at least $2 million in total. When it is determined that a proposed award must eventually be approved by the National Science Board, the Research Applications Directorate prepares an information package which is similar to the Grant Review Board package and forwards it to the National Science Board through the Foundation's Director.

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If the proposed research will be funded in more than one increment, the grantee must submit a proposal to continue the research project beyond the current increment. An Office of Programs and Resources official told us there was no specific RANN policy for the length of funding periods. Continuation proposals generally are more concise than new proposals and tend to concentrate more on accomplishments as a basis for continued funding. In such a case, the grantee submits a renewal, award amendment, or continuation proposal to the program manager while currently funded research is being performed. The program manager then evaluates the proposal, usually with the assistance of peer review or advisory panels.

Once review of the renewal application is complete, the program manager either encourages withdrawal or prepares a modified Grant Review Board package, including an award recommendation for concurrence by his division or office director. If the division or office director approves, the package is forwarded to the board. After this point, the process for board, directorate, and Foundation concurrences are the same as previously described for new awards. Continuation proposals requesting dollar amounts requiring approval by the National Science Board must be approved by it if the work was not approved when the original proposal was submitted. If the program manager believes a continuation proposal should be declined, the procedures followed are similar to those for declining new proposals.

RANN'S SOLICITATIONS USED

AS OF OCTOBER 14, 1974

Fiscal year	Title	Purpose
1973	Evaluation of Policy-Related Research in the Field of Municipal Systems, Operations, and Services	Make a significant body of policy-related research on municipal systems more accessible and usable by policymakers and provide a more rigorous basis for future research projects dealing with policy-related research on municipal systems.
	Evaluation of Policy-Related Research in the Field of Human Resources	Make a significant body of policy-related research on human resources more accessible and usable by policymakers, indicate those areas lacking in significant policy-related research, and provide a more rigorous basis for future research projects dealing with policy-related research on human resources.
	Exploratory Technology Assessments in Selected Areas	Provide a substantive, comprehensive, useful input into public policy formulation and decisionmaking with regard to the application of particular technologies; explore and encourage technology assessment and the application of systematic methods, techniques, protocols, and approaches to complex, policy-related problems; and encourage the growth of organizational capability to conduct

Fiscal year	Title	Purpose
		impartial, comprehensive technology assessments.
	Telecommunications	Develop the collective capability outside the Government for conducting research on long-range telecommunications policy.
1974	Research on Subsystems and Systems for the Application of Solar Energy to the Heating and Cooling of Buildings	Stimulate innovative research on the technologies that may be required for widespread application of solar energy to heat and cool buildings.
	Decision-Related Research in the Field of Local Government Management	Provide the knowledge needed to improve the delivery of local government services by evaluating or analyzing alternative policies and practices relating to the measurement, pricing, and planning of services and foster extensive use of validated alternatives among local governments.
	Decision-Related Research on the Organization of Service Delivery in Metropolitan Areas	Provide the knowledge for improving delivery of selected municipal services by describing, analyzing, and evaluating alternative organizational arrangements for service delivery in U.S. metropolitan areas and extensively disseminate the results to local governments, relevant Federal agencies, and concerned professional and public interest groups.

Fiscal year	Title	Purpose
	Decision-Related Research on Technology Utilized by Local Government	Improve the information available to local government officials for use in specifying and selecting equipment technologies.
	Design Studies for Experimental Application of Two-Way Cable Communications to Urban Social Service Delivery and Administration	Design social experiments to test the costs and benefits of applying two-way cable communications to the delivery of social services in urban settings and improve urban administration.
	Ocean Thermal Energy Conversion:	
	Part A--Research on an Engineering Evaluation and a Test Program	Establish guidelines for systems optimized from both a technical and economic standpoint by analyzing design concepts for large floating ocean thermal powerplants.
	Part B--Advanced Research and Technology on Key Program Elements	To establish system viability of large-scale floating powerplants for converting substantial amounts of ocean thermal energy into more usable forms.
	Research on Wind Energy Conversion Systems	Advance the scientific and technological bases necessary for developing reliable, practical, and cost competitive wind energy conversion systems as an alternative source of significant quantities of energy and determine requirements, assess applications,

Fiscal year	Title	Purpose
		and stimulate innovative research on the problem and technologies of wind systems to support achieving the overall program objective.
1975	Research on General Revenue Sharing	Obtain applied research findings on selected topics related to the impact of the State and Local Fiscal Assistance Act of 1972 (Public Law 92-512).
	Alternate Formulae for General Revenue Sharing	Provide a comprehensive review of formula possibilities likely to receive serious consideration during debates over renewal of the State and Local Fiscal Assistance Act of 1972 (Public Law 92-512).
	Technology Assessment in Selected Areas	Provide a substantive, comprehensive, useful input into public policy formulation and decisionmaking with regard to the application of particular technologies; explore and develop techniques of technology assessment and apply systematic methods, techniques, protocols, and approaches to complex, policy-related problems; and encourage the growth of organizational capability to conduct impartial, comprehensive technology assessments.

PROCEDURES FOR DEVELOPING PROGRAM SOLICITATIONS AND EVALUATING RESPONDING PROPOSALS

PROGRAM SOLICITATION DEVELOPMENT

When a RANN program manager occasionally determines that he is not receiving enough unsolicited proposals in his program area, he usually consults with officials of the Foundation's Grants and Contracts Office for technical assistance in choosing the appropriate proposal generation mechanism. They may choose a request for proposals or a program solicitation, if a more directed approach to encouraging the submission of research proposals is needed, or they may decide that using publications which encourage unsolicited proposals should be continued.

If program solicitation is chosen, the program manager, with technical assistance from the Grants and Contracts Office, prepares a draft version for submittal to the Research Applications Directorate's Grant Review Board. (Composition of board membership is discussed in app. I.) The program manager may obtain peer review comments on the solicitation from individuals or organizations determined by RANN as ineligible to submit a research proposal in response. After division or office director concurrence, the draft program solicitation is sent to the Grant Review Board. The board may approve, hold, recycle, or reject the solicitation. After board approval, the solicitation must be approved by top RANN management officials and the Foundation's Offices of General Counsel, Government and Public Programs, and Grants and Contracts. If any award under the solicitation is anticipated to be $500,000 or greater in a single year or $2 million or greater for the total research project, the solicitation also must be approved by the Foundation's National Science Board. The National Science Board, like the Grant Review Board, may also suggest changes or may recycle the solicitation for reconsideration.

A synopsis of the approved program solicitation is prepared by the Grants and Contracts Office and published in the Commerce Business Daily, and the solicitation is subsequently mailed to all respondents and other individuals and

organizations with a possible interest. The Office of Government and Public Programs may also prepare and release a general public announcement of the solicitation.

PANEL REVIEW OF PROPOSALS

Proposals received by the closing date are reviewed by a proposal evaluation panel, consisting of technical and administrative members. Technical members may be Foundation officials; peer reviewers; or others chosen by the program manager, with administrative members selected from within the Foundation, usually representatives from the Grants and Contracts Office. The panel either may be convened under the direction of the program manager, or may evaluate the proposals independently of the program manager and give him recommendations.

The panel review is conducted through a two-step process similar to bid evaluation procedures used in Federal procurement. The competitive range of proposals is determined, and a preliminary ranking is obtained. Proposals within the competitive range are those which are submitted by capable performers and which respond to the requirements in the program solicitation as determined by technical members of the review panel. The panel's administrative component evaluates these proposals and ranks them according to requested award amount. The program manager may discuss competitive proposals with proposers to obtain clarification of points raised by the review panel. After all such discussions have been concluded, the manager may solicit best and final offers from each competitive proposer.

He may convene an additional evaluation panel for revised proposals, which is composed of as many members of the original technical review component as possible. The panel evaluates the revised proposals and reranks all proposals as described above, based on the new information. The program manager selects the proposed awardees generally using criteria of the best combination of low cost and high yield of anticipated research results. RANN division or office director concurrence is obtained, and the program manager prepares a selection memorandum, detailing the evaluation and selection of the proposed awards, which is forwarded to the RANN Source Selection Board for review and approval.

SOURCE SELECTION BOARD

The board reviews the proposed awards and declinations for propriety of the recommended actions and selection process. Board membership, at the time of our review, consisted of the following RANN officials:

--Assistant director for Research Applications, chairman.

--Deputy assistant director for Science and Technology, vice chairman.

--Deputy assistant director for Analysis and Planning.

--Director, Office of Programs and Resources.

--Program analyst, Office of Programs and Resources, executive secretary.

The vice chairman usually presides when proposals under program solicitations are being considered, with the chairman presiding over responses to requests for proposals, as discussed in appendix V.

The program manager presents the proposals and action recommended by the proposal evaluation panel. The cognizant division or office director also normally participates in the discussion.

OTHER REVIEWS

Following the board's review the recommended declinations are further reviewed by the Executive Committee of the Grant Review Board, which, except for the chairman, is the Source Selection Board. The recommended awards are subsequently signed by the assistant director for Research Applications or his deputy assistant director for Science and Technology. The Grants and Contracts officer signs the awards as the designee of the Foundation's Director and executes the grant or contract with the awardee. Unsuccessful proposers are notified of the declination. Debriefings are usually held to give specific reasons for selection of successful proposals and for declinations of others.

RANN'S REQUESTS FOR PROPOSALS USED

AS OF OCTOBER 14, 1974

Fiscal year	Title	Purpose
1972	Photothermal Energy Conversion for Central Power Station Generators	Study four separate concepts of photothermal energy conversion, outline a research program for each concept, prepare a program plan leading to demonstration for each concept, conduct a cost benefit analysis of full-scale systems in terms of energy units delivered, and provide general guidance on costs and schedule for prototype solar powerplant.
1973	System of Identifying and Assembling List of Technology Assessments	Establish a list of technologies, the impacts of which on society are proposed to be studied, and propose priorities from the candidates on this list.
	Training Course in Program Management	Develop and teach a course in program management to Foundation personnel.
	Solar Energy Utilization for Heating and Cooling of Buildings	Establish the theoretical feasibility of solar heating and cooling of buildings and provide the basis of planning for the later phases of solar energy applications.

Fiscal year	Title	Purpose
	Support of Committee on Forecasting Models, Federal Council on Science and Technology	Design and conduct survey of nondefense Federal modeling activities.
	Technology Assessment in Solar and Geothermal Energy	Conduct technology assessment of the development of (1) U.S. geothermal resources and (2) technologies for terrestrial applications of solar energy.
1974	Provision of Working Paper in Solar Energy Applications	Provide a series of evaluations and economic analyses which would indicate the potential market availability and potential market applications of each of RANN's six solar energy activities.
	Systems Study of Geothermal Program	Perform a systems analysis of the Foundation's Geothermal Energy Research Program; based on this analysis, develop a recommended 5-year preliminary program development plan emphasizing proof-of-concept experiments and the supporting advanced research required in the program.
	Systems Study for Tunneling Plan	Perform a systems analysis of tunneling techniques for urban areas upon which research program plans leading to proof-of-concept experiments for improved tunneling techniques can be based.

Fiscal year	Title	Purpose
	RANN Symposium Support	Initiate a major Foundation program to disseminate the results of research in the RANN and Intergovernmental Science Programs.
	Management Information System Requirements Study	Perform a supplementary study in the Research Applications Directorate to identify new management information requirements of the directorate's top management.
	Experimental Annotated Bibliography of Policy Analysis on Social Programs	Develop an experimental policy analysis source book to be used by program analysts and evaluators concerned with social programs and policies within Federal domestic agencies and at State and local levels.
1975	Prototype Research Review	Provide a prototype research review and compilation of results from awards made by RANN's Division of Social Systems and Human Resources from July 1, 1970, through June 30, 1973. The research review will examine the products from the awards, relate them, and prepare nontechnical reports of results for use by decisionmakers and the public.

APPENDIX IV

Fiscal year	Title	Purpose
	Development and Experimental Application of a Research Planning Protocol	Develop and experimentally apply a research program planning protocol.
	Development of Project Development Plans in the Area of Energy Resources Technology	Help prepare project development plans and other documentation necessary to facilitate the transfer of portions of the RANN energy program to other Government agencies.

PROCEDURES FOR DEVELOPING REQUESTS FOR PROPOSALS AND EVALUATING RESPONDING PROPOSALS

REQUESTS FOR PROPOSAL DEVELOPMENT

The decision to solicit a proposal or a number of proposals through a request for proposals is jointly made by the RANN program manager and the Foundation's Grants and Contracts Office, which is responsible for administering requests for proposals. The office, in conjunction with the program manager, prepares a draft request for proposals; a draft synopsis for eventual publication in the Commerce Business Daily; and, if sole source solicitation is anticipated, a draft of findings and determinations.

RANN division or office director concurrence and Grant Review Board (board membership is in app. I) approval of the draft request for proposals and synopsis must be obtained in the same manner as for program solicitations, discussed in appendix III. If any award under the request for proposals is anticipated to be $500,000 or greater in a single year or $2 million or greater in total, the request for proposals also must be reviewed and approved by the Foundation's National Science Board.

After all necessary approvals are obtained, the Grants and Contracts Office prepares a final version of the request for proposals and synopsis. The synopsis is published in the Commerce Business Daily. Requests for proposals are mailed to all respondents and to others with a possible interest identified by the program manager and the Grants and Contracts Office.

PANEL REVIEW

The program manager and the Grants and Contracts Office assemble the panel to evaluate the proposals. The program manager selects the technical members to rank the proposals based on scientific merit, and the Grants and Contracts Office selects members of its staff to rank the proposals on cost. After rankings, the total panel, which is chaired by a Research Applications or RANN division official, is convened to determine the competitive range of the proposals.

Competitive proposals are those from responsible bidders which are responsive to the specifications in the solicitation and are within an allowable cost range. Proposers not within the competitive range are notified of their elimination.

For those proposals within the competitive range, the Grants and Contracts Office, assisted by the program manager, negotiates where possible and obtains best and final offers. The panel then reconvenes and reranks the proposals, if necessary, and determines the proposed awardees. The selection of successful bidders requires concurrence by the responsible RANN division or office director and eventually must be approved by the Foundation's contracting officer.

SOURCE SELECTION BOARD

The program manager prepares a memorandum explaining the request for proposal development, evaluation of proposals, and the selection of awardees. The Board's functions and makeup and the remainder of the request for proposal process are as explained in appendix III for the program solicitation process under the caption "Source Selection Board" on page 139.

UTILIZATION PLANNING FOR SIX PROJECTS

FUNDED BY THE RESEARCH APPLICATIONS DIRECTORATE

EVALUATING THE APPLICATION OF TELECOMMUNICATIONS TO HEALTH CARE DELIVERY IN NURSING HOMES

This project provides for operating an experimental hospital-based health care delivery system under which nurse practitioners--nurses with advanced education--would make routine visits to nursing homes and perform less complex medical procedures. A telecopier and a telephone is used to transmit such items as patient pulse rates and other medical records from the nursing home to a hospital for review by a physician. With this information, the physician could either prescribe treatment or decide to visit the patient. The project's objectives are (1) to determine if this experimental system is more economical than physicians' visits to nursing homes or having nursing home patients transported to hospital emergency rooms for treatment, (2) to develop indexes of the quality of care provided under each system, and (3) to determine the capacities that nurse practitioners can fulfill.

This project, supported through one RANN award in May 1973 for $373,700, will expire in September 1975. According to the researchers and the RANN program manager there are major economic and other barriers to achieving widespread application of the experimental system, even if the system is proven to be effective.

A major problem is obtaining reimbursement by either Medicare or Medicaid for medical services provided by the nurses. The researcher was not aware of any State Medicaid program, with one possible exception, that would reimburse the hospital for services provided by nurses working without the presence of a physician to provide supervision. The researcher informed us that hospitals and nursing homes are not interested in replicating the experiment because of the reimbursement problem.

In general, to qualify for reimbursement under Medicare, services of a nurse practitioner or other physician assistant must be related to a physician's professional services

and be under the physician's immediate personal supervision. Therefore, if a patient is seen only by a physician assistant during an office visit, Medicare will not reimburse for the services. Medicare will pay for nurse practitioners employed by a hospital to provide inpatient or outpatient services, but no specific provisions exist describing coverage for patients entitled to home health benefits.

In contrast, there are no statutory or regulatory barriers to payment for services of physician assistants under Medicaid. Their services would be reimbursable if provided under a physician's personal supervision. The critical matter concerns the closeness of supervision which the physician must exercise over physician extenders, which has been left for interpretation by each State.

The RANN program manager told us that he was aware of the reimbursement problem when the project was being considered for support by RANN. Before obtaining the RANN grant, the researcher was conducting the project with support from other organizations, including a hospital paying the salaries of the nurses. At the time RANN considered funding the project, the hospital was not willing to continue in the project unless reimbursed for the salaries of the nurses.

In September 1974 a Medicaid official for Massachusetts, where the experiment was being conducted, informed us that the State was considering reimbursement for health services provided by nurses in the experimental project only. He stated that reimbursement would be conditional upon a guarantee that medical care and a physician would be available at all times and that a physician would participate in initially assessing the patient's health and assume legal responsibility for the health services provided by the nurse. He advised us in April 1975 that the State Medicaid program was working with the physician to develop a mutually satisfactory reimbursement contract, but that approval would still have to be secured from other State offices before Medicaid could begin reimbursing for the nurse services.

Utilization planning

The project's utilization plan in the research proposal identified general types of potential users, such as nursing

home administrators, nurses, and Government health care programs; however, the plan did not specify users with an interest in the project and a possible willingness to implement the project results if successful. The plan stated, however, that the research team planned to identify Medicare and Medicaid officials for active involvement in the project. The roles that these users would assume were not defined. The research proposal did not discuss the problem of State reimbursement for nurses providing health services outside the hospital.

The RANN program manager had the research proposal reviewed primarily by Federal officials with some academic, research institute, and consultant participation. Primary user groups such as hospitals, nursing home officials, and third-party medical care reimbursement organizations were not requested to evaluate the proposal.

The peer review comments indicated that the project's utilization plan should be strengthened because it provided only for keeping potential users informed. One reviewer classified the plan as passive and recommended that the plan contain detailed actions necessary to replicate the project elsewhere.

The program manager advised the researcher that statements from appropriate officials should be secured to make their interest a matter of record. Evidence of interest by the hospital participating in the project and an area medical program was available in the project folder, but no discussion concerning other hospitals or the potential application of anticipated results to other geographic areas was available.

In summarizing the proposal to the Grant Review Board, the program manager stated that two conferences would be held during the conduct of the project to aid in using the research. Although conferences can aid in disseminating research, we believe they would not satisfy the need for an active utilization plan as recommended by the project's peer reviewers.

The research team had performed several dissemination and utilization activities, including publishing an article in a nursing home trade journal, having the project publi-

cized in at least seven local newspapers, and participating in a local radio program to answer questions about the project. The first conference was held during May 1974 and was attended primarily by researchers involved with other telecommunications research. Funds originally designated for a second conference, in which users would participate, have been reprogramed to develop a model dissemination plan for telemedicine research projects.

THE INTERACTION BETWEEN URBANIZATION AND LAND: QUALITY AND QUANTITY IN ENVIRONMENTAL PLANNING AND DESIGN

The principal tasks proposed were the design and implementation of models to evaluate the impact of projected urbanization of a metropolitan area on its land and other environmental resources. It was anticipated that these models would enable analysis of an urban region's development process in terms of the social, fiscal, and environmental changes and determine legal constraints on such changes. Through this project, the researchers wanted to develop models capable of furnishing decisionmakers with analytical data about typical suburban problems, such as conflicts in land use and impacts of major capital improvements.

The project was based on work performed during 1967 by two of the researchers responsible for the project. The RANN program has supported the project since February 1972 with five grants totaling $914,200. The current grant expires on July 31, 1975. As of January 1975, RANN officials were considering another grant for the project to support the projected final year of funding.

Barriers to implementation

As of January 1975, an official of Massachusetts, where the research was being performed, said the State had not committed itself to using the models. He said implementation depended on training of technical personnel, development of user instructions, validation of the models, computer availability and funds for implementation. The researchers had not completed testing of the models to determine their superiority over other decisionmaking techniques. In addition, other States have not been actively involved with the project, which could hinder their accep-

tance and implementation of the models, thereby further reducing the impact of the research project. There was, however, limited participation by representatives of regional and local organizations.

None of these problems were discussed in the initial research proposal submitted by the research team and subsequently provided to reviewers for their comments. But many of these and other potential problems were pointed out by RANN's peer reviewers. Although some progress has been made toward alleviating the impact of some of these barriers, others have not yet been adequately addressed.

Several reviewers of both the proposed third-year efforts and earlier efforts expressed views ranging from beliefs the results would not be usable to doubts that the results would be transferable to other geographic locations. They also pointed to lack of discussion concerning identification of organizations that might use the model. One reviewer concluded that the extraordinary amount of information needed automatically reduced the replicability of the model and, in essence, made it an idealized model which land use planners had always hoped for, but because of both monetary and time constraints, could never achieve. Reviewers of third-year efforts felt that through application of the models to real issues, insight into the appropriateness of the scale at which the models were being built could be obtained, thus establishing the transferability of the models to other areas and the possibility of implementing the research.

Responding to these concerns, on March 4, 1974, the research team submitted a proposal to RANN to fund several elements of cost associated with development and presentation of a two-semester workshop. Objectives of this workshop were to test the model's performance against real world problems and train people to operate it. The State official who had pointed out the need for technical capability said this training program would enable the State to use and update this research methodology. To help satisfy technical staff requirements of public agencies, the workshop provided for tuition-free attendance by 12 senior technical personnel who would be charged with supervising model operation if used by the State.

The researcher expected that the workshop participants would develop a working knowledge of the models, thus enabling them to form the nuclei of user groups after the models are ready for transfer to the user community. They planned to document ways the component models could be linked and applied to real world problems and describe these capabilities in working guidebooks. The workshops are therefore serving a multiple purpose, including attempts to determine the usefulness of the models, develop user capability, and compile a user handbook. The RANN program manager stated that the workshop would establish the level of performance attainable from the models and determine whether the models could deal with real problems in a manner superior to conventional techniques.

Although these issues are being addressed, the source of funds for implementing the model has not been established. This issue was raised in February 1973 by a reviewer of the first-year progress and proposed-future research. He advised that the assurance of Federal support to cover transition cost would influence State and local authorities considering implementing the system. This State official told us that RANN would have to provide the bulk of the implementation funding. In January 1975 he told us that since the research project was being reviewed for a final year of funding, that month would have been the ideal time for the State to submit a proposal to implement the model. He felt that phased support would be required for the State to adopt and operate the model.

Recognizing that the models were still being tested, the State official conjectured that until they were validated, the State probably would not commit itself to implementation. Therefore, although this might be the opportune time for implementing the models, the State probably could not reasonably commit itself to as yet unproven methodology for land use planning.

Utilization planning

Formal utilization planning was not a part of the initial proposal submitted to RANN; however, the proposal did contain scattered references to users' involvement and how their knowledge could be used. For example, the researcher initially provided for involvement by research associates,

individuals possessing special expertise that could be applied to this research effort. In addition, these individuals had been asked to confirm the research objectives as important. Through these individuals representing State, regional, and other organizations, the researcher believed the project team would have a better chance of understanding the realities of problems relating to urban development.

Massachusetts officials' involvement in reviewing the progress and proposed research was not secured until January 1973, when the review process for the second year's funding was held. Previously, only Federal agencies, academic institutions, a nonprofit organization, and a consultant had reviewed the proposal. Summarizing reviewers' comments, the RANN program manager said that the lack of user review was an important deficiency which needed to be addressed soon to assure that the project did not stray from the real problems with which practitioners were concerned. The review team recommended establishing an advisory committee to examine research objectives and periodically review research progress.

Site reviewers, meeting again during December 1973 to evaluate research progress during the second year and discuss the proposed efforts for the third year, believed that problems associated with transfer of such models to decisionmakers might be greater than those expected by the researchers. Accordingly, they again recommended that the researcher establish an advisory committee made up of officials of the State in which the research was being performed as well as of neighboring States experiencing similar land use problems. Reviewers suggested that the advisory committee serve in a general advisory capacity and develop several major land use questions to which the research could be addressed during the third year. However, membership for the committee was not solicited until April 1974, with the first meeting being held in June 1974. In addition, the advisory committee was composed only of representatives from Massachusetts.

A proposal for the third and fourth years included planning for direct user involvement. Although specific potential users still were not identified, consultations were reportedly in progress between the research team and Massachusetts and some of its local agencies. Several

State technical and policy personnel were to be identified and integrated into the research team to insure their awareness of the intent, scope, and limitations of the project. Also, the research team and State and local officials were to work together in workshops to test and adapt the models to user needs. The remaining elements of the utilization plan were a preparation of a summary report demonstrating feasibility and utility of the concepts developed and a commitment to continue interacting with user groups after completing the research project. The researcher, however, noted that responsibility for application and future development would be shifted to users.

In summary, elements of utilization planning were present in the initial proposal for this project and became more extensive as the project progressed. Through contacts with officials of the State in which the research was being performed, the research team provided an opportunity for awareness of the project to the State government.

Interest in the models has been exhibited through at least three departments of the State government. Nine participants of the workshop represented State functions. In addition, two ranking State officials, who reviewed the research proposed for the third year, expressed continuing interest in the project and readiness to consider including the models in their decisionmaking processes. They were also members of an advisory committee established to review progress of the workshops.

Although Massachusetts is apparently interested in the results, other States have not been actively involved with project activities, such as reviewing proposals, participating in workshops, and serving as research associates or members of the advisory committee. If the developed model is validated, this failure to obtain early involvement by other States could slow extensive application of the models since secondary users would not possess a basic familiarity with the capabilities of the models. Additionally, extension of potential user involvement to neighboring States could assist in establishing the extent of the demand for this type of decisionmaking methodology.

Although the proposals did not discuss the extent of the demand for this type research, a member of the advisory

committee for the project informed us that the need for the research was obvious, but he could not fairly say a demand for the research existed. He believed that if the model was validated and implemented at the State level, most of the local governments would turn to the system for information.

COMMUNITY DEVELOPMENT STUDY

The study included two related projects on the role of the Mission Coalition Organization--a federation of community organizations in San Francisco's Mission District--in community development.

The initial project, funded by RANN for about 2 years beginning in June 1971, was to have a university provide technical assistance to the community group, with a concurrent study of organizational interaction between the community organization and public agencies operating in the Mission District to determine how public agencies could be more responsive to community needs. The project was expected to provide data on the inner-city minority community that would be valuable to the scientific community and city, State, and Federal decisionmakers who establish policy and plan programs.

The technical assistance was provided for the research team to gain the cooperation of the community organization and to examine the value of university interaction with an urban community. In this respect, the RANN program manager stated that earlier traditional research efforts to obtain inner-city data were met with resistance, thus posing a problem to researchers and government officials who needed the data.

The second project, funded in September 1973, also provided for technical assistance to the community organization and continued the case study of organization interaction between the community organization and Mission District public agencies. This project concerned the effects of special revenue sharing (funding allocated on formulas for broad functional areas such as management training) on the community organization, whereas the initial project concerned categorical programs (funding for specific activities, such as vocational guidance and nurse training).

The second project's findings were to be compared with initial project results to show the effects of special revenue sharing.

As of January 1975, RANN had awarded five grants totaling $864,000 for the two projects. Funding for the second project was scheduled to expire in March 1975.

Utilization planning

The research proposal for the first project did not have a formal utilization plan, and the proposal did not explore the extent that the research results would have nationwide applicability. Although it was apparent that the results of technical assistance provided the Mission Coalition Organization would be conveyed to it, the means of mass distribution of project results to other potential users was not planned for in the proposal. The question of nationwide applicability of the research was considered in general terms, such as the researchers anticipating the research results would be useful to similar communities and relevant to policy evaluation of other organizations.

The research proposal was evaluated by universities, research institutes, and Mission District neighborhood agencies. Mail peer review comments received from non-San-Francisco-based reviewers were generally less favorable than those received from local neighborhood agencies and site visitors. Their negative comments were concerned primarily with project leadership and planning. The reviewers did not comment on the potential utility of the results to other localities. RANN officials made site visits to evaluate the research team, and addenda were added to the proposal affecting project planning.

Technical assistance provided the Mission Coalition Organization during the project's initial 2 years included assistance in areas such as education and social services, housing and urban design, and employment and economic development.

In studying the interactions between the community group and local public agencies, the research team identified protest, collaborative planning, and community control as methods used by the community organization in attempting

to influence local policy and planning. The researchers also identified problems which they called urban syndromes, such as rapidly changing national program goals and inadequate program funding, which consistently appeared in organizations' interactions and influenced the effectiveness of programs.

In August 1973 a conference was held to disseminate and discuss the project's findings and identify future research needs. Representatives from universities; consulting groups; Federal, State, and local governments; public interest groups; and the Mission Coalition Organization participated at the conference. The RANN program manager said community organizations in other geographical areas were not invited to the conference, but that they were represented through the public interest groups. He said the views of conference attendees were considered in the second project on special revenue sharing.

The research proposal for the second project contained a utilization plan that provided for research findings to be made available to researchers, public officials, public interest groups, and Mission Coalition and other local users through professional journals; papers presented at professional meetings; semiannual reports to Federal, State, and local agencies; and Federal agency publications. In addition, the coalition and other local users were to be kept informed through personal contact. The RANN program manager stated that reliance was placed on coalitions of community groups to disseminate research results to community organizations through their clearinghouses, newsletters, seminars, and conferences.

The research proposal for continuing the project was evaluated by Federal agency officials, college and university personnel, and community organizations. A number of these reviewers generally felt the Mission Coalition Organization was not necessarily typical of community organizations and, therefore, the research may not be widely applicable.

One reviewer claimed that the research was relevant to policy determination only to the degree that the community organization studied was representative of community organizations in general. He felt that this community organization was not typical of those in other communities. He

claimed that this nonrepresentativeness would detract from the study's potential contribution to a national need.

Another reviewer claimed that the technical assistance provided to the studied community organization restricted possible comparisons with other community groups. He believed that useful generalizations from the study would be difficult. In fact, the reviewer advised that generalizations from this case study could lead to serious mistakes in policy determination if the uniqueness of this community organization were ignored.

Suggestions as to how this case study could be more applicable to addressing a national need--the responsiveness of local policymakers to community needs--were provided by some reviewers. One reviewer suggested that the research effort include community organizations from various localities. He advised that these localities be included before the research team defined policy issues. Another reviewer commented on the need for the findings to be compared to situations in other communities. A third reviewer claimed that it would be difficult to generalize from one case study and suggested that three or four case studies might be more appropriate.

Although some reviewers were concerned with the usefulness of the study to other communities, reviewers generally felt that the proposal was timely and addressed a major national concern.

In January 1975 the RANN program manager advised us as follows on the purposes of the research and its general applicability to other communities:

--The technical assistance was not considered research; however, the assistance was necessary to gain entry to the Mission Coalition Organization. The material gathered in providing the assistance would be useful in managing the coalition's programs.

--The methodology of the project is observing, defining, and analyzing a community organization under categorical grants and special revenue sharing in order to prepare a descriptive study. The coalition is

composed mostly of low-income people of Central and South American descent with problems that some community organizations could relate to.

--The project will be completed in March, and although validation would be useful, RANN has not planned to validate the research in other communities.

In January 1975 the research project's principal investigator said there was no such thing as a typical community organization, but that their research findings were transferable to some extent to other community groups. As an example, the researcher believed that community groups would be able to use methods used by the Mission Coalition Organization to influence policymaking, such as joint planning by Government and community agencies.

SEISMIC DESIGN DECISION ANALYSIS FOR EASTERN METROPOLITAN AREAS

The initial proposal submitted in 1970 stated that, except on the west coast and in certain mountain States, the earthquake threat to ordinary residential and commercial construction is virtually ignored by developers and engineers. The researcher described this practice as inconsistent with experts' opinions and with practices of several Federal agencies. He believed these variations of opinion and practice should be resolved before the Nation is committed to a major new housing construction program. The researcher, working with buildings of 5 to 20 floors, proposed to (1) determine whether new buildings in eastern metropolitan areas erected in accordance with prevailing regulations and practices had an adequate level of earthquake resistance and, if not, (2) make recommendations for adoption by Federal agencies supporting new construction to insure optimum protection levels.

Long-range project objectives included developing cost-benefit data for increased seismic resistance and developing models for analyzing and comparing costs and benefits from alternative strategies for reducing the consequences of earthquakes.

This project has been supported to perform earthquake engineering research since March 1971 when the Foundation's

Basic Research Directorate funded $127,400 for a 1-year study. Subsequently, project management was transferred to RANN, under which three additional grants were made totaling $826,700, for a cumulative award of $954,100. The most recent award, made June 5, 1974, for $648,500, was for a 3-year effort to extend the previous efforts to other types of buildings, facilities, and geographical areas.

Utilization planning

Although there was evidence of user involvement in guiding the project and conducting research, little opportunity was extended to user communities to comment on the proposals. The researcher indicated that potential users of his results would be Federal agencies involved with new construction, engineers, architects, building officials, and insurance companies. The RANN program manager believed that practicing engineers would be the primary users of the research results. But none of these type organizations were involved in reviewing the proposals. Instead, reviewers were exclusively from academic institutions or were the program manager's associates within the RANN program.

Utilization planning for this project was not accomplished until the fourth award, made in June 1974, approximately 3-1/2 years after the initial award. The proposals for the first three awards did not contain utilization plans as such; however, evidence of user involvement was scattered throughout the proposals.

The researcher in the initial proposal pointed out that insurance companies and several Federal agencies would be the likely users of his research. He felt the insurance companies would use it in establishing rates, while Federal agencies would use it in revising their regulations pertaining to new federally funded construction. The second proposal added engineers, architects, and building officials to the list of potential users. These proposals contained no evidence that the potential users were contacted to determine their degree of commitment to using the research results.

The researcher was able to interact with an insurance rate setter as part of an advisory committee function for another research project. Also, involvement with other

researchers and a local engineering firm has been an element of user involvement since the initial proposal. The second proposal, in February 1973, recognized the need for working with engineers, architects, and building officials to gain acceptance of and to implement the research results.

Major involvement with individuals who could implement the research results was first addressed in the proposal for the fourth award. This involved cooperation in a planned review of the seismic design provisions of the Boston building code by a committee of local members of the Boston Society of Civil Engineers. The research team was to assist the committee in evaluating the current code provisions for structural design and in determining if any modifications were appropriate by undertaking staff studies. In return, the committee's efforts were expected to aid the research by providing reactions and suggestions concerning study methodology. In addition, the team would learn what type of information was valuable to code development activities.

The chief engineer of the State Office of Code Development told us that dissemination of research information had been very good and that the code revising committee had been able to use a significant amount of the research results generated by this project. He also confirmed that the project had developed beneficial results by demonstrating that the previous risk classification for this geographic area had been found excessive for the class of buildings studied and for certain surrounding soil conditions. He added that adoption of this provision increased code flexibility and may make it possible to design more economically while still incorporating the new seismic factor.

Although the Massachusetts Office of Code Development found the research useful, its application of the researcher's seismic design methodology was apparently fortuitous, since interaction with the State was not provided for in utilization planning until the fourth award.

Concerning application of the research in other States, the most recent proposal included workshops to extend the methodology to other eastern cities; however, these specific workshops were not held because of concern that they might duplicate efforts of another RANN-supported project designed to gather all relevant earthquake engineering research and

devise a model seismic code. This project, administered by the National Bureau of Standards with major funding from RANN, was supporting utilization on a program level. Building code officials were being encouraged to interact with that group since their objective was to update, expand, and substantially revise building practices to incorporate recent earthquake engineering research results. The proposal did not, however, indicate how results of this research project would be transferred to the other project so that building code officials would have access to the results.

As a substitute for the workshops originally planned, the researcher and the RANN program manager had tentatively agreed, as of January 1975, that the research team would meet with engineers, planners, and building officials in Boston to demonstrate what information was available and to obtain additional ideas of how useful the research might be to them. During the final year, they expected to sponsor one or two instructional workshops attended by officials of other eastern metropolitan areas.

Although dissemination was not provided for in the research proposal's utilization plans, the research team has widely disseminated its results. Among the dissemination activities as of January 1975 were report writing for 16 project reports, 50 internal study reports, and 12 papers and articles. The distribution list for the project reports contained 113 names of individuals representing Government agencies, professional engineers, insurance companies, industry, and academic institutions. The researchers have also served on numerous professional committees and task forces, participated in numerous seminars, and lectured before groups representing engineers, researchers, politicians, planners, and insurance companies.

RESEARCH COORDINATION AND UTILIZATION--THE TAHOE BASIN

This project, administered by the Office of Intergovernmental Science and Research Utilization resulted from a research proposal submitted by the Tahoe Regional Planning Agency, a bi-State public agency responsible for developing and enforcing a regional plan for resource conservation and orderly development of the Lake Tahoe Basin, and the Lake

Tahoe Area Council, a nonprofit organization sponsoring and administering research to preserve the Lake Tahoe Basin. The planning agency stated in the proposal that, as the principal consumer of Tahoe research, it found the overall research effort and results lacking in direction, coordination, availability, and usefulness.

The proposal provided for establishing a Research Coordination Board to include, among others, members of the planning agency and the area council, and to develop an inventory of completed research applicable to the basin and a priority listing of research needed for the basin; encourage researchers and research sponsors to address these needs; establish a Tahoe Basin research information system; and coordinate research efforts by reviewing proposals for research in the basin.

First-year funding for the project, awarded in June 1973, was $74,000. A continuation award was made in November 1974 for an additional $90,000 to expire in April 1976.

As of January 1975, the board had developed an inventory of completed research and a listing of research needs for the basin, commenced work on the research information system, publicized its existence and functions, and reviewed about a dozen research proposals.

The major barriers that could hinder project success are the board's lack of authority to require that research proposals be submitted to it for review and the need to obtain funding to support the board's staff and activities, including completion and operation of the research information system, when Foundation support is discontinued. These barriers were recognized by the Office of Intergovernmental Science and Research Utilization and reviewers of the research proposal before funding the project. The proposal was approved by the Foundation, however, without a specific plan to overcome these barriers.

As of January 1975, the board had not established any written agreements with research sponsors for their routine submission of proposals for research in the basin. The board, therefore, has little assurance that it is receiving all proposals. Under the continuation grant, the board planned to develop proposals seeking funds to continue its activities.

Funding to continue board functions

The initial research proposal submitted by the planning agency and the area council was sent by the Office of Intergovernmental Science and Research Utilization to a number of Federal agencies that, for the most part, supported project objectives. Several peer reviewers commented that the project, if proven useful, would require funding to maintain. Before approving the grant, the office's program manager advised the planning agency of his concern about a source of permanent funding for the project. The area council's president advised the program manager that it had been successful in obtaining private and public funding for needed research for the basin since 1958 and that its past record and continuing activities were ample evidence of its ability to provide future services.

The project was approved without specifically identifying sources interested in supporting the board's staff and activities. On January 20, 1975, the board's research coordinator said the board had ideas for obtaining funding, but no prospective future funding sources had been contacted. He stated that contacts were not being made until project evaluation in about May 1975.

Board's coordination of research proposals

The research proposal provided that the board would serve as a research coordination hub for the basin seeking a cooperative effort with all government agencies, independent institutions, universities, and private investigators. The board planned to achieve this objective by reviewing research proposals and influencing the research being performed to meet the needs of the basin.

The proposal did not state what procedures the board would implement to insure that it received all proposals for research in the basin. Prior to the initial award on June 20, 1973, the program manager advised the planning agency that submitting research proposals for the board's review would be voluntary. On January 21, 1975, the program manager advised us that the board had made contacts with some research institutions and research-sponsoring agencies to request review of their research proposals but written agreements were not made. He stated the board was responsible

for convincing Federal agencies sponsoring research in the basin to have their grantees cooperate with the board.

The board's research coordinator said much contact had been made with scientists and administrators to seek their cooperation in submitting proposals. He cited several seminars, newspaper articles, and a newsletter. The chairman of the board also sent a letter to the members of the Western Federal Regional Council[1] announcing the functions of the board and seeking cooperation. Board staff members had also attended meetings of the Federal Regional Council.

As of January 24, 1975, the board's research coordinator said the board had reviewed about 12 research proposals, of which 9 were submitted by researchers, 2 by the Department of Agriculture's Forest Service, and 1 by the Tahoe Regional Planning Agency. The research coordinator stated he was not aware of any proposals for research in the basin that the board had not reviewed.

ENVIRONMENTAL MANAGEMENT RESEARCH IN THE LAKE TAHOE BASIN

This project concerned decisionmaking for increasing urbanization with the research directed toward water quality preservation. A long-range objective is to develop a predictive model for analyzing the environmental consequences of alternative land use strategies on water quality. The researchers selected the Lake Tahoe area for study because extensive urbanization was threatening the purity of the lake through increased nutrient inflow from several sources, including sewage effluents and soil erosion. They projected that basin use would increase significantly by 1980, thereby placing an even greater demand on its resources.

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[1]Executive Order No. 11647, dated February 10, 1972, established Federal Regional Councils for each of the 10 standard Federal regions. The councils, with membership of selected Federal regional agencies, were to develop closer working relationships among themselves and with State and local governments and coordinate Federal assistance to State and local governments.

The researchers proposed to determine what human activities contribute to lake deterioration and the extent to which man can control the process. A further objective is to ascertain if society is willing and effective in applying technical abilities through social and political action to obtain balance between development and conservation. Since an earlier Foundation program funded the planning phase in 1970 for $97,800, RANN has made five additional awards for cumulative funding of about $1.8 million to extend research activity through April 30, 1976.

Utilization planning

Although this project has been ongoing since 1970, it lacks a formal systematic utilization plan. However, the researcher has been active in a variety of utilization and dissemination activities, with most of this activity provided on an ad hoc basis to potential users seeking assistance.

The first three proposals for this project did not contain formal utilization plans; however, references to these activities were scattered throughout the proposals. The fourth proposal contained a section describing generally how the research team hoped to distribute research results and to provide assistance to public agencies and other interested parties. However, reviewers of the proposals still criticized the project's utilization planning. In fact, as recently as the review of the sixth proposal, dated August 1974, reviewers were still criticizing the project because it needed a systematic utilization plan. Details of utilization planning follow.

In the initial proposal (Apr. 1970), the research team expressed its intention to devote the final year of a planned 4-year effort to the application and demonstration of its research findings. It also proposed that whenever possible and applicable it would make the results available to the public agencies responsible for regulating urban development in the basin. In this regard, it planned to work with the Tahoe Regional Planning Agency, which was established in March 1970, to prepare a regional plan for the basin. Although the proposal was reviewed by a Federal official, it was not reviewed by decisionmakers from the basin. The grant files contained evidence of early

interaction between the research team and user groups. For example, the research team was working closely with the California State Water Resources Board and the Tahoe Regional Planning Agency. In addition, a team member was serving on an advisory committee to the U.S. Forest Service, which is responsible for managing Federal lands in the basin, and in an advisory capacity to the planning agency.

The second proposal (Jan. 1971) requested funding for 2 years. The researchers reported that they would continue to provide data inputs to the public agencies. In addition, they planned to appoint a lay advisory and review board composed of members from the California and Nevada natural resource and conservation-related agencies, the planning agency, and local counties to help guide the research and increase its usefulness. A university student, who was also a research team member, had served as an assistant to the director of the planning agency to facilitate interaction and assist in information flow between the two organizations. The proposal stated that cooperative efforts with local government agencies, the U.S. Soil Conservation Service, and developers had been started to test revegetation schemes. Finally, the researchers reported that they planned to refine their model for predicting environmental and social consequences of decisions by obtaining comments from Tahoe decisionmakers experimenting with the model. Several reviewers of the second proposal represented user organizations, including the planning agency.

A third proposal (Nov. 1971) requested supplemental funds and included a segment for collating existing project data, specific analysis related to planning, and distribution of results to the Tahoe Regional Planning Agency and other local jurisdictions. Although this activity appears to be a significant project component, this section did not contain much information.

The fourth proposal (Feb. 1972) did contain a section describing generally how the research team hoped to distribute research results and provide assistance to public agencies or other interested parties; however, it did not address how results would be distributed to specific user groups.

The distribution strategy included the researchers' intentions to publish relevant findings, produce a periodic newsletter, and hold periodic conferences. They further planned to be responsive to requests for studies and analysis of data presently available or submitted to them by other interested parties. In addition, a research assistant was to inventory materials of possible public use, coordinate

requests for data and analysis, and make public the research team's findings and conclusions.

Reviewers participating in a February 1972 site visit and those providing mail reviews had some criticisms of utilization planning. Several pointed out that potential users of the anticipated results had not been adequately involved. Some reviewers felt that closer coupling with feedback on research needs from the planning agency and other local users would have been desirable; others believed that evidence of user support through letters or review and endorsement of the proposal should have been obtained. Coordinating other federally supported research in the basin and adding communication personnel to the project was also suggested.

Summarizing the results of this February site visit, the RANN program manager cited reviewers' concerns over inadequate use of the project results. The program manager said attempts to develop liaison between the researcher and the planning agency, described as the major and most appropriate user group, had been arduous because both groups were somewhat reluctant to work closely together. During March 1972 the researcher provided a proposal addendum which described cooperative work between the research team and other organizations involved in the basin. An April 1972 letter advised the RANN program manager that meetings with the U.S. Forest Service and the planning agency were scheduled for early May to explain the character of the proposed research and facilitate communication between the participant groups. Also in the February site visit report, the program manager noted that efforts had been made to add individuals who could help disseminate results.

The fifth proposal (June 1973) advised that the research team had provided information to user groups, including the planning agency, through the extension and delivery of services provided for in the previously funded proposal and through other personal contacts. The team reported that it had prepared a developer's handbook, coordinated its research with another similar RANN project, and started focusing on interpretation of environmental impact statements. They planned to demonstrate to user groups the aspects of these documents which most influenced the quality of the basin environment. A July 19, 1973, addendum expanded on the March 1972 addendum, describing interactions with related researchers and appropriate user groups.

Major criticisms provided by proposal reviewers included the need for a more systematic implementation plan and more contact with the planning agency. Two reviewers suggested

that a research coordinator associated with the planning agency could enhance the projects' relationship with local decisionmakers and possibly enable the raising of sensitive issues between scientists and the planning agency.

The Office of Intergovernmental Science and Research Utilization program manager who reviewed the utilization plan for this proposal acknowledged that, despite lack of a detailed formal utilization plan, the grantee had been active in a variety of utilization and dissemination activities. However, he noted that much of this activity had been provided on an ad hoc basis to potential users seeking assistance from the grantee. His analysis was that, although the grantee had achieved some excellent utilization, developing a formal utilization plan to meet user needs in an organized way could be very valuable.

In the site visit report, the RANN program manager said that the reviewers had expressed concern over the lack of evidence of a well-developed implementation plan. Among recommendations resulting from the site visit was establishing a user group committee and including in its membership the research coordinator from the planning agency.

In June 1973 the Office of Intergovernmental Science and Research Utilization funded the project "Research Coordination and Utilization--the Tahoe Basin." (See p. 161.) This project was originated because the Tahoe Regional Planning Agency felt that the Tahoe research effort and results lacked direction, coordination, availability, and usefulness. The project resulted in establishing a Research Coordination Board to develop an inventory of completed research applicable to the basin and a priority listing of research needed for the basin, encourage researchers and research sponsors to address these needs, establish a Tahoe Basin research information system, and coordinate research efforts by reviewing proposals for research in the basin.

The utilization plan included in a summary of the sixth proposal (Aug. 1974) planned direct contact with users at the local level and contact through technical publications on the national level. Less technical publications and manuals were planned for local planners and other agencies. The team expected to continue clarifying elements of environmental impact statements and planned timely dissemination of their research results at local meetings.

Although a user advisory board was in operation to advise the researchers of user needs and promote use of information developed, we were informed that meetings had not been well attended. Consequently, such responsibility has been

transferred to the Research Coordination Board. In addition, the researcher was serving on the Science Advisory Panel to the Research Coordination Board, thus giving him immediate access to the basin's research coordination function. The team had also developed a large addendum summarizing their contacts with research and user organizations.

Two reviewers of this proposal commented on the failure to develop an orderly approach to research dissemination. One felt that since program thrust was on land use and development, a regional planner should be on the research staff to serve as a check on reality and provide liaison with user organizations.

Despite numerous criticisms regarding lack of any organized system for using research results, no detailed plan had been prepared. However, the list of contacts with other organizations and the description of the interactions revealed that the research team had provided numerous user groups with technical assistance, including advice on whether specific building sites should be authorized.

The research team had been active in a variety of ways to disseminate results of the research project. Between August 9, 1973, and April 25, 1974, the researcher cited 29 activities, including lecturing, testifying, participating in symposiums, seminars, conferences, forums, workshops, and a radio broadcast interview, in which the research team had actively provided information concerning their research on environmental problems. In addition, numerous publications were in various stages of preparation. Over 100 reports, papers, and theses were cited as resulting from this RANN-supported project. Of these, 25 had been published.

The researcher acknowledged the criticisms that his research project has not been delivering products on a timely basis, but he informed us that the team has been attempting to resolve this difficulty through several mechanisms. Seminars, advertised through a newspaper and mailing list, have been held for approximately 2 years. The researcher told us that six seminars held during 1974 presented results rarely over 6-months old and generally little more than 1-month old. He noted the difficulty in publishing in a timely manner in journals and said that preprints had been given to a State planning agency to provide current information. Other measures included seeking input from Lake Tahoe area agencies for developing a computer decision model. Workshops were also planned to demonstrate use of the model to user groups.

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D C 20550

nsf

OFFICE OF THE
DIRECTOR

JULY 17 1975

The Honorable Elmer B. Staats
Comptroller General of the United States
U. S. General Accounting Office
441 G Street, N. W.
Washington, D. C. 20548

Dear Mr. Staats:

Enclosed are the NSF comments and response to the GAO Draft Report, "Opportunities for Improved Management of the Research Applied to National Needs Program." I appreciate the report's central finding that "RANN management is making an active and continuous effort to develop research programs responsive to our nation's problems and has obtained a highly qualified staff to fulfill its mission." I believe that the GAO recommendations for improving utilization procedures and peer review procedures have been addressed in a rigorous manner and that the actions RANN will take are highly responsive to the letter and spirit of the recommendations.

Sincerely yours,

H. Guyford Stever
Director

Enclosure

GAO note: Page references in the Foundation's comments refer to the draft report. Page references in this report are in the left margin.

COMMENTS ON GAO DRAFT REPORT

"Opportunities for Improved Management of the Research Applied to National Needs (RANN) Program"

National Science Foundation

1. General Comments on GAO Draft Report:

The GAO Draft Report reflects the results of an intensive and, in a number of respects, in-depth review of the procedures, policies, and practices used in the management of the Foundation's RANN program. The specific recommendations set forth in the Report are receiving serious attention by the Foundation pursuant to taking additional actions where required to further upgrade the overall effectiveness of RANN. The discussion of these recommendations, as summarized in
[ii] the Digest section of the Report (pages iv-v) and the proposed actions in response thereto are contained in Section 2 of this Foundation response to the Report.

The Digest section should indicate important aspects of RANN management not included in the GAO investigation. If the reader is unaware of these aspects, the report's omission of important factors in RANN management will not be discerned. The Digest section of the Report should note that the management of RANN's energy research and technology programs is not treated. Yet, the development, funding, evaluation, utilization, and transfer of solar and geothermal energy research programs to ERDA was by far the largest single management activity in RANN during the period of the GAO study.

GAO note: RANN's policies, procedures, and practices considered in the report were applicable to its energy activities.

In addition, the major management challenge of simultaneously achieving scientific quality and timeliness in carrying out RANN projects is not specifically treated in the Report. Yet, there is a continuing tension between the time required to carry out research that is scientifically rigorous and complete compared to the time when users need information for decisionmaking. The discussion of RANN management nowhere addresses this possible conflict and others between the perception and requirements of the scientific community and the user community even though RANN management procedures are designed to meliorate these matters.

2. Comments on GAO Recommendations:

2.1 Design and Selection of RANN's Research Programs

2.1.1 Recommendation 1 - Formal procedures should be established for the development of RANN's research programs that would widely publicize its interest in developing a program area. The procedures should also provide communication mechanisms with interested persons and organizations, and Federal agencies having related programs to obtain their views during initial program development stages and in finalizing program objectives and plans.

2.1.2 Discussion - NSF agrees with GAO on the need for more formal systematic program development procedures which would widely publicize RANN interest in developing a program area and which would obtain wider user input in program planning and design as well

as public input. RANN's recent planning documents, in fact, require both (Attachment 1).

The real issue is the cost-effectiveness of alternative procedures for generating and aggregating input from scientists, users, and the public. Obtaining information about user needs and the needs of the general public is a costly and time-consuming process, albeit necessary. In considering cost-effectiveness, several problems arise: (1) users and the public sometimes have difficulty in clearly articulating their R&D needs; (2) particular needs must be consistent with obtaining general applied scientific knowledge; (3) needs sometimes conflict, causing difficulties in program aggregation and consistency; (4) in some cases, the major function of applied research is to help create users, not to satisfy an existing network of users.

2.1.3 NSF Response - Because of the problems involved in establishing cost-effective procedures, RANN will continue to experiment with new ways of obtaining user and public input in the RANN program. For example, building on experience gained in several COPEP studies, numerous researcher/user conferences, and the first RANN Symposium, twelve regional RANN seminars are taking place between May 15 and June 15, 1975.

GAO note: Attachment 1, RANN's planning document, is not included in this report.

These seminars are designed to acquaint a broad spectrum of users, scientists, and the public with RANN programs and plans and to get their feedback. More than 100,000 invitations were mailed to individuals for the seminar series.

Further experiments will be conducted as part of the strategic planning and evaluation process described in Attachment 1, including an expanded planning and coordinating activity with Federal mission agencies. The objective will be to develop prototype systems for better obtaining effective input from scientists, users, and the public. The prototype systems and mechanisms that are most cost-effective will then be formalized and established as part of the strategic planning process.

2.2 Peer Review

2.2.1 Recommendation 2 - A study be made to assess the potential impacts of changes in RANN's research proposal evaluation system as suggested by researchers.

2.2.2 Discussion - RANN has multiple objectives in subjecting proposals to peer review. These are: (1) to obtain a priori estimates of the scientific quality of proposed work; (2) to obtain a priori estimates of the utility of proposed work; and (3) to obtain estimates of an organization's capabilities to conduct research. These estimates

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are advisory in nature, not determining. Ultimately, the program staff must make a case that the proposed research represents best value to the Government.

In the case of unsolicited proposals, these estimates are obtained by treating each proposal on its merits and assembling suitable expertise through mail, panel, and/or site visit techniques. Solicited proposals are treated competitively, usually through panel techniques. There are formal requirements for the debriefing of unsuccessful applicants. These review procedures for solicited proposals are consistent with the requirements of Federal procurement regulations.

Respondents in the GAO survey of applicants raised important questions in the following areas; program manager selection among preliminary proposals; control of choice of peer reviewers; obtaining quality reviews; access to reviewers' comments; structure of review; feedback to reviewers; and declination processes.

RANN is continuing to examine ways to provide a reliability check in the selection of preliminary unsolicited proposals for further processing. For example, the Division of Advanced Productivity Research and Technology and the Office of Systems

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Integration and Analysis require: (1) multiple independent staff readings of preliminary proposals; (2) consensus recommendations to the Division or Office Director; and (3) divisional concurrence on proposed treatment of preliminary proposals.

RANN is also investigating additional oversight procedures to ensure, insofar as practicable, the integrity of the review process for formal proposals. Currently, in addition to the Division/Office oversight, the RANN Grant Review Board examines the skill mix of reviewers and checks for inadvertent bias. Additional checks may, if required, be built into the design of the reviewer selection process.

The potential for review bias in solicited proposals may pose less of a problem. Panels are large, and proposals are either randomly assigned to reviewers or read by all reviewers. Reviewer feedback and interaction occurs for proposals in the competitive range. In addition, there is a formal Source Selection Board check on possible bias in the review evaluation process. Provisions exist for debriefing both successful and unsuccessful applicants upon request or otherwise as required. However, it is necessary to insure that the personal characteristics of panelists and "dominant personalities" do not determine results.

Respondents believed that there should be a more systematic procedure for obtaining quality reviews. A large fraction believe that RANN should formally evaluate reviewers' performance; another large fraction suggests that RANN purchase reviews, although opinion is split on whether purchased reviews would make a large difference in outcomes. Another large fraction believes that review should be done in stages with reviewers seeing each others' comments before making a final judgment (Staged review is already accomplished in solicitations. Panel members individually rate and rank and then discuss all proposals in the competitive range.)

While the quality of the peer review process can be improved, such improvements cannot be accomplished without increased costs and processing time. The GAO data show that processing time is already viewed as a significant variable in efficient planning of research by applicants. Changes in the peer review system involve weighing increases in processing time against improvements in quality.

Over 60 percent of both successful and unsuccessful respondents preferred either verbatim text of reviews or edited but verbatim text. It is a long standing NSF policy to provide paraphrased text to preserve reviewer confidentiality in exchange for candor in

the original text. Within current constraints, applicant should receive sufficient amounts of information to improve research to be funded or to understand reasons for declination.

NSF believes that reviewers should be informed of positive actions taken on proposals -- that is, where an award is made. Proposals that are declined remain the property of the applicant. The benefits to be gained from explicitly informing reviewers of declinations would appear to be outweighed by the disbenefits to the applicant. Many RANN program managers inform reviewers of awards automatically, and procedures for doing this do not appear to be costly.

As part of RANN's evaluation system, some original reviewers of successful proposals are being asked to evaluate the final products. The same final products are also evaluated by scientists not involved in original review. Consequently, the evaluations can be used to test the reviewers' predictive capability and their effectiveness.

NSF respects respondents' views on obtaining more information on declinations. Procedures for debriefing unsuccessful applicants should be expanded where required.

2.2.3 NSF Response - It is believed that certain actions on peer review of RANN projects should be taken now; however, additional changes require both further analysis and experimentation before they can be fully justified. Specifically, RANN will:

2.2.3.1 Establish mandatory procedures for informing reviewers of awards made.

2.2.3.2 Increase documentation on declinations and make appropriate documentation available to the applicants.

2.2.3.3 Evaluate the cost-effectiveness of additional checks on selection of RANN unsolicited preliminary proposals and select alternatives where required to increase the reliability and validity of program managers' selections for further processing. The concurrence procedures currently followed in the Productivity Division and Systems Integration and Analysis Office will receive special attention.

2.2.3.4 Conduct analysis and experiments on the review of unsolicited proposals to increase review quality and reduce potential bias. The cost-effectiveness of Divisional concurrence in reviewer choices by program managers will be evaluated.

2.3 Utilization Planning

2.3.1 Recommendation 3 - The information suggested by the May 1974 utilization planning guidelines for unsolicited proposals be made mandatory, and emphasis be added to the guidelines providing for early identification and active involvement of initial and secondary users.

Recommendation 4 - Utilization planning requirements be developed for proposals submitted in response to program solicitations.

Recommendation 5 - Ongoing unsolicited and solicited research projects' utilization plans be reviewed against the May 1974 guidelines and the recommended requirements for solicited proposals respectively to determine if the plans need modification.

Recommendation 6 - Utilization plans in research proposals be a distinct, separate part.

2.3.2 Discussion - The GAO analysis does not adequately reflect the complexity of the utilization question. The GAO presents no explicit model or theory of how research information is used in decisionmaking. Since there are many factors besides research that enter into decision, and there are other research

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streams besides the one from RANN, the contribution of RANN research must be judged on an incremental or marginal basis. The proper question to ask about RANN utilization is: Did evaluated research results from a particular project or from a particular program provide a significant positive incremental contribution to user decisions? The question from a research funding perspective is to decide or predict whether particular proposals will provide the desired positive incremental contributions.

Whether very intensive a priori utilization plans are the best guarantors of utilization or whether other techniques are appropriate and cost-effective -- e.g., extensive involvement of users in evaluating intermediate product -- must be an empirical question. In this connection, the GAO's own data on user

[99] involvement (page 107) are suggestive. Seventy-six percent of the users want to be involved in evaluating final products, and seventy percent want to be involved in evaluating proposals. The fractions wanting to assist in identifying their own needs, developing research, and monitoring and disseminating research are all significantly lower. This kind of result is to be expected, for users as well as researchers incur opportunity costs. Efforts devoted to interaction with the scientific community

or research funding agencies mean less effort will be applied to the users' main activities.

Clearly, each project and program should have appropriate utilization activity, and the cost-effectiveness of such activity must be maintained. A priori determinations of the cost-effectiveness of utilization plans must account for the value of the information to be generated, the capabilities of the performer, and the relation to the larger RANN program. Thus, some RANN proposals may contain heavy utilization activity at a point in time and others little. As the research progresses, this activity may well change.

The GAO's own discussion of six projects funded early in RANN's history (Chapter 5) illustrates this process. GAO finds, for example, that, in a health care telecommunications project (page 77),
[74] the research team "had performed several dissemination and utilization activities...and were working with Massachusetts Medicare officials to obtain reimbursement for medical services provided by nurses" even though such activities were not predicted in the a priori plan. In a modeling project for

[76] environmental planning and design, GAO finds (page 78) that "utilization planning became more extensive as the project progressed." In a project on seismic design decision analysis, "utilization planning

[80] improved as the project progressed" (page 83).

The more extensive the utilization planning, the more unreimbursed proposal costs an investigator may incur. This is especially true if rigorous "market demand" estimates are always required. But research funders do not have many validated predictors of utilization performance.

Through outside contract, RANN is currently analyzing the utilization performance of 120 projects to establish better predictors. It may be that increased monitoring of utilization activities as product is built up is far more cost-effective than more extensive utilization planning at the beginning of a project. Some relevant output, even if it is partial output, may be a key in successful utilization.

The utilization potential of a project must be judged in terms of an overall program design. For example, in some cases, it is appropriate that RANN itself undertake separate utilization efforts without placing heavy burdens on investigators. Such

was the case in general revenue sharing research. In other cases, very heavy burden should be placed on the principal investigator. Such was the case in an award to the University of Washington to construct forest management models. The University of Washington was explicitly funded to carry out utilization activity as a partner with the State Department of Natural Resources.

In the case of utilization planning for solicitations, NSF believes this also must be a function of the
[94] overall design. For example, in a solicitation on ocean thermal technology (page 101) it is unreasonable to expect detailed utilization planning. The purpose of the research is to create users. In the
[95] case of municipal management solicitations (page 102), utilization planning requirements should be heavy. RANN staff and the Grant Review Board explicitly review each proposed solicitation for relevant utilization requirements.

GAO assumes that the proper "unit of utilization" is the individual project. The results of individual projects are rarely definitive, and a series of cumulative results is usually required to insure utilization. Consequently, aggregated, validated results from a RANN program element are probably a better "utilization unit" to consider.

Within a program element, there may be problem-oriented basic research projects, and problem-focused applied research including technology research and policy research. The mix of projects in a program element will vary over time. All of the information from the different types of projects must be aggregated, integrated, and validated to insure problem solution and utilization. More intensive utilization efforts for particular projects may or may not be cost-effective, depending on how the projects fit into the overall program design.

NSF believes that much more rigorous utilization planning for program elements must be done. Utilization planning for program elements places the "burden of utilization" properly on the RANN program staff and on the complementary staff of the Office of Intergovernmental Science and Research Utilization. It is not always efficient or effective to place heavy burdens on a particular investigator. His work may only be a small part of a large design.

2.3.3 NSF Response -

2.3.3.1 RANN will require that an explicit utilization plan be developed for each program element. The utilization plan will relate the expected flow of product over time to intermediate and final users and show who the utilization performers are expected

to be and the rationale for their selection. Intermediate users include basic and applied researchers and translators and integrators of basic and applied research. Final users are decisionmakers in the public or private sectors.

2.3.3.2 RANN now requires that the utilization guidelines of May 1975 be mandatory in the sense that evidence or argumentation about intended utilization must be set forth systematically and specifically in the proposal and by the program staff to the Grant Review Board. However, because RANN is a problem-solving research organization, the definition of users must include the intermediate users defined above (2.3.3.1) as well as the final users who are decisionmakers in the public and private sectors.

2.3.3.3 RANN will further emphasize that proposed program solicitations must have an appropriate specific utilization design to be evaluated as part of the Research Applications solicitation review process.

2.3.3.4 RANN will review all ongoing research projects funded before May 1974 (first revision of guidelines) to insure that these projects conform to current utilization standards.

2.4 Use of Excepted Authority

2.4.1 Recommendation 7 - A determination be made of whether desired personnel are available from the Civil Service Commission registers prior to using the Foundation's excepted hiring authority.

2.4.2 Discussion - GAO finds that RANN "has obtained a highly qualified staff to fulfill its mission" [i] (page i). GAO notes "most of the 80 RANN key management officials were employed through [112] excepted appointments" (page 119). NSF believes that RANN must maintain the staff quality already achieved. Members of the scientific or user communities most qualified for professional positions in RANN often will not appear on the CSC register. Often the time frame for NSF recruitment for professional positions makes the use of CSC registers impractical.

2.4.3 NSF Response - When the nature of the position requirement makes it advantageous, RANN will make an explicit and documented search through the CSC registers.

3. Specific Comments:

[16] 3.1 Page 18, paragraph 2: The Interagency Coordinating Committee met on December 18, 1974, and February 19, 1975, to provide an overview of RANN activity and to discuss RANN's FY 1976 program plans.

[23] 3.2 Page 26, paragraph 1: NSF agrees that the structure of the Interagency Committee and time constraints faced by RANN and the agencies sometimes limits discussion of programs. NSF believes that early exchange of program plans would permit more precise discussion and analysis.

[24] 3.3 Page 27, paragraph 3: RANN will experiment with alternative dissemination techniques as it designs its programs. The number of possible public interest groups and trade associations having some relation to RANN activity is very large. This large number raises complex questions of the cost and timeliness of "outreach" programs and of processes for effectively aggregating very diverse and conflicting views.

[25] 3.4 Page 28, paragraph 2: RANN supports general revenue sharing research, because it satisfies the RANN criteria noted in

[8] paragraph 2, page 9, of the Report.

[28] 3.5 Page 33, paragraph 1: NSF plans that public interest groups and State and local governments will participate in the evaluation of RANN's revenue sharing research products. The discussion on page 33 illustrates the tradeoffs between very wide consultation, aggregation of diverse views, and timeliness and utility of research.

[30] 3.6 Page 35: RANN is now further expanding formal procedures for development of its research programs. More emphasis is being placed on strategic planning of research programs (Attachment 1). The more formal the procedures, and the wider the participation, the more time the development of a given research program will take. Since RANN is responsible for research that is scientifically meritorious and timely, a balance must be struck on both the cost and length of program design processes.

[56] 3.7 Page 62, first table: Twenty-two percent of unsuccessful respondents stated that they needed no help in preparing an unsolicited proposal compared to 12 percent for successful respondents. This suggests that unsuccessful applicants may not have fully realized the substantive and procedural requirements for RANN's unsolicited proposals. The result suggests that RANN might provide more examples of high quality proposals and should perhaps go beyond the guidelines in explaining the desired contents of research and utilization plans. The Regional Seminars currently being held are intended to contribute importantly to this end.

[56] 3.8 Page 62, second table: Seventy-five percent of RANN's program managers obtain other experts' views on preliminary proposals. This practice is consistent with researchers'

[57] desires expressed in the first table of page 63. RANN evaluation procedures for preliminary proposals may not be entirely clear to researchers, or researchers may desire that all program managers be checked for the reliability and validity of their judgments. RANN will examine the cost-effectiveness of having further determinations concerning preliminary proposals checked for reliability and validity. (See NSF Response 2.2.3.3, page 9.)

[58] 3.9 Page 64, first paragraph: Program managers are subject to oversight in the exercise of their own judgments on peer review. The Grant Review Board checks for possible bias in review and on the "balance" of the review, e.g., the spread among users and scientists. As noted in the comments on the GAO recommendations, RANN will further analyze and experiment with more formal checks on the objectivity of the peer review process.

[61-62] 3.10 Pages 66-67: As noted previously, RANN will evaluate alternative procedures for insuring review quality consistent with current general NSF policy on reviewer confidentiality.

[61] 3.11 Page 67, paragraph 1: Panel reviewers for RANN solicitations receive expenses and sometimes receive a consulting fee. The same rule holds for site visitors for unsolicited proposals.

Mail reviewers of unsolicited proposals are ordinarily not compensated. Mail reviewers or evaluators of final products are now being compensated.

[63] 3.12 Page 68, first table: Almost seventy percent of the researchers prefer some notification of proposal disposition if they serve as reviewers. Although many program managers provide such notification, RANN will make notification of awards mandatory. See 2.2.3.1 above.

[64-65] 3.13 Page 69, first and second tables: RANN will more thoroughly document reasons for declinations and transmit relevant documentation to applicants.

[66] 3.14 Page 70: Total processing time of a proposal includes the applicant's efforts to develop a proposal; staff analysis and guidance; peer review; and administrative processing. Total processing time will vary substantially with the number of requirements a proposal must meet. If an applicant is required to do extensive "legwork" to develop his research plan or utilization plan, development and processing time will go up. Applicants' unreimbursed proposal costs and RANN costs will also go up.

[70-96] 3.15 Pages 73-93: Utilization planning for projects. See comment 2.3, Utilization Planning, for the distinction between project utilization and program element utilization and for cost-effectiveness considerations.

[72-96] 3.16 Pages 75-104: Whether all "barriers to implementation" can be identified at reasonable cost before a project begins is an open question. GAO's own analysis suggests that utilization of project results may be an iterative process. Users become much more interested or aware as the product appears. And some projects are designed to create users. Whether RANN should impose more costs in a priori utilization planning for projects or more costs in utilization monitoring of ongoing activity or spend more on centrally-directed RANN efforts is not settled from the evidence offered. RANN will analyze these options further to determine relative cost-effectiveness.

[99] 3.17 Page 16, Users view on utilization. The data show that seventy percent of the users want to be involved in evaluating research proposals and seventy-six percent want to be involved in evaluating final results. Fifty-six percent have been involved in evaluating RANN proposals but only thirty-four percent have been involved in evaluation of final results. The fractions wanting involvement in identifying user needs, monitoring research, or even dissemination are significantly lower. The users' views suggest the complexity of the utilization question.

RANN has initiated a product evaluation system (Attachment 2, AD/RA Circular 15) which significantly increases the involvement of users in product evaluation.

GAO note: Attachment 2, AD/RA Circular 15, is not included in this report.

100-102] 3.18 Pages 108-109, Implementation. Implementation denotes activity in the operational phase which is beyond the utilization phase; for example, actually making changes in regulations or providing capital investment funds to execute findings from research. Thus, many of the barriers to implementation noted by the users relate to social and economic issues which are not generally within NSF's power or authority to address.

In any case, the fractions indicating that the "barriers" are "definitely a serious problem" are low. The mean percentage of "definitely a serious problem" across all barriers is twelve percent. The mean percentage of "somewhat of a serious problem" across all barriers is sixteen percent.

PRINCIPAL OFFICIALS OF THE NATIONAL SCIENCE FOUNDATION RESPONSIBLE FOR ADMINISTERING ACTIVITIES DISCUSSED IN THIS REPORT

	Tenure of office	
	From	To
DIRECTOR:		
H. Guyford Stever	Feb. 1972	Present
Raymond L. Bisplinghoff (acting)	Jan. 1972	Jan. 1972
William D. McElroy	July 1969	Jan. 1972
DEPUTY DIRECTOR:		
Richard C. Atkinson	June 1975	Present
Lowell J. Paige (acting)	Sept. 1974	June 1975
Raymond L. Bisplinghoff	Oct. 1970	Sept. 1974
Vacant	June 1970	Oct. 1970
Louis Levin (acting)(note a)	Aug. 1968	June 1970
ASSISTANT DIRECTOR FOR ADMINISTRATION (note b):		
Thomas E. Jenkins	Sept. 1972	June 1974
Thomas F. Jenkins (acting)	Dec. 1971	Sept. 1972
Bernard Sisco	Oct. 1969	Dec. 1971
ASSISTANT DIRECTOR FOR ADMINISTRATIVE OPERATIONS:		
Fldon D. Taylor	Aug. 1974	Present
Eldon D. Taylor (acting)	July 1974	Aug. 1974
Vacant	June 1974	July 1974
DIRECTOR, OFFICE OF PLANNING AND RESOURCE MANAGEMENT:		
Joel A. Snow	Aug. 1974	Present
Jack Sanderson	July 1974	Aug. 1974
Vacant	June 1974	July 1974
ASSISTANT DIRECTOR FOR RESEARCH APPLICATIONS:		
Alfred J. Eggers, Jr.	Mar. 1971	Present

	Tenure of office	
	From	To
DEPUTY ASSISTANT DIRECTOR FOR RESEARCH APPLICATIONS:		
Richard J. Green	Aug. 1974	Present
Sidney Sternberg	Aug. 1971	Aug. 1974
DEPUTY ASSISTANT DIRECTOR FOR SCIENCE AND TECHNOLOGY, RESEARCH APPLICATIONS (note c):		
Ali B. Cambel	Aug. 1974	Sept. 1975
Joel A. Snow	Mar. 1971	Aug. 1974
DEPUTY ASSISTANT DIRECTOR FOR ANALYSIS AND PLANNING, RESEARCH APPLICATIONS:		
Harvey A. Averch	Aug. 1974	Present
Ali B. Cambel	Feb. 1974	Aug. 1974
DEPUTY ASSISTANT DIRECTOR FOR PROGRAM MANAGEMENT, RESEARCH APPLICATION (note d):		
Richard Green	Aug. 1972	Feb. 1974
Robert Crawford (acting)	Feb. 1972	Aug. 1972
Leon Schwartz	Mar. 1971	Feb. 1972
DEPUTY ASSISTANT DIRECTOR FOR MANAGEMENT AND UTILIZATION, RESEARCH APPLICATIONS (note e):		
Richard Green	Feb. 1974	Aug. 1974

a/As executive associate director, Dr. Levin performed functions of deputy director.

b/The Office of Planning and Resources Management and the Directorate of Administrative Operations were established on June 25, 1974, to replace the Directorate of Administration.

c/The position of deputy assistant director for Science and Technology was abolished in September 1975.

d/The position of deputy assistant director for Program Management was changed to deputy assistant director for Management and Utilization in February 1974.

e/The position of deputy assistant director for Management and Utilization was discontinued in August 1974.