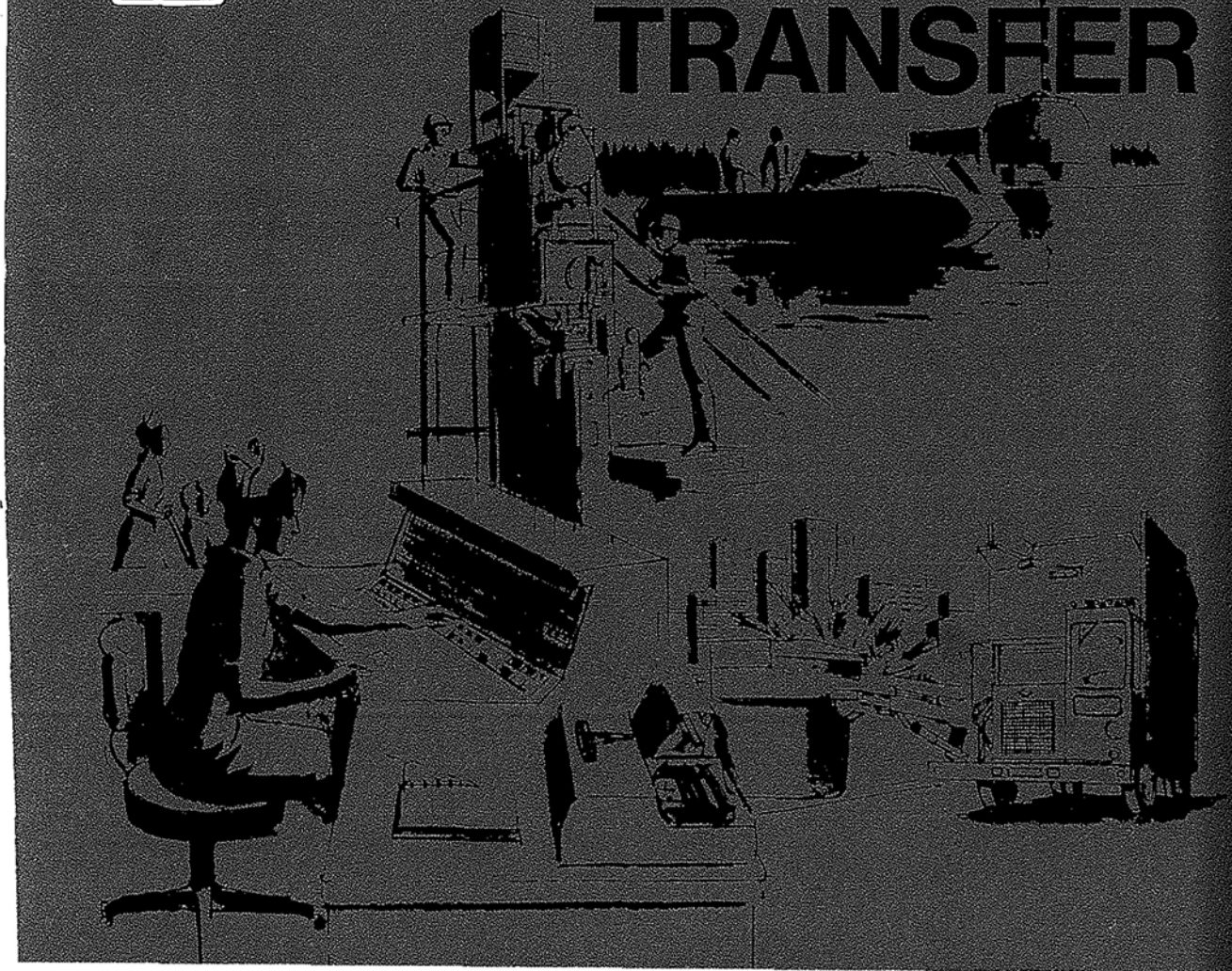
DIRECTORY OF

FEDERAL TECHNOLOGY TRANSFER



"One of the clear lessons of the past few years is that our society as well as that of the rest of the world, is intimately tied to technology and the science that produces it. Certainly our own approaches to problems in energy, environment, food production, and the well-being of the national economy will include substantial contributions from science and technology. As a Nation we are fortunate to have an extraordinarily strong science and technology base to draw on in dealing with these and other important national problems."

—President Ford, in a report
to Congress, February 1975

FEDERAL TECHNOLOGY TRANSFER DIRECTORY OF PROGRAMS RESOURCES CONTACT POINTS

June 1975



Federal Council for
Science and Technology
Committee on
Domestic
Technology Transfer

FOREWORD

This directory of the Federal Council for Science and Technology Committee on Domestic Technology Transfer represents an important milestone in the Federal Government's attempt to ensure that the Nation's scientific and technological knowledge and expenditures have the maximum beneficial impact in solving the Nation's problems. It brings together in one volume, an index of the programs, resources and contact points at the Federal level which can be drawn upon in achieving transfer of technology and knowledge.

Much of the activity described is decentralized. Because the detailed information is communicated, and in most cases the technology is transferred, at the functional working level, the processes may not have attracted great attention. It is this diversity that, in turn, may account for the lack of understanding regarding the extent of the Federal Government's commitment to a partnership effort in science and technology. But, it should be clear from the content of this document that there is an extensive Federal commitment to bring the results of research and development investment to effective application throughout the public and private sector. As the techniques evolving from research on transfer mechanisms and methods are refined, and as all the levels involved in the process become more aware of what is possible, an increasingly effective process should evolve.

While publication of this directory is a major achievement, it should be considered as one of a series of practical steps in strengthening the partnership between the Federal Government, State and local governments, and the private sector in the area of science and technology.



H. Guyford Stever
Chairman

INTRODUCTION

Technology Transfer is a key element in the practical application of research and development to the wide range of civilian-oriented problems. This is the process by which existing research knowledge is transferred operationally into useful processes, products, or programs that fulfill actual or potential public or private needs. Technology Transfer is critical to assuring that the results of an annual Federal investment of over $15 billion in research and development are being applied to improve the services and quality of life throughout the Nation. The idea of transfer is expressed differently by different organizations; hence phrases like technology sharing, technology utilization, and others appear in the literature and in this report. In some cases (such as for defense and space programs) technology transfer is the process of employing a technology for purposes other than that for which it was developed. For our purposes, they all relate to the same objective.

This report provides a tool for State and local government officials and private industry to more effectively share the results of Federal programs aimed at the development of knowledge and technologies. It is designed as an easy-to-use directory of Federal technology transfer activities across a wide spectrum of the Federal Government. Each section gives a succinct description of an agency's program, including the agency's research base, its technology transfer policy and objectives, areas of responsibility, methods of implementation, accomplishments and user organizations. Contact points through which a user can find the most pertinent elements of the agency are provided. There is an index to help users find activities or applications related to their areas of interest and also determine whether activity areas are common to more than one Federal agency.

Clearly, technology transfer has attained new importance since the time, not long ago, when it was seen as an interesting subject for theoretically oriented conferences but still viewed as a peripheral activity in many Federal agencies. As is evident from the array of agencies represented in this report, technology transfer has now become an important activity in most agencies. Much of this thrust has developed during the past few years.

This new importance was partly stimulated by the often quoted Presidential Message to Congress on Science and Technology in March 1972. Perhaps more important was the move toward "New Federalism" and revenue sharing, and the concern expressed by leaders at each level to actively spur the application of Federally sponsored research and development to State and local problems. During 1972, in addition to the President's Message, the Federal Council for Science and Technology, the Council of State Governments, and the National Action Conference on Intergovernmental Science and Technology Policy, among others, recommended new partnerships to bring Federally developed science and technology to bear on

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DEPARTMENT OF AGRICULTURE

Enabling Legislation and Mission

In 1862 Abraham Lincoln approved an act creating the U.S. Department of Agriculture (USDA) in order to acquire and diffuse among people of the United States useful information on subjects connected with agriculture. Land-grant universities were authorized under this act. The Hatch Act of 1887 established agricultural experiment stations in each State, most of which are part of the land-grant colleges; and the Smith-Lever Act of 1914 established a Cooperative Extension Service in each State to carry to American farmers and homemakers the results of research in agriculture, home economics, and related subjects.

Today USDA's overall objectives are met through research, education, conservation, marketing, regulation, agricultural adjustment, production management, and rural development activities. It views its mission as enabling those engaged in the production, processing, and marketing of agricultural products to meet the food and fiber needs of the public efficiently while bringing a fair share of economic and social returns to producers and marketers for their investment and labor; enabling public and private interests to ensure man's ability to manage renewable resources; and developing the Nation's renewable resources for the use and enjoyment of both urban and rural people. USDA missions are also aimed at improving the resource management and conservation in the developing nations of the world and strengthening world markets for food, fiber, and natural resource products.

Technology Transfer Policy and Objectives

The USDA technology transfer system is based on three basic functions: the generation of knowledge through research and development; the dissemination of the results of such research and development; and the organization of clientele or users of knowledge to increase the speed of interpretation, acceptability, adoption, and eventual use of knowledge, services, and skills.

The USDA summarizes the background of the dissemination activities as follows:

sleepwear will be legally mandatory by the end of 1975, 5 years after the development of the process. Rust-resistant wheat varieties and dairy herd improvements represent a significant achievement that is based on continued development of technologies.

Other recent examples include research on African swine fever, the sugar beet root maggot, and odor problems associated with large dairies located near metropolitan areas in California. Responding to requests from Blue Plains, Maryland, and St. Paul, Minnesota, ARS scientists are developing guidelines for disposal of sewage sludge by application to farmland. Another example is the ARS studies of wholesale food distribution facilities made for cities and municipalities at their request. In such a study, ARS experts will survey existing facilities, estimate the present and projected needs of the city, and make preliminary feasibility studies of alternate ways of meeting the city's needs.

Cooperative State Research Service (CSRS)

The Cooperative State Research Service (CSRS) administers Federal grant programs for agricultural and forestry research conducted at State agricultural experiment stations, forestry schools, and other State institutions. The cooperative programs provide a continuing flow of new knowledge essential to the solution of current and future problems affecting agriculture, forestry, and rural life. The CSRS has a staff of 80 who assist cooperating State institutions in evaluating and planning programs and help provide coordination among States and between the States and Federal agencies. The CSRS has a budget of $100 million, which accounts for about one-fifth of the support for the cooperative programs of research in the States. More than half of the program support is derived from State legislatures and the remainder comes from industry, foundations, and other Federal agencies. The State scientists work closely with extension personnel both in selection of projects and in making research results available.

Economic Research Service (ERS)

The Economic Research Service (ERS) provides basic economic intelligence on agricultural and natural and human resource matters. It has a staff of about 600 scientists with a $21 million budget. Its activity is divided into major areas: commercial agriculture including the food and fiber industry's structure, foreign agriculture trade, production, prices, and marketing; resource and development economies encompassing rural people and rural environment, welfare programs, land and water resources, and international agricultural development. Examples of research related to State and local government include city-county government consolidation, enabling legislation for rural zoning, the effects of urbanization on land use and the impact of government programs on local economies.

Results of its research and service programs are widely disseminated and are relied upon by administrators in formulating and executing agricultural programs and by various levels of government with responsibility for planning the use of natural resources.

Statistical Reporting Service (SRS)

The Statistical Reporting Service (SRS) provides basic statistics needed by growers, dealers, handlers, processors, and others concerned with the food and fiber industries. The results of the Service's programs, particularly the crop and livestock estimates programs, are widely used and are necessary in establishing agricultural policy.

Soil Conservation Service (SCS)

The Soil Conservation Service (SCS) is the technical soil and water conservation agency of the USDA. It provides technical leadership in programs to States and local governments and individuals to develop, protect, and im-

professional staff in this manner: Agriculture and Natural Resources, 37.4 percent; Home Economics, 21.0 percent; 4-H Youth Development, 32.7 percent; and Community Resource Development, 8.9 percent.

Federal extension personnel are familiar with national research developments and assist State extension specialists in incorporating these developments into their educational programs. State extension specialists work with the research staffs of their own college, plan comprehensive educational programs, and keep county extension agents well informed on the latest scientific information interpreted for practical application.

The county extension agent is the focal point of the program. The county is where the actual transfer takes place. Two major types of transfer activities of the county agents include: creating awareness of the existence and advantages of new agricultural techniques and products, and solving problems in response to individual requests. In the first activity the county agents use demonstrations, field days, meetings, seminars, and workshops.

County agents also play an important role in adapting new technologies and products to the level and need of the user. Also, from their personal knowledge of the problems of the users, they can inform the State extension specialists both of the effectiveness of new developments and of problems which may require new research. They also bring grower experience and expertise into the information system.

The educational methods used include demonstrations through which research results are tried and demonstrated on operating farms under practical field conditions as well as meetings, field days, use of mass media, individual consultation, and other techniques. The Extension Service generally uses local advisory committees to help plan and conduct its programs.

Current Research Information System (CRIS)

The Current Research Information System (CRIS) became operational in 1969 and is designed to provide ready access to information regarding the research activities of the USDA, the State agricultural experiment stations, and other cooperating institutions by improving communications among agricultural research scientists, especially with regard to current research work, and providing research managers with up-to-date and coordinated information on the total research programs of these agencies.

To coordinate all of these activities, the Agricultural Research Policy Advisory Committee (ARPAC) was established with membership consisting of the heads of the agencies of the USDA with research responsibilities, the Administrator of the Extension Service, the head of the National Agricultural Library, representatives of the State Agricultural Experiment Stations at the land-grant colleges, the forestry schools, the Agricultural Research Institute, a representative of a USDA public advisory committee on research and representatives of other agencies of government concerned with agricultural research. The Committee has become an important channel for communications among the top managers of these programs. It is through this organization that participating research agencies decided in 1971 to undertake a program of joint cooperative agricultural research planning.

The basic element in this new planning system is a group of four Regional Research Planning Committees. These Committees are expected to analyze the total publicly supported agricultural research program in their region, to identify appropriate shifts or changes in emphasis, to identify high priority needs as well as programs that might be dis-

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

Enabling Legislation and Mission

The National Oceanic and Atmospheric Administration was created by the President's Reorganization Plan of 1970 which also formed the Environmental Protection Agency.

The mission of NOAA is to further the Nation's safety, welfare, security, and commerce through increasing knowledge and rational use of the natural environment.

This mission involves: (1) the development of programs to assure that the ocean environment and its resources are wisely used in a balanced way to enable their development and conservation for the national well-being; (2) the execution of such programs so that the oceans' resources can be effectively and economically developed by the private sector, providing an arena for the creation of new industries and the revitalization of existing ones; (3) the development and operation of systems to monitor and predict environmental conditions such as weather, ocean, earth and solar hazards so that through information services and hazard warnings, life and property are protected and the efficiency of commercial, industrial, and agricultural activities are improved; and (4) the exploration of the feasibility and, where warranted, the development of a national capability for beneficial environmental modification, and understanding the consequences of inadvertent environmental modification.

Rational use, development, and conservation of natural resources are promoted by scientific research and technological development. Continuous surveillance of the oceans and atmosphere permits NOAA to discharge its responsibility for predicting environmental changes, and for issuing warnings when hazardous conditions are expected. The living and mineral resources of the sea are explored, developed, and managed for the good of the Nation. Means are explored for using natural resources and for modifying the environment without causing deterioration or damage to either, and for developing methods to conserve or improve conditions. The Administration also provides environmental support to other Federal departments and agencies and coordinates with them national efforts directed toward protecting, main-

Implementation

The Office of Sea Grant administers funding support for institutions engaged in comprehensive marine research, education, and advisory services aimed at assisting man in the intelligent utilization of the seas and Great Lakes of the United States, and their adjacent coastal areas. The advisory services constitute the technology transfer mechanism by which the results of the supported research, development, and analysis are introduced into marine and coastal business and industry.

Such technology transfer is an inherent part of the Sea Grant Program as specified in its enabling legislation, the National Sea Grant College and Program Act of 1966. It specifically provides for the development of programs of instruction, practical demonstrations, publications, and other communications "with the objective of imparting useful information to persons currently employed or interested in the various fields related to the development of marine resources, the scientific community, and the general public."

The subject matter scope of the Sea Grant Program is defined by the Act as

> including, but not limited to, the fields oriented toward the development, conservation, or economic utilization of the physical, chemical, geological, and biological resources of the marine environment; the fields of oceanography and oceanology; and the fields with respect to the study of the economic, legal, medical, or sociological problems arising out of the management, use, development, recovery, and control of the marine environment.

In the implementation of the program, emphasis is on coastal zone activities.

Institutional Sea Grant funding is made to universities with a broad, demonstrated competence in marine-related activities, when the universities commit themselves to accept the Sea Grant Program as a major continuing institutional goal by providing at least one-third of the cost of the funded activities from non-Federal funds. The institutions are required to plan and operate major research programs involving the talents of economists, sociologists, administrators, political scientists, lawyers, and educators as well as natural scientists and engineers.

Advisory services under Sea Grant funding include publications, dissemination of information through audio and visual media, demonstrations, extension services, seminars, conferences, and other appropriate means. Advisory services include "repackaging" of information to make scientific or engineering data immediately useful to interested consumers.

Publication activities associated with the advisory services transfer technology through scientific, engineering, and other professional journals, and the trade and technical press, including local and regional specialized publications. The translation of scientific information directly into commercially applicable knowledge expressed in language understandable to industrial personnel with no scientific background is especially important in Sea Grants.

The National Marine Fisheries Service (NMFS) is involved in various types of fishery systems research to develop the following three goals: (1) More effective resource sampling systems; (2) means to increase the harvesting efficiency of the fishing industry—particularly where underutilized species are concerned; and (3) fishing methods that are more species-selective for conservation purposes.

Ongoing research with definite or possible application to industry includes development of electrical shrimp and fish trawls, shrimp-separator trawls, and methodology for reducing porpoise mortality in the tuna purse seine fishery.

NMFS endeavors to transfer fishery

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NOAA's marine ecosystems investigations include a modest first-phase effort to obtain baseline data needed to assess the impact of anticipated deep ocean mining of manganese nodules in the Pacific Ocean. The long-range goal of this program is to promote industrial development of marine minerals to broaden the Nation's mineral resource base by developing both the capability to predict probable environmental effects from potential marine operations and to develop special environmental disturbance control techniques to prepare for industrial development of extractive systems compatible with other marine resources and the marine environment.

This program includes a number of contractual relationships with industry and the academic community to conduct research leading to mining of the sea floor. A continuing interchange of information and ideas has been maintained with the mining industry.

Several activities of NOAA's Office of Marine Technology (OMT) contribute to technology utilization and exchange. OMT acts as the national focal point for knowledge of technology related to the testing, evaluation, and calibration of sensing systems for ocean use, and it disseminates operational results and technical information to serve the national oceanographic community. The Engineering Development Laboratory (EDL) provides engineering services in support of data acquisition and processing functions encompassing the areas of systems engineering analysis; exploratory development; engineering and prototype hardware and software model design and development. The NOAA Data Buoy Office is developing several buoy systems designed to provide meteorological, oceanographic, and water quality data in support of weather observation and prediction scientific programs, exploration and exploitation of energy sources, transportation and fisheries industries, and water pollution monitoring. The National Oceanographic Instrumentation Center operates a laboratory for the evaluation of oceanographic instruments. It encourages the coordination of national specifications for oceanographic instrument development and conducts programs among Government agencies, academic laboratories, and the industrial community for developing standards and calibration procedures as well as sponsoring regional capabilities to calibrate instruments.

The National Geodetic Survey (NGS), an element of the National Ocean Survey, is responsible for establishing and maintaining the basic National Horizontal and Vertical Networks of Geodetic Control, and it exercises government-wide leadership in the improvement of geodetic surveying methods and instrumentation. The NGS operates the National Geodetic Survey Information Center, which prepares data for its own organizations, as well as for Federal, State, and local governments' publication and distribution.

The activities of NOAA's Environmental Data Service (EDS) contribute to technology utilization and exchange. EDS consists of five centers involved in archiving the Nation's environmental data in the atmospheric, oceanic, and solid earth disciplines; in indexing those environmental data nationally and internationally in the EDS centers; and in providing members of the user community with environmental data summaries and products. Editing and publishing of NOAA's scientific and technical publications; operating and coordinating NOAA's libraries; and providing technical information services are the responsibility of the EDS Environmental Science Information Center (ESIC). ESIC, through its automated Oceanic and Atmospheric Science Information Service (OASIS), is the basic point of contact for NOAA's technology transfer in the atmospheric, oceanic, and solid earth disciplines.

U.S. Maritime Administration

Enabling Legislation and Mission

The Merchant Marine Act of 1936 established the Maritime Administration to administer programs to aid the development, promotion, and operation of the United States merchant marine. It is also charged with organizing and directing emergency merchant ship operations.

During the 1960's, United States foreign trade increased by more than 50 percent, but in the same period the percentage of that tonnage moved in American ships had dropped by more than half to 5.4 percent. By 1982 the American foreign trade fleet was expected to decline from its World War II total of 4,446 to 200 ships able to carry less than 3 percent of United States foreign waterborne commerce if no new measures were taken. Declines in the shipbuilding industry would also have been severe.

With these problems in mind, President Nixon, in October 1969, announced a new maritime policy with the aim of rejuvenation of the United States merchant marine. The policy included:

- An expanded, 10-year shipbuilding program;
- Revision and streamlining of construction and operating subsidy programs;
- Extension of benefits and incentives to the entire foreign trade cargo fleet, including tankers, and initiation of mortgage guarantees;
- Enlargement and redirection of maritime research and development;
- Improvement of seaports and promotion of intermodal transportation systems.

The resulting Merchant Marine Act of 1970 describes the MarAd objectives as follows:

The specific objective of the MarAd Research and Development program is to reduce United States shipbuilding and ship operations costs to a level of equality with foreign cost while substantially decreasing the need for Government subsidies.

With this mandate from the President and Congress, the MarAd research and development program was enlarged and directed toward practical applications which would result in making the United States merchant fleet more productive and competitive and contribute to the successful implementation of the new shipbuilding program.

Research Base

The Maritime Administration (MarAd) constructs or supervises the construction of merchant-type ships for the Federal Government and, through administration of its subsidy program, for the U.S. merchant fleet. It conducts programs to assure equal opportunity in employment by Government shipbuilding, ship repair, and water transportation contractors. It helps industry generate increased business for U.S. ships; conducts programs to develop ports, facilities, and intermodal transportation systems; and promotes domestic shipping. MarAd also administers a War Risk Insurance program which insures operators and seamen against losses caused by hostile action if domestic commercial insurance is not available.

The Administration conducts research and development activities to improve the efficiency and economy of the merchant marine.

Research Utilization Policy and Objectives

MarAd carries out its R&D projects, not only through Government funding, but with in-

servation and efficient transportation of energy.

The two National Maritime Research Centers at Kings Point, New York, and Galveston, Texas, are new Government facilities which are directed toward testing components and systems prior to at-sea tests. The Computer-Aided Operations Research Facility (CAORF) at the Kings Point Center will be the world's most advanced ship operations simulator. Its construction is nearing completion in readiness for operation in fiscal year 1976.

The Maritime Research Information Service (MRIS) is a computer-based information system for acquisition, selection, storage, retrieval, and dissemination of references to proposed, ongoing and completed research and development projects and to technical reports and journal articles in the maritime field. MRIS users include steamship companies, shipbuilders, research firms, labor organizations, ship designers, government agencies, and universities. MRIS began operation in July 1970 as a result of a 1969 conference of maritime interests which gave a high priority to the development of such a maritime-oriented research information service.

Besides MRIS, reports from MarAd R&D programs are distributed through National Technical Information Service (NTIS). Symposia and other industry meetings are held to review results of major efforts, both to describe the technical developments and their application as well. In those cases where MarAd equipment contractors are developing advanced hardware, they, along with MarAd, act to inform the maritime industry of the characteristics, capabilities, and costs of the systems developed. Since the contractors have potential commercial gains to be derived, they act not only to disseminate the information but also to put the products into actual commercial use. This is especially true if the contractor has a stake in the success of the product through his sharing of the development cost with the Government.

Technology Transfer Accomplishments

Specific technological research and development areas affecting maritime transport include automation, simulation, satellite communication and navigation, cryogenics, and advanced marine power systems such as industrial gas turbines and nuclear engines. Three of them, the utilization of automation, nuclear technology, and advanced communications, are described below. Others include materials, hydrodynamics, structures, ice-breaking technology, underwater technology, cryogenics, oil/water separation, and advanced gearing.

MarAd has active programs utilizing automation technology for both shipboard use and in shipyards. Shipboard applications include the use of computers to assist in the control of the ship (e.g., docking, navigation and collision avoidance, bridge operations, etc.) as well as to monitor various ship functions such as the ship's machinery, cargo control, etc. One effort involves the development of a computerized Shipping Operations Information System (SOIS) designed to allow vital cargo control information to be communicated between vessels and central computer facilities ashore and the vessel's owners via remote computer terminals. SOIS is also useful in fleet resources management, intermodal cargo transfer problems, and in processing the large amounts of documentation associated with shipping operations.

Automation is also being incorporated in the United States shipyards for both design and fabrication. The Merchant Marine Act of 1970 required a progressive reduction in construction subsidy. The MarAd R&D in this area is therefore aimed at making United States shipyards more productive. Many of the manufacturing processes and controls are

Ports and Terminals Bureau, Inc.; human factor studies which collect and analyze data to determine personnel characteristics required for selection and training of seamen and officers for efficient and safe operation of modern merchant ships; and advances in shipbuilding techniques such as welding, painting, heavy lifts and special vehicles as well as shipyard training programs to develop qualified personnel. Deepwater terminals and moorings have been designed to handle large oil tankers efficiently and without pollution. For the Great Lakes area, R&D work has pursued the solution of specific problems related to year-round (winter) operation of commercial ships, e.g., ice-breaking systems, advanced communications and navigation systems, and hull forms especially suited to transportation in Great Lakes trade.

In keeping with the MarAd mission, all the R&D work is directed toward strengthening the U.S. merchant marine and the results of its findings are available through Government sources as described above. In addition, personnel of the R&D offices are available for additional consultation and help to discuss and evaluate special needs of local governments.

For additional information contact:

Berg Paraghamian: (202) 967-4113
Assistant for Program Development and Control
Maritime Administration
Office of the Assistant Administrator for Commercial Development
14th and E Streets, N.W.
Washington, D.C. 20230

Economic Development Administration

Enabling Legislation and Mission

The Economic Development Administration was established by the Public Works and Economic Development Act of 1965 to provide grants for public works and development facilities, other financial assistance, and the planning and coordination needed to alleviate conditions of substantial and persistent unemployment and underemployment in economically distressed areas of the Nation. The Act has been amended periodically, most recently in September 1974 which extended authorizations for a 2-year period. The Congress authorized a budget of $184 million for fiscal year 1975.

Research Base

EDA conducts technical assistance, research and planning programs designed to create new job opportunities and new industries in economically distressed areas. Such assistance includes project planning and feasibility studies, management and operational assistance and studies evaluating the needs of and developing potentialities for economic growth of such areas. In a few selected industries technology transfer has been used as a means to achieve the objective of stimulating economic growth in lagging areas.

Technology Transfer/Research Utilization Policy and Objectives

EDA programs are undertaken with the objective of near-term implementation in terms of job creation, raising income levels, and assisting the private sector in increasing capital investment. Also, assistance is provided States and localities to help in orderly economic development planning which could involve the transfer of technology as a technique.

serve as a focal point for liaison on standards activities within the Department of Commerce, among Government agencies and between the government and the private sector. It serves as a catalyst in stimulating standardization activities where they can be undertaken most appropriately and effectively in response to identified needs.

The Office of Product Standards does not undertake any in-house research and development programs.

Technology Transfer Policy and Objectives

Transfer of technology is achieved through the medium of standards developed by others under the stimulation and guidance of the Office of Product Standards.

National and international engineering and product standards, subject to continual revision so as to reflect advances in technological progress, serve as an immediately usable means of technology transfer within, and between, industry and Government and among nations at all levels of industrialization.

Technology Transfer Responsibility

The organizations responsible for transfer of technology through standards are those inside and outside the Government in which standards are developed and by which they are promulgated as such or by reference in codes or other regulations.

Implementation

Results of research are made suitable for technology transfer by their incorporation in continually updated standards used by reference in specifications for procurement by government and industry and in regulations issued by Federal, State, and local authorities.

All members of the professional staff of the Office of Product Standards are engaged in the guidance and stimulation of the development by others of standards that serve in technology transfer.

A recent example is the development of more than a thousand nuclear-power industry standards by cooperative efforts of the Atomic Energy Commission and over 30 standards organizations in the private sector. These standards are being used in guidelines for the construction of nuclear power plants to expedite approval of such plants to comply with regulations ensuring the proper level of safety. New and revised standards in many fields continue to be developed at a rate of thousands per year.

Standards are used by every agency of government and by every segment of industry; transfer of technology flows directly from its sources to its users through the medium of standards.

For additional information contact:

Director of the Office of Product Standards
Room 3876
U.S. Department of Commerce
Washington, D.C. 20230

National Bureau of Standards

Enabling Legislation and Mission

The National Bureau of Standards was created by Congress in 1901 to provide scientific and technical support to manufacturing, to commerce, and to Government. The enabling legislation, as modified by subsequent amendments, specifies the Bureau's functions to include maintenance and improvement of the national standards of measure-

Technology Transfer Policy and Objectives

The scope of NBS technology transfer activities is indicated in the assigned functions of its major organizational units (Department of Commerce Organization Order 30-2B, September 11, 1973).

Institute for Basic Standards

The NBS Institute for Basic Standards provides the central basis within the United States for a complete, consistent system of physical measurement and furnishes services essential to accurate, uniform physical measurement throughout the scientific community, industry, and commerce.

The Institute for Materials Research

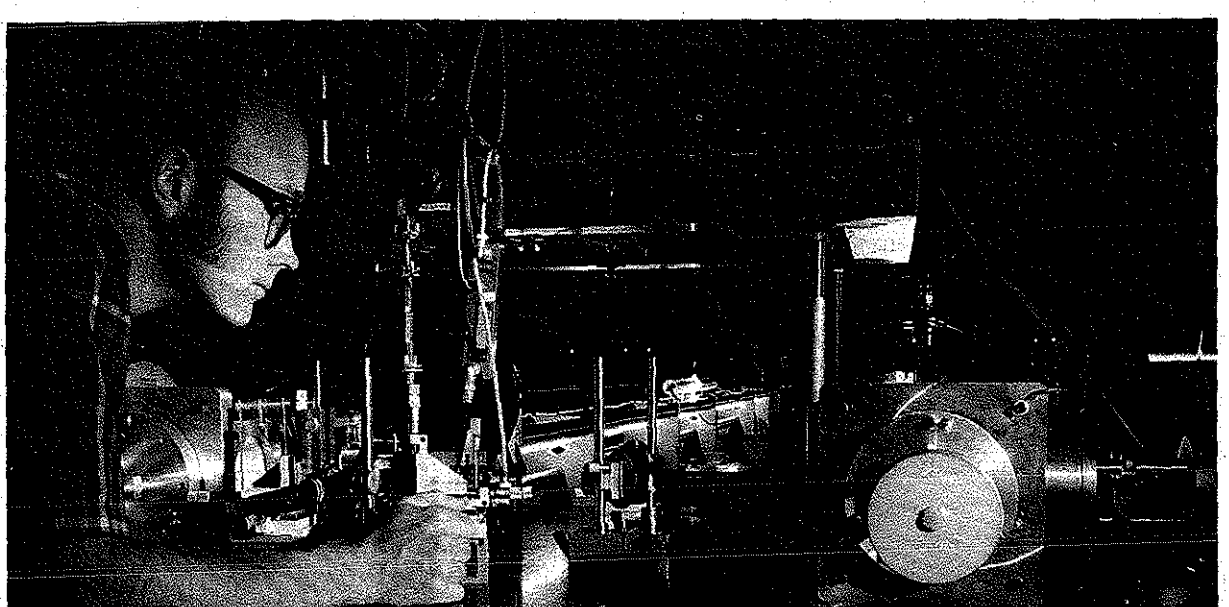
The Institute for Materials Research conducts materials research leading to improved methods of measurement, standards, and data on materials properties needed by industry, commerce, educational institutions, and Government; provides advisory and research services to other Government agencies; and develops, produces, and distributes standard reference materials.

The Institute for Applied Technology

The Institute for Applied Technology provides technical services to promote the use of available technology and to facilitate technological innovation in industry and Government and provides technical advice and services to Government agencies upon request.

The Institute for Computer Science and Technology

The Institute for Computer Science and Technology provides technical services to aid Government agencies in improving cost effectiveness through the selection, acquisition, and effective utilization of automatic data processing equipment.



NBS provides the United States' central link to the International System of Measurements (SI), and promotes accurate and uniform physical measurements throughout the Nation's scientific, industrial, and commercial communities.

Assurance Programs in mass, voltage, etc. Recently, efforts to provide similar accuracy control in clinical laboratory analyses were initiated successfully.

NBS, through its technical experts, assists in the development of engineering standards. These standards are issued in cooperation with one of the several voluntary national standards setting bodies, or in the case of mandatory standards, by other Government agencies with the appropriate regulatory authority. Examples in the latter category include standards for fabric flammability, toy and consumer product safety, environmental pollution abatement, and Federal Information Processing Standards to improve the capability and performance of hardware and software used in automatic data processing.

The Voluntary Product Standards Program operated for the Department of Commerce by the NBS provides a mechanism for the development of voluntary engineering standards as a supplement to the activities of the private sector organizations. The NBS administers a set of consensus procedures (Part 10 to Title 15, Code of Federal Regulations) providing for input from all of the groups concerned with the proposed standard. The Bureau operates an Engineering Standards Information Service which maintains a library of more than 150,000 standards, publishes general and specialized indexes of standards, and handles about 5,000 inquiries per year on the availability and sources of national, foreign, industrial, and State and Federal Government standards.

NBS programs concerned directly with technology transfer to State and local governments include sponsorship of the National Conference on Weights and Measures. This group had its beginning in 1905 when the Director of NBS called a meeting of representatives from several States "to bring about uniformity in the state laws referring to weights and measures, and also to effect a close cooperation between the state inspection services and the National Bureau of Standards." The Conference now brings together at its annual meetings approximately 500 weights and measures officers, and other officials of Federal, State, and local governments, and representatives of equipment manufacturers, industry, business, and consumers. To aid the Conference in achieving uniformity among State laws and standards, the Bureau provides actual standards to each of the 50 States, helps train State and local weights and measures personnel, and provides assistance in laboratory design.

NBS provides technical and secretarial support to the National Conference of States on Building Codes and Standards (NCSBCS), which was initiated with the help of NBS in 1968. Through this organization, NBS assists in the development and promotion of model legislation and model construction codes and helps provide a technical base to assist advances in construction technology.

In 1961 NBS sponsored formation of a National Conference of Standards Laboratories. This nonprofit, laboratory-oriented organization promotes cooperative efforts toward solving the common problems faced by standards laboratories. Its membership consists of academic, scientific, industrial, commercial, and governmental laboratories concerned with the measurement of physical quantities, the calibration of standards and instruments, and the development of standards of practice.

Under the direction of the NBS Standard Reference Data Program approximately 20 percent of the world literature in the engineering and physical sciences is reviewed and critically evaluated. Output in the form of numerical data on physical and chemical properties of materials, compilations of engineering data, and tables of mathematical functions serve as source materials in user research programs, in engineering applications and in marketing decisions. The

laboratories, spacecraft tracking stations, electrical power distributors, commercial radio broadcasters, astronomers, and civilian and military aircraft and ships.

- The NBS Institute for Computer Science and Technology has provided technical leadership through a project with the Health Resources Agency, to effect standardization and diffusion of the Massachusetts General Hospital Utility Multi-Programming System (MUMPS), a general-purpose computer language for the health care community. The MUMPS language and its several dialects are being used widely for a variety of computer-based business and clinical support applications in health care.
- The NBS Center for Building Technology served as the technical arm of Operation Breakthrough, a cooperative Government-industry program to find methods to meet the Nation's housing needs. Through an interagency agreement between the Department of Housing and Urban Development and the Department of Commerce, the NBS was commissioned to develop criteria for the evaluation of the performance of housing systems proposed by 22 manufacturers. The use of performance standards in place of engineering standards is an effective technique to facilitate the innovative use of new methods and materials in the construction industry.
- Calibrations by the NBS Reactor Division of standards for thermal neutron flux levels in reactors are relied upon by ERDA contractors and the nuclear reactor industry in general as aids in evaluating performance of new reactors, particularly during the initial break-in period.
- In July 1973, the NBS Building Environment Division at the request of the National Conference of States on Building Codes and Standards issued a Technical Note on Technical Options for Energy Conservation in Buildings. This publication identifies measures that State officials can responsibly recommend to their Governors to reduce energy use.
- A model code for metering cryogenic fluids was developed by the NBS Cryogenics Division. This resulted from a 4-year research effort at the Boulder laboratories to evaluate metering instrumentation and to transfer technology currently in use for handling liquefied gases. The program was conducted in cooperation with State regulatory agencies, several foreign regulatory groups and the Compressed Gas Association (a nonprofit group representing all segments of the industry in the U.S., Canada and Mexico). Adoption of the model code by the National Conference on Weights and Measures in 1972 will presumably forestall the difficulties associated with separate State codes.

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National Technical Information Service

Enabling Legislation and Mission

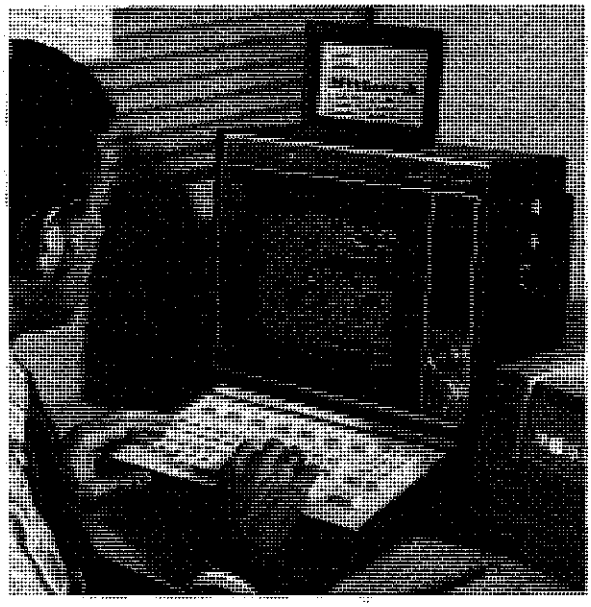
The National Technical Information Service was established by the Secretary of Commerce in 1970 with the purpose as stated in Title 15, U.S.C. Sec. 1151-1157 (1950 with changes) of making the results of technological research and development more readily available to industry, business, and the general public by maintaining a clearinghouse for the collection and dis-

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ventions available for licensing. New subject categories are added to this series regularly, after being developed whenever there is a market sufficient to justify a new bulletin and allow for recovery of production costs. The 24 different categories now included are Administration, Agriculture and Food, Behavior and Society, Biomedical Technology and Engineering, Building Technology, Business and Economics, Chemistry, Civil and Structural Engineering, Communication, Computers—Control and Information Theory, Electrotechnology, Energy, Environmental Pollution and Control, Government Inventions for Licensing, Industrial and Mechanical Engineering, Library and Information Sciences, Materials Sciences, Medicine and Biology, NASA Earth Resources Survey Program, Natural Resources, Ocean Technology and Engineering, Physics, Transportation, and Urban Technology.

NTIS is the national marketing coordinator for various Information Analysis Centers (IAC's) sponsored and partially financed by DOD, AEC, HEW, NASA, and the Department of Commerce. The IAC's are mainly



Some of the software listed in the Directory is of particular interest to State, county, and city governments for problem solving. Several worth mentioning include "Municipal Information Systems," which was tested in five major cities with application to such problems as: cash flow and treasury management; budget preparation/program budgeting; purchasing; labor negotiation; payroll, personnel and accounting; tax assessing and collection; police, fire and waste management; public complaints and service scheduling; vehicles, permits, licenses and inspections, utilities, vital statistics. With another program, "City Games," the user will be able to forecast the probable results of civic decisions upon areas within the city as well as upon the entire city. And "Forecasting Municipal Water Requirements" will help to calculate, forecast and evaluate water usage requirements and conservation effects to within 15 percent of actuality.

NTIS, in its continuing effort to provide the broadest exposure and to simplify access to the vast store of Federal technology, has entered into several agreements that are unique for a Government agency. One such agreement is with the American Express Company, which now permits commercial credit card purchases of Government products. This "first" event required a special ruling by the Comptroller General of the United States.

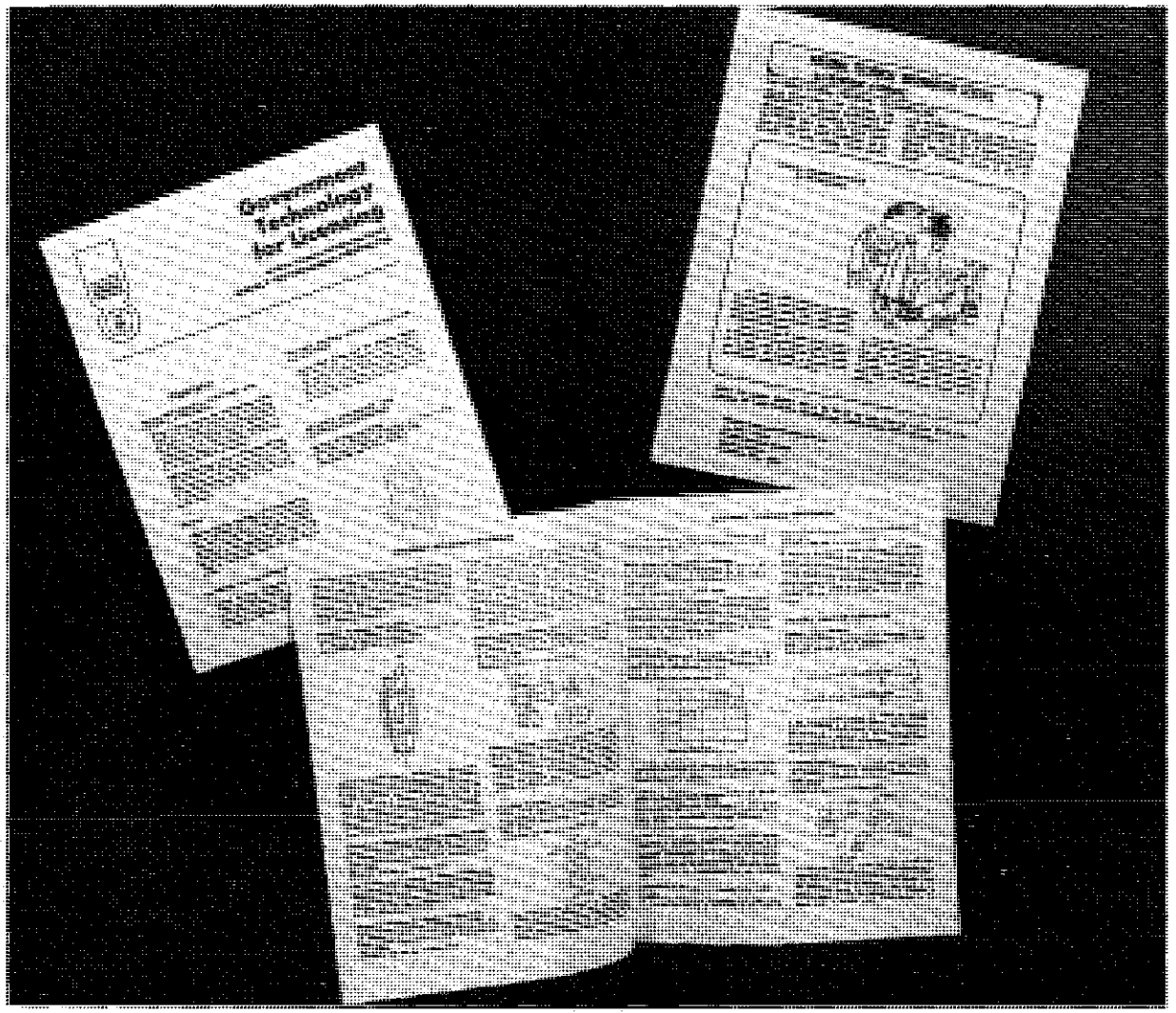
Another agreement is with the McGraw-Hill Bookstore in New York, which gave birth to the first "Store of Information." For the first time, people will be able to walk into the McGraw-Hill Bookstore and search via computer terminal through the 400,000 research reports in the NTIS collection. The search is only the first part of McGraw-Hill's new service. If the search produces promising leads, the Bookstore's display terminal will show the abstracts and, if the abstracts point to real answers, customers can order the complete reports at once.

Another agreement is with an entrepreneur who operates "Bookmobiles" throughout the United States visiting universities, colleges, and other educational institutions. A select number of Federal studies, handbooks, manuals, guides, etc., that could be used as texts or reference tools are displayed in the "Bookmobiles."

Also on display and available to visitors will be NTIS announcement journals, indexes, weekly topical newsletters, and brochures describing a variety of products and services.

The Baker & Taylor Company with sales agents in all 50 States is an outlet for NTIS announcement media. The company promotes and takes subscriptions to the biweekly Government Reports Announcements and its companion Government Reports Index, the Annual Government Reports Index, and the 24 topical Weekly Government Abstracts newsletters.

Other marketing techniques that are being considered include the use of telephone sales specialists and Western Union Airgrams.



years. In contrast, test plates coated with this new organometallic polymer have been submerged in Hawaiian and Floridian waters for almost 40 months and are still 100 percent clear of fouling. The antifouling coating is a Government-owned invention and is available for licensing. Licenses have already been issued to five companies.

A seminar "package" of the proceedings and supporting documentation can be purchased from NTIS for $125 and includes:

- Tape cassettes of the presentations and the question-and-answer portion of the program.
- Photographs of all slides used during the presentations.
- Four technical reports by the Navy inventors on organometallic polymer antifouling technology.
- Special bibliography on marine fouling prepared by NTIS.
- Copy of the Navy patent application on

people to locate patent documents on subjects of interest to them without much effort.

In the United States, as elsewhere, the volume of patent literature in existence is continuing to expand dramatically. Over 3.8 million U.S. patents have been issued. Taking into account that the patent search files contain more than one copy of most patents because of cross-referencing, there are now some 11 million copies of U.S. patents in the files, and about 9 million foreign patents and other technical documents. U.S. patent documents are added to the files at the rate of a quarter of a million per year. A substantial amount of Patent and Trademark Office activity is aimed directly at making this patent literature available to the public.

Official Gazette

One of the most effective ways of disseminating patent information to the public is through the publication of the *Official Gazette*. It contains a summary of each of the approximately 1,600 patents granted each week, including a drawing and a patent claim describing the invention. The *Gazette* is arranged according to subject matter class and subclass. If a person has interest in the full patent specification, copies of the pertinent patent can be ordered. The *Official Gazette* is available on a subscription basis from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. It is also available in over 500 libraries throughout the United States.

Copies of Patents

In FY 1974, the Patent Office printed 80,000 patents at a base rate of 125 copies of each patent. Daily, 22,000 patent copies are distributed worldwide. Five million patent copies are sold each year at 50 cents per copy. In addition, the Patent and Trademark Office provides copies to foreign patent offices under exchange agreements and to libraries at nominal costs. Subscriptions are available for copies of all patents issuing in a specific subclass. Patent copies may be obtained from the U.S. Patent and Trademark Office, Washington, D.C. 20231.

Public Search Room

To enable members of the public to conduct investigations of patent literature, a public search room is maintained at the Patent and Trademark Office. Employees are on hand to explain how patent searches can be conducted.

The search room contains paper copies of all U.S. patents arranged according to subject matter in the U.S. classification system, which contains over 300 classes and 90,000 subclasses. There is a second set of patents in the search room arranged in numerical order. The patents in numerical sequence are on 16-mm microfilm cartridges. Available in the search room are microfilm readers that will produce paper photocopies from the microfilm upon insertion of a coin and the push of a button.

The public also has access to the Patent and Trademark Office's scientific library, which is adjacent to the search room. The library contains several hundred thousand volumes of technical literature, as well as patents from 26 foreign countries. The public search room and scientific library are located at 2021 Jefferson Davis Highway, Arlington, Virginia 20231.

In addition to the facilities at the Patent and Trademark Office, more than 20 public libraries in the United States have collections of patents arranged in numerical order. These patents are supplied to the libraries under a special statutory authorization at a nominal cost.

Classification Information

The Patent and Trademark Office makes available several kinds and forms of informa-

"tailored" reports on any technological area on a cost-reimbursable basis.

For further information concerning OTAF publications/services contact:

Office of Technology Assessment and Forecast
U.S. Patent and Trademark Office
Washington, D.C. 20231
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Office of Telecommunications

Enabling Legislation and Mission

Executive Order 11556 of 1970 reorganized Federal telecommunications activities, creating both the Office of Telecommunications Policy in the Executive Office of the President, and assigning several telecommunications support functions to the Secretary of Commerce, in the Office of Telecommunications (OT):

- Analysis and engineering for management of the radio spectrum;
- Technical and economic research;
- Research and analysis on radio propagation, radio systems, and operating techniques;
- Work in the general field of telecommunications sciences in support of other Government agencies as required.

These, in addition to existing statutory functions in telecommunications R&D of the Secretary, involve OT in both the high technology of telecommunications and navigational sciences as well as in their transfer to the broadest user communities.

Technology Transfer Policy and Objectives

The OT views telecommunications as a tool of vast social and economic importance. All use of telecommunications involves questions of resource allocation. Telecommunications differs from any other service by its endless substitution possibilities and its latent impact—comparable to the development of the steam engine which extended the power of man's brawn. Telecommunications provides an extension of the power of the mind of man.

The mission of the Office of Telecommunications is not merely to promote the use of telecommunications—promotion implies simple commercial advocacy. Rather, it is to promote rational, economical, and effective use of telecommunications to create additional real wealth in the economy and to enrich our way of life.

Telecommunications extends the operations available to society. An inherent part of the telecommunications mission—its role in the Federal Government—is to establish a path whereby these options may be exercised. This may require the creation of incentives to advance, or the removal of institutional, governmental, and private impediments, which retard the opportunities.

Thus, the focus of OT's work is to advance the national capacity for utilizing both the available technologies, and new ones, through removal of legal, economic, and other institutional barriers.

This involves:

1) performing policy analysis leading to the release of restraints upon fuller use of telecommunications technology through both social and technical innovation;
2) conducting scientific and engineering research that is innovative;

adding the objectives of expanded readership through secondary publication, and development of general assistance to State, local, and commercial interests by creating an Information Exchange Center for both demonstration and consultation.

These new additions to technology transfer are contingent upon budgetary and staffing proposals for full implementation.

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DEPARTMENT OF DEFENSE

Enabling Legislation and Mission

The Department of Defense (DOD) is the successor agency to the National Military Establishment, created by the National Security Act of 1947. It was created as part of a comprehensive program designed to provide for the security of the United States through the establishment of the integrated policies and procedures for the departments, agencies, and functions of the Government concerned with national security.

Research Base

Scientific and technical matters; basic and applied research; research, development, test and evaluation of weapons, weapon systems, and defense material; and design and engineering for suitability, productibility, reliability, maintainability; and environmental services are the responsibility of the Department of Defense.

Technology Transfer Policy and Objectives

A DOD Policy Memorandum was issued on June 21, 1972, from the Deputy Secretary of Defense to the Secretaries of the military departments and the Director of Defense Research and Engineering, encouraging the military services to participate in technology transfer to critical nondefense work. Such nondefense work must not impede the mission of the service or laboratory; it is to be compatible with the capabilities of the laboratory and the cost is to be supported by the beneficiaries. Work may be performed in support of Federal, State, and local governments. Work will be performed for the private industrial sector only in special cases.

Jointly supported projects are permitted when there is also a direct application to a military requirement. Although the development of detailed implementation policy was left to the prerogative of each military service, a memorandum for the Director of Defense Research and Engineering issued on June 14, 1974, clarifies the level of effort that may be applied to civilian problems, and forwards the operating policy of the Department of Defense Technology Transfer Consortium as general policy guidance. As a result, all three services encourage their laboratories and technical activities to assist in solving urgent civilian problems to the extent it is consistent with primary mission responsibilities, and the availability of manpower and facilities.

and sold in full-size or microfiche copies to the general public.

DDC also provides status information on Defense R&D in progress. There are more than 20,000 active work unit descriptions of work in progress in the system. Information on 13,000 of these work units is available to the general public through the Smithsonian Science Information Exchange (SSIE) which also maintains for public use, similar information about ongoing research supported by other Federal agencies as well as many non-Federal organizations. More information about the SSIE appears under that entry in this Directory.

In addition to DDC, there are other special-purpose information centers, such as the Navy Research and Development Information Center (NARDIC), which facilitate technology transfer. NARDIC makes information regarding Navy research and development available to industry. It was established because of the recognized benefit to the Navy of civilian participation in research and development relevant to Navy needs.

Technology Transfer Accomplishments

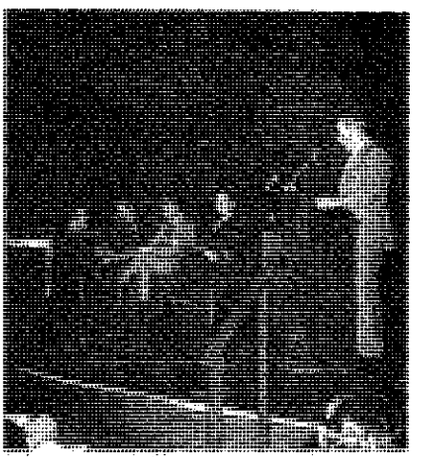
The 31 DOD laboratories that have become active in the DOD Consortium are interested in a more active technology transfer program. The Consortium is an informal association of the technology representatives from the member laboratories. Through this informal working group, technology transfer efforts and interactions with other Federal agencies and with potential users at the Federal, State, and local level are coordinated and reinforced. This has enhanced the individual efforts of the three services and their participating laboratories. The Consortium elects its own chairman and is represented by a full-time liaison person in the Washington area, located in the Intergovernmental Science and Research Utilization Program (ISRU) at the National Science Foundation. This liaison function links the Federal laboratories with user agencies at all levels of government. A DOD scientist with an M.D. has also been detailed from a consortium laboratory to the National Institutes of Health for a year, and one each has been assigned for a year to the EPA headquarters and their National Research Center in North Carolina. These personnel sharing arrangements, which are funded by the user agencies, reflect the Consortium's strategy of transferring technology through the development of person-to-person relationships and partnerships.

Every effort is made in the DOD Consortium to maximize the use of existing communication networks and mechanisms for technology transfer. Some of the resources which contribute to the success of the DOD program are:

- The NASA problem statements are made available to the DOD Consortium, and an opportunity is provided for responding with feasible technical solutions.
- The network of regional technology transfer agents of the Small Business Administration is a resource for determining the technological needs of small businesses.
- The nonprofit technology brokers, such as Public Technology, Incorporated, are sources of information on the technical problems of States, cities, and local governments. Grants sponsored by the NSF Intergovernmental Science Research Utilization program have helped establish institutional arrangements vital to identifying fruitful areas for the application of DOD technology to States, cities, counties, and private sector. Examples of such grants are the Pennsylvania Technical Assistance Program (PENNTAP), the California Innovation group, the Massachusetts Science and Technology

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The first of a series of Technology Transfer seminar/workshops was held at the Naval Underwater Systems Center, New London Laboratory on 24 May 1974. Representatives were brought together from local government, industry, universities, and Federal establishments to search for ways to apply military technical resources to the solution of domestic problems.



A valuable new method for testing eyesight resulting from visual research initiated for military purposes is now being used in hospitals and clinics throughout the United States. The technique, developed by the Naval Electronics Laboratory Center, using brainwave patterns only requires the subject to keep his eyes open and look at the stimulus. This means that young children, mentally handicapped, or uneducated persons can now have their vision tested.

The funding for the technology transfer activities to the civilian sector is largely derived from the users, since DOD funding can be used in only cooperative developments.

The following persons are focal points for communication on DOD Technology Transfer:

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Washington, D.C. 20330

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Mr. Joseph D. Antinucci (202) 632-5990
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National Science Foundation
OISRU, Room 1240
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Mr. Perry Newton (202) 692-0516 or 0517
Director of Navy Technical Information
U.S. Navy
Headquarters Naval Material Command
Washington, D.C. 20360

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ENERGY RESEARCH & DEVELOPMENT ADMINISTRATION[1]

Enabling Legislation and Mission

The Atomic Energy Commission, established by the Atomic Energy Act of 1946, was extensively revised by the amendment of 1954 to provide and administer programs for research and development, international cooperation, production of atomic energy and special nuclear materials, and the dissemination of scientific and technical information. In addition, the Commission has responsibility to protect the health and safety of the public, and the environment, and to regulate the control and use of source, byproduct, and special nuclear materials.

The President signed the Energy Reorganization Act of 1974 into law on October 11, 1974. One effect of this act was the incorporation of the nonregulatory activities of the AEC into a new Energy Research and Development Administration (ERDA) and atomic regulatory activities into the Nuclear Regulatory Commission (NRC). When fully organized, this Administration will assimilate not only functions of the AEC, but also the Department of Interior's Office of Coal Research, and certain energy projects of the National Science Foundation and the Environmental Protection Agency and others. ERDA has been given a broad charter to develop new and improved energy source and utilization technologies consistent with sound environmental and safety practices. Such technologies cover all forms of energy sources including fossil, nuclear, solar, geothermal, and other advanced concepts, as well as conservation research and development. At the time of this writing, the formal transition from AEC to ERDA has not been consumated. Hence, the policies and activities described here are from the perspective of the AEC. They are subject to change as ERDA comes into being and as the ERDA programs develop.

Research, Development, Manufacturing, and Operational Functions

Under the direction of the General Manager who serves as the chief executive officer of the agency, ERDA establishes and administers programs to meet the purposes stated above.

[1] The Atomic Energy Commission was abolished on January 19, 1975, and its nonregulatory activities incorporated into the Energy Research and Development Administration, which was activated on that same date.

Inspections of the Atomic Energy Commission-licensed activities are carried out from five Regulatory Regional Offices.

Technology Transfer Policies and Program Objectives

The potential users of the technology generated under the Atomic Energy Commission research and development programs may have very diverse interests in both the public and private sectors of the economy.

The purpose of the program is to expeditiously transfer technology from AEC laboratories to industry, and to State and local governments. The administrative priorities which guide the program include: identifying promising technologies, establishing transfer channels with users, increasing user involvement, maintaining active personnel roles, establishing Technology Utilization Representatives at all major AEC laboratories, and identifying barriers and means to overcome them.

Technology Transfer Responsibility

The Atomic Energy Commission's formally funded Technology Utilization Program is administered by the Office of Industry Relations. The Program is principally concerned with the horizontal application of mission-oriented, AEC-generated technology to needs of industry and of State and local governments.

Implementation

The Technology Utilization Program is concerned with facilitating the application of laboratory expertise to technological problems in both the public and private sectors. The diverse technologies consist of ideas, hardware, processes, special facilities, technical projects, developments, and individual expertise. The process by which such secondary uses of the existing technology can be transformed operationally into useful processes, products and programs to fulfill actual or potential public or private needs can be thought of as *technology utilization*. Some areas of AEC technology most relevant to public or private needs concern pollution monitoring and control, waste management, medical diagnostics, energy, electronics, machine tool and gaging, and general fields of management support.

The transfer process itself involves a series of cooperative efforts between AEC laboratories and the user. Effective dialogs must be carried on to accomplish identification of the principal problems and to establish priorities. The task of technology transfer and utilization, consequently, emphasizes communication and liaison. This is why the AEC's Program supports Technology Utilization Representatives at each of the major AEC laboratories. This staffing gives potential users the benefit of direct contact with knowledgeable individuals familiar with activities in their particular laboratories.

At present the AEC has Technology Utilization Representatives at eight of its national laboratories. These representatives serve as focal points of contact and act in a liaison capacity to publicize technology resources at their particular laboratories for potential users in both public and private areas. They handle inquiries, search the technology, and respond with suggestions for meetings or referrals. Staff exchanges are encouraged between the laboratories and State and local governments to foster the communication essential to successful technology transfer.

Industry and State and local requesters can contact these Representatives directly. These requesters, by identifying their needs including alternatives, constraints, and other useful criteria, will help match technological solutions to their problems. The Office of In-

dustry Relations' Program emphasizes active person-to-person roles to help solve specific public or private sector problems. Requests for published technical reports—for example, to supply library requests—should be addressed to the AEC's Office of Information Services, Science Service Branch, Washington, D.C. 20545.

Laboratory representatives are encouraged to meet with officials of State and local governments and with industry personnel. The development of new industry and the strengthening of existing industry can substantially benefit local entities. Because industry, and State and local governments, sometimes require assistance in applying new technology, the liaison function of the technology transfer staff is vital.

A highly structured symposium/workshop has been the principal means employed by the AEC to establish needs in terms of specific, well-defined technologies and to identify potential users. A workshop was hosted on December 4, 1974, by the AEC at the Brookhaven National Laboratory at Upton, New York, in cooperation with NASA and the Long Island Association of Commerce and Industry. This one-day "Business Utilization of AEC and NASA Technology Conference" surveyed major breakthrough technology developed in the past three decades by NASA and the AEC. In a more specialized effort on November 19-21, the AEC hosted an intensive 3-day workshop at the Lawrence Livermore Laboratory in California on industrial applications of precision machining and gaging, in cooperation with the Society of Manufacturing Engineers.

It is also recognized that industry may need the grant of specific proprietary rights to Federal technology as an incentive to cooperate in viable technology utilization. The Commission regulations do permit limited exclusive licensing of AEC patents.

Technology Transfer Accomplishments

The Atomic Energy Commission's Technology Utilization Program worked with a variety of large and small companies, with interests as varied as the commercialization of a unique sewage treatment process and the sale of hand and foot radiation monitors to the nuclear industry. In addition, the program has provided significant technical assistance and data to several of the States. Some notable recipients of such assistance are: Tennessee, whose responsible State officials personally surveyed the Oak Ridge National Laboratory complex and are currently making use of the data banks and expertise available there; California, where AEC expertise has been substantially exploited in the formulation of governmental policies and actions to address energy problems; and Illinois, where expertise is being provided the General Assembly through the Illinois Energy Crisis Investigating Committee. Activity is also underway at the local level. At Tacoma, Washington, for instance, through a cooperative AEC-City effort, improvement in firefighting equipment will utilize the adaptation of an AEC-developed, remotely controlled valve to fire hydrant use.

One major AEC contractor, the Nuclear Division of the Union Carbide Corporation, issues "Industrial Cooperation Bulletins." Each bulletin briefly describes a specific item and reports on its stage of development, its potential industrial applications, and patent status.

Bulletin content is determined by an Industrial Potential Assessment Committee (IPAC) composed of informed personnel from the AEC's four Union Carbide-operated installations. Meeting quarterly, the IPAC reviews innovative items, inventions and new ideas originating at the Union Carbide installations, and selects for publicity the items having the most potential for industrial application.

cubic feet of gas over the next 20 years. In this project, industry did the work and will evaluate the results.

An additional AEC program, now discontinued because it has reached industrial self-sufficiency, is the application of radioisotopes for medical and industrial purposes. The increase in the diagnostic use of radioisotopes in clinical medicine is due in part to AEC-sponsored improvements in radiation detection techniques, particularly the continuing advances in the development of radioisotope scanners. These detectors are used to localize and measure radioactive materials which have been introduced into the body. The scan can indicate size and position of organs as well as suspected space occupying lesions.

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ENVIRONMENTAL PROTECTION AGENCY

Enabling Legislation and Mission

The Environmental Protection Agency (EPA) was established by Reorganization Plan 3 of 1970 to permit coordinated and effective governmental action to assure the protection of the environment by abating and controlling pollution on a systematic basis. The Reorganization Plan transferred to EPA a variety of research, monitoring, standard setting, and enforcement activities related to pollution abatement and control which, when properly integrated, will provide for the treatment of the environment as a single interrelated system.

Research Base

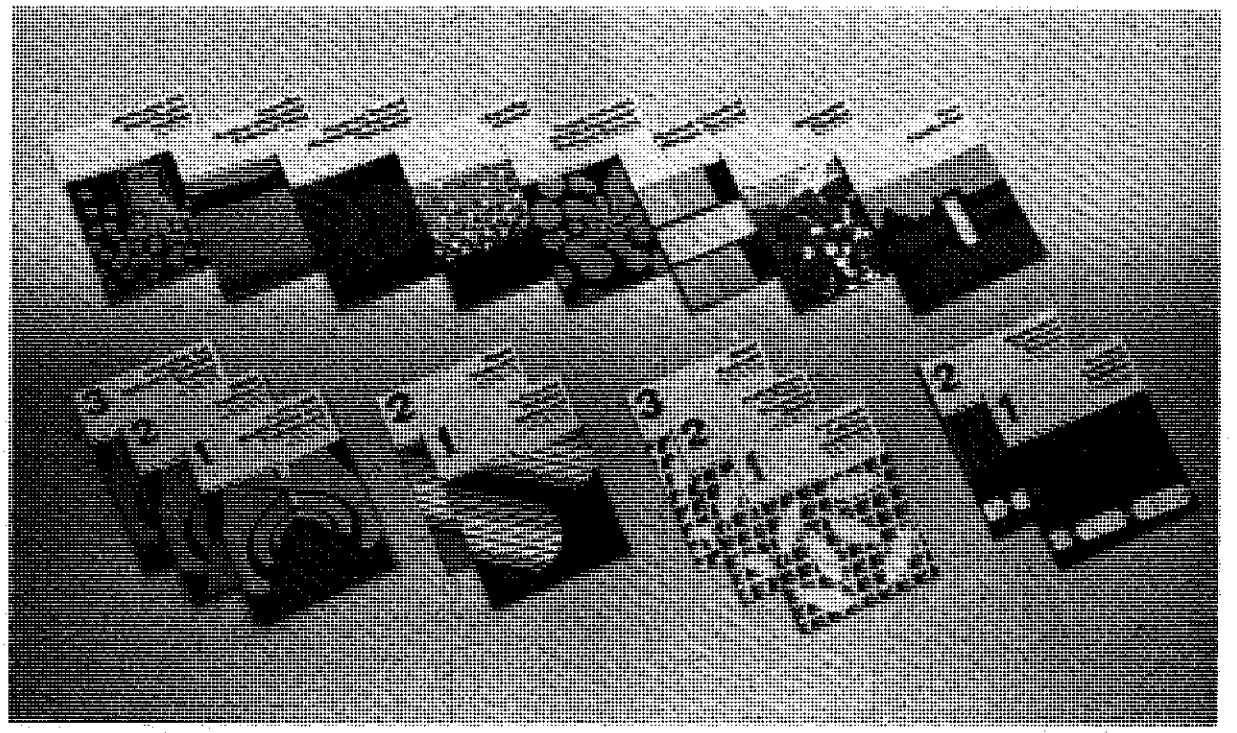
The EPA R&D budget in FY 1975 was $130 million. Organizationally, the major EPA R&D programs are as follows:

The Office of Environmental Engineering is responsible for Agency research, development, and demonstration activities in the area of pollution prevention, control, and abatement. The Office of Environmental Sciences is responsible for Agency research, development, and demonstration activities in the areas of criteria development, establishment of environmental quality standards, and location of control activities. The Office of Monitoring Sytems is responsible for Agency research, development, and demonstration activities in the area of measuring and monitoring equipment, techniques, and systems. The four National Environmental Research Centers are responsible for the management of the Agency's programs in research, development, and monitoring at their respective centers. They supervise and coordinate a number of satellite laboratories, pilot plants, and field stations that conduct more limited and specific research programs. Although each Center performs a varied research program, the Cincinnati Center gives particular emphasis to pollution control methods; the North Carolina Center to health effects of environmental stresses; the Corvallis Center to the ecological effects of environmental pollution and control; and the Las Vegas Center to environmental monitoring.

Technology Transfer Policy and Objectives

The EPA Technology Transfer Program was initiated by the Commissioner of the Federal Water Quality Office in the fall of 1970. The

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Municipal Seminar Handouts on top—Industrial Seminar Handouts on bottom.

quarters staff of 11 and an FY 1975 budget of $1.25 million. Technology Transfer responsibility is handled by an ad hoc committee in each of the 10 EPA Regional Offices.

Implementation

The EPA's research operation is developed around inputs of user needs and is carefully constructed to try to meet those needs. The technology users consist of three major groups: consultants, municipal, industrial, and State design engineers; administrative decisionmakers with pollution control policy responsibilities; and the general public and special-interest environmental and conservation groups.

The Technology Transfer Office reviews research in progress, and extracts developments which have reached a stage of readiness for broadcasting to a wider audience.

Several vehicles have been developed for getting information to users. The compilation and dissemination of information in the form of publications is a major effort of Technology Transfer. One objective is to present the large amount of experience, data, and criteria evolved from research, development, and demonstration (EPA, industrial, university, etc.) in a form more readily utilized by design engineers. To accomplish this, Technology Transfer has initiated a continuing series of technical publications. Currently available technical publications include:

Process Design Manuals for
- Phosphorus Removal
- Suspended Solids Removal
- Carbon Adsorption

Technology Transfer also issues a series of semitechnical process and project brochures and newsletters. The purpose of the brochures is to offer administrative decisionmakers and conservation groups an insight into the latest pollution control alternatives. The newsletter's primary intent is to keep all interested parties informed of the activities of the Technology Transfer program. In addition, each issue (approximately once each quarter) presents information on successful research and demonstration projects, regional office activities, a brief summary of a new pollution control technology, and other items of timely interest.

A chief means for transferring the products of EPA research and development is through industrial and municipal seminars.

A series of industrial seminars aimed at helping the smaller manufacturers meet their obligations for improved pollution control is one key portion of the seminar program. In this series, plant managers and members of the operating staff are invited to a 2-day program in which the detailed problems associated with their particular industry are discussed. The sessions usually begin with a discussion of the permit system by a member of the EPA Permit Program. In subsequent technical sessions, the technology capable of solving the key pollution problems in that industry are presented. Typical topics discussed are the problems of modifying an existing plant compared to building a new facility, waste treatment where land is limited, the value of the waste survey, monitoring, process modifications, byproduct recovery, and preparing to tie into a municipal system. The seminars include case histories in which an engineer or manager closely associated with a successful project in the industry under consideration discusses his experiences. To ensure that the seminars always address the most urgent needs of the industry to which they are addressed, representatives of the appropriate industries are consulted during planning of the seminar programs. Industrial seminars have been given for the metal plating, poultry, meatpacking, dairy, textile, seafood, and fruit and vegetable industries. In addition, seminars on monitoring industrial wastewater and toxic substances control have also been presented. Future industrial seminar topics include air pollutant monitoring, ion exchange, reverse osmosis, and ultrafiltration.

EPA's Technology Transfer Office has conducted a series of municipal design seminars dealing with wastewater treatment facilities oriented to the specific needs of the geographical region in which they are held. A typical municipal design seminar lasts 2½ days and is divided into five half-day sessions. The first session is used for introductory discussion on timely pollution control issues and Federal and State policies and positions. The next three sessions are concurrent technical presentations of design information including criteria, costs, equipment, and experience, on three topics relevant to the needs of the specific region (phosphorus removal, for example). A question-and-answer session concludes the seminar on the third day. Presentations at these seminars are made by EPA personnel, eminent consulting engineers, equipment manufacturers, chemical suppliers, etc., experienced in the design of municipal wastewater treatment facilities.

Technical sessions in municipal seminars to date have covered the following subject areas:

Flow Equalization
Nitrogen Control
Physical-Chemical Treatment
Phosphorus Removal
Upgrading Existing Wastewater Treatment Facilities
Oxygen Aeration
Suspended Solids Removal
Combined Sewer Overflows
Sludge Treatment and Disposal
Wastewater Treatment Lagoons
Wastewater Filtration

groups, administrative decisionmakers, and the general public.

One such motion picture depicts the efforts of the city of Richardson, Texas (suburban Dallas), to improve its treatment plant efficiency. Although the Richardson treatment plant was efficient for the removal of biodegradable organic matter, it did not remove nutrients, such as phosphorus. In 1969, a project was arranged to demonstrate how a conventional treatment plant such as Richardson's could upgrade its performance in a short time and at minimal cost to remove both additional BOD and suspended solids and also nutrients such as phosphorus. This project has proved to be one of the most successful demonstrations of wastewater treatment ever supported by EPA, and the award-winning Technology Transfer film entitled "Somebody Around Here Is Doing Something Good" tells the complete story.

Closed-circuit television delivers highly technical presentations by well-known professionals in the pollution control field. These presentations, prerecorded videotapes produced by Technology Transfer, give the presenter and listener advantages other media cannot achieve. Small consultation groups can view the tapes and have direct contact with the presenter via telephone at time of showing. Detailed design considerations are discussed, and current examples of facilities utilizing the particular technology are viewed. The videotapes can answer current technical questions directly and rapidly by an expert in the field.

The Technology Transfer Program from its inception has been involved with the professional organizations representing the users of environmental pollution control technologies. This relationship familiarizes large national professional gatherings with the program and their activities; assists in supporting national introduction of major new publications; and ensures support of new technology evolving from EPA research and demonstration programs.

In addition to Technology Transfer personnel participating in many professional organization technical committees, the Program also participates in major conferences with exhibits and program material. These organizations include:

Water Pollution Control Federation
American Public Works Association
American Institute of Chemical Engineers
American Society of Civil Engineers
Consulting Engineers Council
Water and Wastewater Equipment Manufacturers Association
Air Pollution Control Association
American Society of Mechanical Engineers

The U.S. EPA Technology Transfer Program also coordinates closely with the Technology Transfer Division of Environment Canada, which now has a Technology Transfer program patterned after EPA's.

For additional information contact:

R. E. Crowe, Director, Technology Transfer
R. S. Madancy, Municipal Program
K. Suter, Industrial Program
N. Lailas, Water Quality and Non-Point Sources Program

U.S. Environmental Protection Agency
Technology Transfer (RD 677)
Washington, D.C. 20460
(703) 557-7700

or contact the appropriate Regional Office Technology Transfer Chairman listed below:

Lester Sutton
Environmental Protection Agency
John F. Kennedy Federal Building
Room 2304
Boston, Massachusetts 02203
(627) 223-2226
(Maine, N.H., Vt., Mass., R.I., Conn.)

Robert Olson
Environmental Protection Agency
26 Federal Plaza
New York, New York 10007
(202) 264-1867
(N.Y., N.J., P.R., V.I.)

FEDERAL ENERGY ADMINISTRATION

Enabling Legislation and Mission

The Federal Energy Administration was established on July 1, 1974, under P.L. 93-275. The stated purpose of the legislation included requirements for ". . . positive and effective action to conserve scarce energy supplies . . . (and) to promote the expansion of readily usable energy sources . . ." The FEA was directed to ". . . promote efficiencies in the use of energy resources." As a result of this mandate FEA has undertaken programs aimed at a reduction in the growth in U.S. energy demand.

The strategy for improving energy efficiency is in three parts:

First, to develop, wherever possible, voluntary programs for energy conservation.

Second, to foster long-term, cost-effective savings in preference to short-lived, enforced demand curtailment.

Third, to rapidly effect the removal of Government constraints on the free market and allow supply and demand to produce a natural balance.

Research Base

FEA has begun an intensive 5-year program of interdisciplinary research, development, and demonstration projects. Specific conservation targets are being established for buildings, appliances, industry and its processes, utilities, transportation, including automobiles and for other systems within our society. Research on the environmental implications of energy activities is also being undertaken.

Projects in progress include studies of possible improvements to commercial and residential exterior structures; heating, ventilating, and air-conditioning systems; appliances, and lighting. For example, a contract has been let with the National Bureau of Standards to measure the effectiveness of retrofitting (1) an electric-driven heat pump in a 20-year-old house; (2) a solar collector on a present gas-heated townhouse; and (3) the shell of a certified mobile home. The Oak Ridge National Laboratory is carrying out a project which will provide complete measurements of the thermal characteristics of mobile homes and develop techniques for prediction of energy use in mobile homes of varied construction. Results of these projects will be dis-

GENERAL SERVICES ADMINISTRATION

Enabling Legislation and Mission

The General Services Administration (GSA) was established by Section 101 of the Federal Property and Administrative Services Act of 1949. The act consolidated and transferred to the agency a variety of real and personal property and related functions formerly assigned to various agencies. Subsequent laws and Executive orders assigned other related functions and programs. GSA establishes policy and provides for the Government an economical and efficient system for management of its property and records, including construction and operation of buildings, procurement and distribution of supplies, utilization and disposal of property, transportation, traffic and communications management, stockpiling of strategic materials, Government-wide responsibility for overall policy development and implementation in the areas of automated data processing management, procurement management, financial management, property management and management systems development, and coordination and development of Government-wide civil emergency preparedness programs.

Research Base

Major programs for the development and demonstration of technology advances include:

Energy Conservation

Primary responsibility for design, construction, and management of existing space and its Federal Supply Service for automobiles has been assigned to GSA's Public Buildings Service. Some of the products to date include programs to reduce temperature and lighting loads with emphasis on task lighting, development of energy conservation design guidelines for new office buildings and for existing buildings, and construction of an "energy demonstration" office building.

Firesafety

The GSA International Conference on Firesafety in High-Rise Buildings produced a new approach, which turns the building into an independent firefighting tool. The first Government building to use this approach was dedicated on November 19, 1974, in Seattle, Washington. In expanding this approach,

techniques in meeting Environmental Impact Statement requirements are in finalization stages.

Technology Transfer Policy and Objectives

For its mission, GSA actively pursues a policy of maximum involvement of public and private organizations in its major program areas by convening all sectors in international conferences, select working groups and committees both in and out of government, and by working closely with industry and professional trade organizations such as those in the building trades. Examples of major international meetings include recent conferences on firesafety, energy conservation, and environment. The major program objectives include working toward maintenance and progress of the state of the art in both the public and private sectors in various trades related to GSA's mission.

Technology Transfer Responsibility

Overall coordination of activities in this area rests with GSA's Assistant Administrator, and major components exist in two of GSA's Services with plans under review for expansion to all major GSA components. Major technology development and implementation responsibilities rest primarily with GSA's Services.

Implementation

Major implementation strategies include joint development of technologies through programs involving such agencies as the National Bureau of Standards, Experimental Technology Incentives Program and contract effort with organizations such as Public Technology, Inc. Initial efforts of technology development and exchange have been aimed at both the public and private sectors with renewed emphasis on State and local governments.

Technology Transfer Accomplishments

Recent efforts include industry-wide interest in our Construction Management Control System and firesafety program demonstration building in Seattle, Washington; an experimental Technology Exchange Program in the Public Buildings Service aimed at identifying candidate building technologies for exchange of techniques and information with selected State and local government users as a test toward formalization of technology transfer and exchange programs in GSA; and efforts underway by the Experimental Technology Staff of the Federal Supply Service to develop a system of information interchange between suppliers and government users to include new product innovations and user experience and for the interchange of selected technical product data with Federal, State, and local governments.

Technology Transfer User Organizations

Users for GSA technologies include all public bodies with similar missions, as well as the construction, supply, and other GSA-related sectors of the private market.

Future Program Emphasis

Future programs will emphasize the expansion of efforts agency-wide and consideration of additional supporting legislation and funding for expanded program activity.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

National Institutes of Health

Enabling Legislation and Mission

The National Institutes of Health had its origin in the Hygienic Laboratory, established at the Staten Island Marine Hospital in 1887, as part of the Marine Hospital Service, later designated the Public Health Service. The Hygienic Laboratory moved to Washington in 1891. It was renamed the National Institute of Health under the Ransdell Act (P.L. 71-251, 46 Stat. L. 379) in May 1930. Under the National Heart Act (P.L. 80-655, 62 Stat. L. 464), the name was changed to the National Institutes of Health in 1948.

The NIH mission to conduct and support research into human diseases is stated in numerous pieces of legislation dating back to 1899 and including especially the Public Health Service Act (42 U.S.C.). A series of legislative enactments and administrative changes following World War II established the complex of research institutes, each with particular categorical assignments or particular disease application, that first comprised the National Institutes of Health. Assignment of the former Armed Forces Medical Library to the Public Health Service, and designating it the National Library of Medicine, in 1956, was followed in 1968 by establishing it as a major component of NIH, thus completing the present organization. The Library's statutory mandate is to make biomedical information available to investigators, educators, and medical practitioners.

Incorporation of the Library into the NIH provided special focus for dissemination of scientific and technological efforts, and strengthened the NIH contributions in this field. The Library and two other large components, the National Cancer Institute and the National Heart and Lung Institute, have bureau status, and in addition there are nine research institutes, the Clinical Center (a 500-bed research hospital) and six divisions constituting the National Institutes of Health.

results of research generally available. This has been at the direction of management, as an official policy, with many organized, specific activities planned and carried out over the years. Even more significant, perhaps, have been the innumerable low-key "grassroots" interchanges and sharing of information, techniques, formulas, procedures and other materials by NIH scientists with their counterparts and colleagues in the private sector. The nature of the NIH attack upon health-related problems, by which 80 percent of the available appropriated funds are expended in the private sector under grants funded by NIH after review of investigator-initiated proposals, and some 10.5 percent expended in intramural research on the same topics, has stimulated ongoing interchange and made sharing of information inevitable.

Implementation occurs in several manners, including:

Publication of research findings. NIH intramural scientists annually publish more than 3,500 articles in the open literature, and make oral presentations at professional meetings, seminars, and conferences.

Conferences and seminars. The component bureaus, institutes, and divisions of NIH arrange, call, and conduct conferences and study sessions of many kinds to which leading research scientists come for interchange of ideas. The Fogarty International Center, in particular, has a permanent series of international conferences on major world health problems. Proceedings of these conferences, and other documents resulting from them, are published and distributed widely. The Fogarty Center has initiated a series of authoritative volumes on preventive medicine as a related activity.

Special conferences also are held for research contractors, such as those involved in the Artificial Kidney Program of the National Institute of Arthritis, Metabolism and Digestive Diseases, and in special emphasis programs of the National Cancer Institute.

Other primary publications. Monographs, state-of-the-art reviews, and critical evaluative essays are prepared and published regularly by individual scientists, acting on their own initiative, in response to invitations from professional bodies or publishers, or to meet specific NIH program needs.

The National Institutes of Health publishes two primary journals, the *Journal of the National Cancer Institutes* and *Environmental Health Perspectives,* in order to meet needs not satisfied by nongovernmental publishing efforts in particular fields and assure dissemination of important information.

Secondary publications. The NIH components regularly issue 16 secondary journals, including abstract journals, bibliographic and citation journals, indexes and other current-awareness periodicals.

Technical information dissemination. The National Library of Medicine has a broad publications and on-line retrieval program to make world biomedical literature available to scientists, educators, and private practitioners. Its products include the authoritative *Index Medicus, Abridged Index Medicus,* and numerous catalogs, bibliographies and literature searches on specific topics. The Library's National Medical Audiovisual Center similarly provides nonprint instructional materials for education in medicine and health-related fields, including motion pictures, tapes, and other materials.

The Library, through the Lister Hill National Center for Biomedical Communications, has pioneered in demonstration projects for medical education and patient care utilizing television networks, and radio and television satellite communications.

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specialized equipment centers for computer technology applications, analytical biochemistry instrumentation, and other services. It supports regional primate research centers and maintains programs to improve laboratory animal facilities and resources, all of which involve and contribute to technology transfer.

The National Cancer Institute supports 18 Comprehensive Cancer Centers to conduct long-term multidisciplinary programs to concentrate on cause and prevention, detection and diagnosis, treatment and other aspects of cancer control.

The National Heart and Lung Institute has programs to stimulate development of sensitive, specific, convenient, and safe diagnostic techniques, both invasive and noninvasive in nature, to determine arteriosclerotic changes in blood vessels.

It also emphasizes efforts to develop automated, quantitative techniques for analyzing electrocardiographic rhythm signals to facilitate clinical investigation of heart arrhythmias.

The Institute's Hypertension Detection and Follow-up Program is a randomized study measuring the extent to which a systematic hypertension management program can reduce coronary morbidity and mortality. Patients in the program, screened from a larger population, are now in a 5-year project to determine the effectiveness of antihypertensive therapy. In addition, the Institute operates a large nationwide contract professional education program to inform physicians on the importance of case-finding in management of hypertension and prevention of coronary attacks, appropriate treatment of hypertensive patients, and necessity for maintenance of treatment regimens.

Other high-priority Institute activity stimulates development of mechanical techniques for augmenting or substituting for the performance of the heart, including heart-assist devices, total cardiac replacement systems, heart valves, biocompatible materials, pumps, actuators, energy transforming devices, implantable energy systems, transcutaneous transmission of energy, and control systems for many of these devices. Technology transfer has been a consequence of these programs in the past and will continue in the future.

The National Institute of Dental Research has ongoing programs in developing or improving delivery and acceptance of caries prevention techniques and in preparation and development of improved restorative materials, both of which are aimed directly at utilization of new technological approaches.

The caries prevention program utilizes both contracts and grants to stimulate acceptance of specific treatment regimens on schoolchildren. A contract has been awarded to develop a prognostic test for caries.

The restorative development program includes efforts to improve amalgams, composite resins and other filling and adhesive materials, artificial dental implants, restorative materials for repairing damage from dental disease and maxillofacial prostheses. Inherent in all programs is intent to promote wide usage in practice of materials developed through intramural, contract, or grant-supported research.

The National Institute of Arthritis, Metabolism and Digestive Diseases has maintained a highly successful technology utilization effort with its Artificial Kidney-Chronic Uremia Program, established in 1965. The program is intended specifically to improve patient care and lower maintenance costs for patients with irreversible chronic kidney failure by providing improvements in artificial kidney apparatus and methodologies.

Research Base

The National Center is generally interested in research which will strengthen health system planning and policy decisions at local levels; efforts to improve information available as a basis of policy decisions on major national initiatives; development of mechanisms for assuring the quality of health services; and the development of optimal care to underserved or poorly served populations.

Among the projects currently underway are:

- Six projects to plan and develop models and assess other alternatives to institutionalization of persons in need of long-term care.
- A group of 18 contracts totaling almost $1.5 million for training of long-term care personnel ranging from physicians to housekeepers in nursing homes.
- A number of tests of a wide-band two-way audiovisual communications system to permit greatly expanded and improved medical communications.
- A test of the computerized Problem-Oriented Medical Information System (PROMIS) which, including as it does, virtually all relevant information about a hospitalized patient, has the potential for raising the productivity and efficiency of hospitals and for increasing their responsiveness to medical needs of the patient and information requirements of hospital personnel.
- Sixteen projects directed toward development of data systems for planning and managing quality care programs for the elderly.
- Expanded research into the economic structure and financing mechanism of health services, focusing on health insurance issues.

Technology Transfer Responsibility

The National Center for Health Services Research maintains an Office of Scientific and Technical Information with a staff of nine to furnish scientific information on its programs. Information concerning research related to technology and its use is transferred through this Office. The Center also uses the facilities of the National Technical Information Service to a major extent in transferring this kind of information.

Future and New Program Emphasis

Under P.L. 93-353, the Center is authorized to award grants and contracts in the field of health care technology, and has also pursued the training of postgraduate students in that area. In the newly authorized area of health care to technology, the Center will engage in research relating to the implementation and evaluation of technology and technological devices.

Users of Technological Information

Users of material from the research and demonstration programs of the Center include providers of health care, health planners, Federal, State, and local health agencies, and health profession schools.

For additional information contact:

Office of Scientific and Technical Information
National Center for Health Services Research
Room 15-75
5600 Fishers Lane
Rockville, Maryland 20852

health statistics: vital statistics, manpower statistics, health facilities statistics, health interview statistics, ambulatory care statistics, and long-term care statistics. For each component there will be developed a common core of items—the minimum information required at all levels. Development of these items, as of common standard definitions, and procedures, will be a joint undertaking involving producers and consumers of data at State, local, and national levels.

Research, development, and implementation of the System are proceeding simultaneously. At present there are 67 contracts in operation involving 35 States. Initial emphasis has been on the vital statistics component, because of the traditional Federal-State cooperation in this area and the existence of well-accepted national standards on data content, definitions, and methodology. As the component is implemented, the States are providing vital data to the Center in machine-readable form, reducing the duplication of effort in which the records were previously processed at local, State, and national levels.

Users of Technological Information

Primary users of information developed in the programs of the National Center for Health Statistics are health professionals, social scientists, State and local health agencies, demographers, manufacturers, and health planners.

For additional information contact:

Associate Director for the Cooperative Health Statistics System
National Center for Health Statistics

or

Scientific and Technical Information Branch
National Center for Health Statistics
Parklawn Building
5600 Fishers Lane
Rockville, Maryland 20852

BUREAU OF HEALTH PLANNING AND RESOURCE DEVELOPMENT

Enabling Legislation and Mission

Under the National Health Planning Resource Development Act of 1975 (P.L. 93-641) an important new program in health planning is now underway in the Bureau of Health Planning and Resource Development. Under the terms of the enabling legislation, the current planning programs for health—Comprehensive Health Planning, the Regional Medical Programs, and Facilities Construction Programs— will be phased out and will be replaced by a network of Health Systems Agencies and new State health planning and development agencies.

Included in the planning structure will be a strong technical, statistical, and methodological base—a base almost nonexistent at present.

Technology Transfer Policy and Objectives

The technology of planning is in its infancy. A massive effort is needed to strengthen the methods available to health decisionmakers. In the new act, provision is made for a technical assistance program which will:

- Provide assistance in developing agency plans including approaches to various kinds of health services; development of technical materials including methodology, policies, and standards appropriate for use in health planning; specification of minimum data needed to describe the status of the residents of a health service area and determinants of that status; and the use of health resources and services within the area;
- Development of guidelines for the organization and operation of Health Systems Agencies;

siveness to the needs of individuals and families in all levels of society. To these ends, the Health Services Administration: administers health service delivery programs supported by project grants, contracts, or other arrangements; provides leadership to and supports efforts designed to integrate health service delivery programs with public and private health financing programs; administers formula-grant supported health services programs; assures quality and contains costs of service provided through the public financing programs; provides or arranges for personal health services, including both hospital and outpatient care, to designated beneficiaries; and provides advice and support to the Assistant Secretary for Health in the formulation of health policies.

The primary legislation enabling the HSA to carry out the stated mission is found in segments of the PHS Act and Social Security Act.

Public Health Service Act:

Title III—

Part B: Federal-State Cooperation

Section 310—Health Services for Domestic Agricultural Migrants

Section 314(d)—Grants for Comprehensive Public Health Services

Section 314(e)—Project Grants for Health Service Development

Parts C and D: Hospitals, Medical Examinations, and Medical Care

These parts enable the care and treatment of seamen, Federal prisoners, lepers plus the assignment of medical and other Health Personnel to Critical Need Areas (Section 329).

Title X—Population Research and Voluntary Family Planning Programs

Title XI—Genetic Blood Disorders

Part A: Sickle Cell Anemia Programs

Part B: Cooley's Anemia Programs

Part C: Sudden Infant Death Syndrome

Title XII—Emergency Medical Services Systems

Title XIII—Health Maintenance Organization

P.L. 83-568: Transfers responsibility for the maintenance and operation of hospitals and health facilities for Indians to the PHS.

P.L. 85-151: Authorizes funds for construction of Indian health facilities.

Social Security Act:

Title V—Maternal and Child Health and Crippled Children's Services.

Title XI—General Provisions and Professional Standards Review.

Research Utilization Policy and Objectives

The Health Services Administration is committed by its mission statement to health care that is responsive to the needs of individuals and families in all levels of society.

The goals and objectives of the agency are built on optimal utilization of technology:

- To achieve improvements in the health service delivery system through increased efforts to: (a) provide equity of access to health services, (b) guarantee quality, and (c) contain costs.
- To provide for full and effective implementation of new methods for organizing delivery of services.
- To create and strengthen services capacity to resolve access problems in health scarcity areas where the private market has failed to build the supply of health services.
- To reduce health services fragmentation by integrating categorical service

The Bureau of Quality Assurance transfer of technology centers around improved monitoring of the quality and cost of medical care through the peer review process. Specifically, the activities include formulation of standards, development of instructional manuals and technical assistance to funded projects.

The Indian Health Service seeks to improve the effectiveness and efficiency of the health and care delivery systems of the American Indians and the Alaska natives by:

- Developing human resources for the operation and management of Indian health care systems.
- Designing and evaluating alternative delivery systems to respond to Indian health needs.
- Demonstrating the application of alternative delivery systems to respond to Indian needs.
- Providing medical care services.

The Bureau of Medical Services utilizes available technology and systems in providing medical care to American seamen, the U.S. Coast Guard, Federal prisoners and other designated beneficiaries. It also operates health units in many Federal office buildings. In addition, through a grant program, it supports regionalized systems of emergency medical care which use the latest developments in technology and systems management.

Research Utilization Accomplishments

Selected projects within HSA involving the application of technology to health care systems include:

Health Information System, Papago Indian Reservation: The objective is to develop a comprehensive computer-based system which provides information needed to support patient care, health system management, and health research. The system began operation in July 1969, and has since collected health data on over 15,000 individuals treated by the Indian Health Service's Sells Service Unit located on the Papago Indian Reservation in Arizona. Data stored in the system include measurements, diagnoses, operations, examinations, laboratory test results, skin test results, immunizations, medications, referrals and revisits. These data are available to the providers of health care by use of portable terminals from any telephone at the time and place of interaction with the patient.

The Health Information System directly supports health care with a number of reports and health summary, which is a capsule review of the patient's health problem and history. The health summary is available over teletypewriter terminals to the physician and nurses whenever the patient comes into the clinic. While the health summary does not always replace the medical record, it does insure that all relevant information about the patient is available to facilitate the provision of curative services as well as routine preventive care to all patients on a regular basis. Management and research functions are supported by special reports which allow the managers of the health care system to make better decisions about the allocation of resources and the operation of the health care system.

The Health Information System also addresses the issue of the quality of medical care. Attention is directed to techniques for monitoring health care to insure that the quality remains high, while optimizing the cost-effectiveness of the health care system.

Alaska Tele Medicine Project: This project links remote health stations in Alaska with the IHS Medical Center in Anchorage by utilizing the ATS-6 communications satellite for transmission relay. This experiment is an

78-410 (42 U.S.C. 241, 242, 242(a)). The mission of this program is to develop new knowledge and approaches to the causes, diagnosis, treatment, control, and prevention of alcoholism and alcohol abuse through basic, clinical, and applied research, investigations, experiments, and studies.

Alcohol demonstration programs, which provide an opportunity for the assimilation of research knowledge and innovative solutions to alcohol abuse problems, are enabled by the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment, and Rehabilitation Act of 1970; P.L. 91-616, as amended by Section III of P.L. 93-282.

An additional program through which new technical knowledge may be introduced to the field is one involved with the alcohol formula grants. The purpose of these grants is to assist States to plan, establish, maintain, coordinate, and evaluate effective prevention, treatment, and rehabilitation programs. The legal basis for the formula grants is the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment, and Rehabilitation Act of 1970, Title III, Part A, P.L. 91-616.

NATIONAL INSTITUTE ON DRUG ABUSE

Drug abuse research programs are enabled by PHS Act, Sections 301 and 304, P.L. 78-410; and the Drug Abuse Office and Treatment Act of 1972, Section 410, P.L. 92-255. The mission is to develop new knowledge and approaches to the causes, diagnosis, treatment, control, and prevention of narcotic addiction and drug abuse through basic, clinical, and applied research, investigation, experiments, and studies.

Drug abuse demonstration programs also provide an opportunity for promoting the diffusion and utilization of a new technical knowledge. The enabling legislation is the Drug Abuse Office and Treatment Act of 1972, Title IV, P.L. 92-255.

The drug abuse education programs are directed toward collecting, preparing, and disseminating drug abuse information dealing with the use and abuse of drugs and the prevention of drug abuse. The legal basis for these programs is the Drug Abuse Office of Treatment Act of 1972, Title IV, P.L. 92-255. The utilization of new technology is further promoted through drug abuse formula grants. Their purpose is to assist the States in planning more effective prevention programs and to implement and evaluate such plans. Legislative authority is provided through the Drug Abuse Office and Treatment Act of 1972, Title IV, Section 409, P.L. 92-255. The drug abuse community service programs provide grants which may utilize new technology in reaching, treating, and rehabilitating narcotic addicts, drug abusers, and drug-dependent persons through a wide range of community-based services. Again, the legal basis for these programs is the Drug Abuse Office and Treatment Act of 1972, Title IV, P.L. 92-255.

NATIONAL INSTITUTE OF MENTAL HEALTH

The mental health research grant program is authorized through the PHS Act, Section 301; P.L. 78-410 (42 U.S.C. 241, 242(a)). The mission of the program is to develop new knowledge and approaches to the causes, diagnosis, treatment, control, and prevention of mental diseases through basic, clinical, and applied research, investigations, experiments, demonstrations, and studies. The projects specifically designed to develop and demonstrate the use of knowledge in new services were enabled through the 1956 Amendment to the Public Health Service Act, P.L. 911, Title V. It is through this provision that much of the NIMH work on studying improved methods of technology transfer as such has been carried out.

problem (drinking) behavior in youth. Still another has tested the impact of education on alcohol abuse.

The National Institute on Drug Abuse supports research on behavioral and social sciences, biomedical topics, and experimental therapeutics. One project has studied special treatment methods for delinquent drug abusers. Another has studied educational and other correlates of children's drug use. Research in the biomedical area has investigated the relationship between dental disease and drug abuse as well as narcotic tolerance and physical dependence mechanisms.

The National Institute of Mental Health research and development programs span a broad range: juvenile problems; social problems; experimental psychology; neuropsychology; personality and cognition; social sciences; biological research; psychotherapy and behavioral intervention; depression and schizophrenia; epidemiology; psychopharmacology; crime and delinquency; minority group mental health; metropolitan problems; and mental health services. Studies have included the role of black workers in school intervention programs, youth-directed multiservice programs, adolescent life style and self-concept; self-esteem as mediator in need achievement; brain functions and behavior; patient profiles and differential responses to therapeutic drugs; legislative change and mental health delivery systems; and automation of delivery of mental health services. Critical studies are carried out on many of these topics through intramural research programs at NIMH. Research and development studies also are carried out intramurally in the general area of biometry. Topics have included the distribution of mental disorders, admission rates to community mental health centers, mental health demographic profile systems, and automated clinical data systems.

Research Utilization Policy and Objectives

The primary policy underlying effective and optimum utilization of research in all three ADAMHA Institutes is that (1) research investments be guided by ascertained priorities for knowledge needs and by scientific merit as judged by peers, and (2) project investigators be assigned firm responsibility for appropriate dissemination of results. In instances of particularly promising research, investigators are given technical assistance in dissemination and grant supplements to ensure adequate diffusion of results. A second policy in all three Institutes is that knowledge derived from research and development activities be made available to interested users, including the general public. This policy is backed by clearinghouse functions supported by each Institute. A third policy is that technologic developments be transferred into the demonstration and service support programs of the three Institutes. Within NIMH new technology transfer policies are being considered through the Research Information Diffusion and Utilization Study Group. A still further NIMH policy is to support continued studies on the technology of technology transfer itself. Much of this work is carried out through the Institute's Services Development Branch where new techniques of conducting research to ensure optimum utilization of results are being developed as well as improved methods of technical assistance on planned organizational change involving the adoption of new knowledge.

Research Utilization Responsibility

Clearinghouse for Alcohol Information

Established in 1972, this Clearinghouse differs from those of the other two Institutes in being operated under contract by a commercial firm. It has been a national focal

Center has made extensive use of computers both in analyzing data from clinical drug trials and for information storage, retrieval, and dissemination purposes. For example, an on-line real-time system that stores data on the protocols of clinical trials reported has been developed, and searches have been done to inform investigators of ongoing, planned, and completed trials. Three books have been produced, namely, *Principles and Problems in Establishing the Efficacy of Psychotropic Agents, Psychotropic Drugs and Related Compounds,* and *International Directory of Investigators in Psychopharmacology.* Because of the program's extensive work in information dissemination, the World Health Organization asked it to operate a network of centers for information about psychotropic drugs. Subsequently the International Reference Center for Information on Psychotropic Drugs was created within the Psychopharmacology Research Branch; it coordinates the work of over 20 other centers.

As one of the first efforts of the Center for Studies of Schizophrenia, of the NIMH Extramural Research Programs, it developed a national conference on schizophrenia in which participants assessed the current status of research findings, determined which were ready for application in the clinical field, reviewed the status of traditional and innovative treatment methods, and considered barriers to the assimilation of new research findings in the treatment of the illness. The *Schizophrenia Bulletin,* begun in 1968, has been a major vehicle for dissemination of up-to-date comprehensive information about schizophrenia. It has contained the Center's annual report of progress in NIMH-supported research on schizophrenia as well as in-depth reviews and syntheses. The Center also has sponsored small workshops and conferences on special subjects pertinent to schizophrenia research, such as childhood autism, high risk groups, treatment strategies, and psychotherapy in schizophrenia.

The Center for Studies of Crime and Delinquency, in the Division of Special Mental Health Research Programs of NIMH, has made use of publications, conferences, and direct consultation with regional, State, and local agencies. Research utilization has been one of its explicit goals. To that end, the dissemination of information to researchers and practitioners has been one of its major activities. The Center has provided funds as grant supplements to investigators who have shown effectiveness of certain procedures. The investigators have used these funds to develop a utilization kit—a package of materials including special brochures—for dissemination information regarding the research findings and their use to program administrators. The kits have been geared to the appropriate audience and disseminated by both the grantee and NIMH. In addition, the researcher has been able to use this supplemental support to hold workshops for program administrators and to do followup consultation with any agency considering adopting his research findings as part of its program.

The Mental Health Services Development Branch, within the Division of Mental Health Service Programs of NIMH, has operated a vigorous and carefully planned diffusion and utilization program. Its objective has been a three-phase research and development program. The first phase has determined the need for scientific information about a services delivery problem and has tried to meet the need through existing information resources. When new information is needed, the second phase has stimulated research projects, and monitored them to ensure utilizable results. The third phase has promoted the diffusion and utilization of resulting knowledge; targets are mental hospitals, community mental health centers, State mental health authorities, regional offices, Veterans Administration hospitals, and agencies and organizations concerned with mental health. The modes of communication have been primarily consulta-

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research is then conducted according to methods that will ensure optimum spread of the results to the user CMHC's. The seventh step is evaluation of the success centers have experienced in adopting the new technology. The program has met with remarkable success and enthusiasm among the CMHC's. (One feature which may account for the success is that the consultation is provided by center personnel themselves who have volunteered to consult with their colleagues in other centers, after receiving special brief training in change consultation.) Technical innovations in the topical areas of program evaluation, management, rehabilitation of chronic patients, children's programs, and in community consultation and education have been most successfully adopted.

User Groups

The products of all three Institutes within ADAMHA are used by Regional Office personnel, State mental health authority staff, CMHC staff, and mental hospital personnel. Other researchers also constitute important user groups, commonly researchers engaged in applied or policy-relevant studies. Further groups include members of mental health associations, drug abuse education coordinators, alcoholism counselors, etc. Training personnel in universities also represent a user group in view of their potential for including new technological developments in formal training programs.

New Program Emphases

Currently, within NIMH the results of a 2-year Research Task Force study are being considered from the standpoint of new policies and practices that will render research and development investments still more beneficial in the general area of mental health. These will include not only refined methods of planning and conducting research, but will extend to more syntheses of research knowledge written especially for users as well as systems for economically providing organizational consultation on the adoption of technical information.

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humans under conditions of routine use. Increasingly, it is clear that the true toxicity may only be expressed after many years of use, e.g., hormonal contraceptives. The Bureau supports studies of drug toxicity in those cases where it feels the need for independently derived data to compare with that developed by drug manufacturers or in those cases where the Food, Drug and Cosmetic Act does not permit FDA to demand that drug manufacturers acquire and submit such data. These needs prompt the conduct of controlled and observational animal and human studies.

Drug Experience Data Collection Methodology

Much data of value to the Bureau's efforts at routinely monitoring the experience in use with marketed drugs exist in the form of the observations of incidents that occur in the day-to-day practice of medicine. Physicians working in various environments observe adverse reactions to drugs and special conditions bearing on the selection, usefulness, and successful application of drugs. The Bureau wishes to collect such data but faces the problem of doing so in a cost/effective manner. Beyond this is the added concern of ability to make valid observations in such difficult to monitor environments as outpatient use. The problems and needs prompt Bureau support of research on drug experience monitoring methodologies.

Data Evaluation Methodology

The Bureau conducts research on new statistical methodologies applicable to the evaluation of data generated in animal, laboratory, and human safety and efficacy studies.

Drug Quality

Biopharmaceutics

As the Bureau improves the quality of its evaluations of the safety and efficacy of new and old drug products, it has become increasingly clear that predictions of performance are dependent upon consistently performing drugs. That is, a drug produced by a single firm or manufactured by different firms be predictably and consistently bioavailable and bioequivalent. The Bureau's research in this area: (a) identifies bioavailability problems existing with specific drugs and (b) develops *in vitro* and *in vivo* methodologies for measuring bioavailability.

Potency, Identity and Formulation Accuracy

The Bureau and the field laboratories have an important regulatory research role in validating the accuracy with which manufactured drug products conform to established standards. Measurements must be made of the pharmacological effects (potency), identity, and formulation accuracy (composition). The Bureau pursues such research on an intramural and extramural basis and field laboratories similarly pursue research on chemical and biological testing methodologies. Frequently, this work seeks to improve or develop new methodologies and other standards that are intended for inclusion in the official compendia, e.g., the U.S. Pharmacopeia and National Formulary. In this regard the Bureau is an international leader in automated, high-volume testing of dose form drug products.

Technology Transfer Policy and Objectives

While there is no formal policy regarding this subject, there is an inherent need that permeates all of FDA to seek to maximize the effective utilization of research findings in its regulatory activities and to assure their full dissemination to the outside scientific community. To the greatest extent possible the products of research efforts in the human drugs program are immediately fed into the operating programs and published extensively in scientific journals, at conferences, etc. As to those internal efforts at linkage, as a

tion with the Office of the Assistant Commissioner for Public Affairs.

Research Base

The Bureau's research program consists of contracted laboratory facilities and specific contracts with industry, organizations, and universities. The program utilizes contracts and interagency agreements to develop standards, conduct applied research and develop baseline data on device and diagnostic product experience. The FY 1975 budget for these efforts is approximately $1.5 million. Also included in the research program is the implementation and utilization of 14 advisory panels which are convened to aid primarily in the medical devices and diagnostic products classification process. These panels consist of the Nation's leading experts in various scientific and technical fields.

Technology Transfer Policy and Objectives

The BMDDP, because of its short existence, has no single formal system for disseminating technical and scientific research information at present. However, it is the Bureau's policy to furnish information with the Freedom of Information regulations.

Technology Transfer Responsibility

The Bureau is in the process of developing formal procedures for disseminating technical and research-oriented information. In lieu of a formal policy, the following organizations have been assigned this functional responsibility.

The Division of Medical Device Standards and Research is responsible for the research on and coordination of medical devices information and the utilization and dissemination thereof. The Division of Diagnostic Product Standards and Research has this same responsibility in the diagnostic products field. Both divisions have the responsibility for standards-making efforts within the Bureau.

The Division of Classification and Scientific Evaluation disseminates information promulgated by the various advisory panels. All Bureau project officers are responsible for ensuring that research data resulting from contracts are effectively utilized and conveyed to the public and other interested persons.

Implementation

The need for a formal technology transfer and research utilization policy has been identified as a priority. Inquiries are being made to the Government Printing Office (GPO) and the National Technical Information Service (NTIS) as to the correct procedures for utilizing their respective services. The Bureau's technology transfer and research utilization policy should be operational in FY 1976. In the interim, staff are encouraged to provide all information, except of course that of a privileged nature, to industry, professional organizations, consumer organizations, and individuals expressing an interest in our programs.

Technology Transfer Accomplishments

The Division of Medical Device Standards and Research has originated and is in the process of maintaining the Medical Device and Diagnostic Product Standards Survey (MDDPSS). The purpose of the MDDPSS is to provide a comprehensive listing of current national and international standards development and promulgation activities in

BUREAU OF VETERINARY MEDICINE

Enabling Legislation and Mission

In 1959 the Veterinary Medical Branch of the Bureau of Medicine was expanded to a division within that Bureau. In September 1965 the Secretary of Health, Education, and Welfare established the Bureau of Veterinary Medicine.

The basic responsibility of the Bureau of Veterinary Medicine is to make certain that all drugs and devices for the treatment of animals are safe and effective. If the drug is intended for use in food-producing animals, the labeling must bear instructions regarding its use which will preclude its becoming a residue in edible products (milk, meat, or eggs) derived from treated animals.

The Bureau's technological research activities largely take place in its Division of Veterinary Research.

Research Utilization Policy and Objectives

The Division of Veterinary Research is responsible for the following overall functions:

- As required, conducts studies to evaluate the validity of data supporting the safety and efficacy of veterinary drugs.
- Periodically may conduct acute and chronic toxicity studies in large domestic animals following reports of animal feed contamination, such as heavy metals, pesticides, and so forth.
- Cooperates with other parts of the Food and Drug Administration in the development of actual evidence based on animal experimentation to support legal action under the Federal Food, Drug, and Cosmetic Act.
- Directs research on the pharmakinetics of residues and metabolites of veterinary drugs in food-producing animals.
- Conducts experiments to determine the prevalence of antimicrobial resistance and the transfer of resistance between bacterial strains.
- Maintains colonies of laboratory animals for experimental tests and studies.

Research Utilization Responsibility

In addition to the intramural research responsibilities listed above, the Bureau also oversees extramural research by means of contracts to nongovernmental institutions. These research contracts are for Bureau mission-oriented studies in specialized areas for which the Bureau lacks the capabilities, either physical and/or scientific, to conduct in its Division of Veterinary Research.

Implementation

The Bureau's research program is listed in Government publications such as 1609 forms of the Agency's Research Reports in the Library of Congress and the FISAR System in the Bureau of Foods. Numerous research studies have been published by the Division of Veterinary Research in professional journals along with pertinent research publications resulting from studies conducted under the extramural contracts. Extramural research contractors are also required to submit annual reports of their research studies.

It is considered the best utilization of generated data from a research program is by means of publications in professional journals specifically related to the research project.

- Plans, conducts, and supports research on the health effects of radiation exposure through contracts and grants.
- Develops criteria, recommendations, and standards relative to radiation use and exposure. Develops and promotes improved procedures, techniques, and users' qualifications for reducing unnecessary radiation exposure. Provides technical and scientific support, including training, to other bureaus within FDA and to other agencies having radiological health responsibilities.
- Participates in development of model codes and recommendations for guidance of industry and of national, State, and local radiation-control and standard-setting agencies in order to optimize radiation control practices.
- Maintains appropriate liaison with other Federal, State, and international agencies, with industry, and with consumer and professional organizations.

Implementation

The Bureau of Radiological Health disseminates the output of its research and development activities in a number of ways to most effectively reach specific audiences. The Bureau publishes its findings in Public Health Service numbered series reports, appropriately coordinated series of technical reports for the Bureau's divisions, offices, and laboratories, and in the open literature in scientific journals.

These Bureau technical report series allow comprehensive and rapid publishing of the results of intramural and contractor projects. The technical reports are selectively distributed by subject matter to State and local radiological health program personnel, Bureau technical staff, advisory committee members, university radiation safety officers, libraries and information services, industry, hospitals, laboratories, schools, the press, and other interested individuals. These reports are also included in the collections of the Library of Congress and the National Technical Information Service (NTIS). NTIS announces and sells these reports internationally by use of an abstract journal.

Significant findings from the Bureau's research and development activities receive additional publication in condensed form tailored to the appropriate scientific journal. The original Bureau technical report is usually referenced in such articles as complete documentation of the work.

In addition to the publications of the findings in the Bureau's publications and scientific journals, significant findings are publicly released by DHEW through press releases prepared by the Bureau. In addition, announcements of new publications are periodically submitted to appropriate scientific journals for use in their new sections.

Technology Transfer Accomplishments

Examples of technology transfer accomplishments by the Bureau of Radiological Health are numerous. A check of the Bureau of Radiological Health Publications Index shows that approximately 1,400 publications in the form of journal articles by Bureau staff, or numbered series reports have been disseminated. This number does not include publications in the open literature of outside work funded through Bureau grants or contracts.

An example of a very broad based technology transfer accomplishment by the Bureau of Radiological Health would be their recent sponsorship, along with the World Health Organization and the Polish Ministry of Health and Social Welfare, of an "International Symposium on the Effects and Health Hazards of Microwave Radiation."

products coming under the purview of the Bureau of Biologics by outside advisory panels.

Research Utilization Policy and Objectives

Technical information from the Bureau is disseminated through publication of technical papers in scientific journals, through informal workshops to which the scientific community is invited, through informal liaison with other Government agencies such as the NIH and the Center for Disease Control, and with formal outside advisory committees such as the Advisory Committee on Immunization Practices and the Pediatric Advisory Committee. Information relating to proposed regulations is published in the *Federal Register.*

Technology Transfer Responsibility

The responsibility for technology transfer resides in the Office of the Director and is administratively handled by the Assistant to the Director. The Division Directors working in concert with the Office of the Director in terms of technical reports and regulatory actions provide all materials for review and dissemination.

Accomplishments

Recent accomplishments have included *Federal Register* publications relating to problems with viral vaccines, i.e., the contamination of vaccine with bacteriophages and problems with the safety testing of influenza vaccine. In addition, Dr. John Robbins has recently published a paper in the *New England Journal of Medicine* concerning problems with bacterial meningitis.

Technology Transfer User Organizations

Scientific information from the Bureau of Biologics is utilized by biologics manufacturers, by scientists working in similar areas, and by the consumer.

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BUREAU OF FOODS

Enabling Legislation and Mission

The Bureau of Foods consisting of 16 divisions and administrative offices:

- Develops FDA policy with respect to the safety, composition, quality including nutrition, and labeling of foods, food additives, colors, and cosmetics.
- Conducts research and develops standards on the composition, quality, and safety of foods, food additives, colors, and cosmetics.
- Conducts research designed to improve the detection, prevention, and control of contamination that may be responsible for illness or injury conveyed by foods, food additives, colors, and cosmetics.
- Develops and promulgates current good manufacturing practices for the food processing industry and model ordinances and codes and model regulations for State

sale through the Superintendent of Documents, GPO; over 2,500 copies have been sold. Similarly, Bureau of Foods cosponsors, with the Executive Director of Regional Operations, "Pesticides Analytical Manual," a comparable manual for methods for residues of pesticides and industrial chemicals, which is updated frequently. It is distributed free of charge to about 4,000 users. From time to time, as the need arises, the Bureau sponsors the publication of monographs in various specialized fields, but not on a regularly scheduled basis.

Recently Bureau of Foods has initiated an internal scientific reporting system, intended chiefly to provide a total, in-depth overview of the Bureau's research effort. It will also serve to capture data and information not scheduled for publication in the open literature. Reports will be microfilmed and stored in the library; they will be accessed through the IBM 2741 computer terminal by subject, program, and name of principal investigator. The system is based on a yearly cycle. It is anticipated that more than 300 reports will be entered annually. Reports of research conducted in other institutions under contract to FDA are also being entered into the system.

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NATIONAL CENTER FOR TOXICOLOGICAL RESEARCH

Enabling Legislation and Mission

In January 1971, the President approved the establishment of the National Center for Toxicological Research (NCTR). The Center examines the biological effects of potentially toxic chemicals in man's environment and is utilized by Government agencies and in cooperation with industry and the academic community.

The primary purpose of NCTR is to conduct research programs to study the biological effects of potentially toxic chemical substances found in man's environment. Our research theme emphasizes improvement of protocols for safety assessment and the study of irreversible lesions, such as carcinogenesis, mutagenesis, and teratogenesis.

Research Base

The NCTR is jointly funded by the Food and Drug Administration and the Environmental Protection Agency. FDA is responsible for administration; both agencies have equal representation on the NCTR Policy Board. The major role of the Policy Board is to provide program direction and to assure sufficient funds for construction and program development.

A Science Advisory Board advises the Director of NCTR in establishing and implementing the research programs and provides extra-agency review in assuring that research programs and methodology development at NCTR are scientifically sound and pertinent to environmental problems.

NCTR's research programs are assigned to 12 divisions: Comparative Pharmacology, Mutagenic Research, Teratogenic Research, Chronic Studies, Acute/Subacute Studies, Pathology Research, Histopathology, Chemistry, Diagnostics, Diet Preparation, Animal Husbandry, and Clinical Pathology.

Research Utilization Policy and Objectives

NCTR conducts research programs:

- To study the biological effects of potential-

assure a quantitative determination of actual toxicant consumption/unit time. Interest has been expressed in this unit by Merck-Institute for Therapeutic Research and The Dow Chemical Co.

The development of the NCTR electronic balance and its coordination with a minicomputer resulted in the development of a system which collects and stores breeding and genetic information on the NCTR mouse colonies. The parameters collected include: sex, body weight, physical condition, litter sizes, behavioral aspects, and research program allocation. Information can be rapidly retrieved. The Upjohn Co. has shown great interest in this program.

Numerous interagency meetings and workshops have been held involving the exchange of technology information. Examples of these agencies include NASA, NIH (NCI), and EPA.

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Rehabilitation Services Administration

Enabling Legislation and Mission

The Rehabilitation Act of 1973 provides the statutory basis for the Rehabilitation Services Administration (RSA), which administers the State-Federal program to rehabilitate disabled persons on a national scale. RSA is a major component in the Office of the Assistant Secretary for Human Development. Its basic mission is to provide vocational rehabilitation services to handicapped persons, mainly to prepare them to engage in gainful employment. The total program evaluates the rehabilitation potential of handicapped persons; provides medical, vocational, training, placement, and other needed services; investigates ways to meet the needs of those for whom a vocational goal is not feasible but who can become more nearly self-sufficient; assists in the construction and improvement of rehabilitation facilities; promotes employment opportunities for handicapped persons in the public and private sectors; provides training to increase the number of skilled professional workers serving the handicapped; works to remove attitudinal, architectural, and transportation barriers to the employment of the handicapped; and develops new applications of the most advanced medical and rehabilitation technology and services to help handicapped persons through research, special projects, and demonstrations.

Authorization for the research programs specifies that research results shall be used to improve service programs for the handicapped, and that *only* research that really promises such improvement shall be funded. Both implicitly and explicitly, appropriate technology transfer and research utilization activities are also authorized, including a central clearinghouse of information and resources to help handicapped persons.

Research Base

Basic R&D authority specifies "research, demonstrations, and related activities" that bear directly on the development of methods, procedures, and devices to help provide vocational rehabilitation services to handicapped persons. Some specific R&D programs include:

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breakthroughs in service delivery to clients.

Technology Transfer Responsibility

The Support Services group (formerly the Division of Research Utilization) in the Office of Research and Demonstrations, RSA, has responsibility not only for RU but also for R&D evaluation; special reports; R&D information systems; telecommunications, films, and other audiovisual efforts; preparation of special documents such as *Guide for Preparing R&D Final Reports,* and RU criteria to be met by new R&D proposals; monitoring of R&D projects devoted specifically to RU; and development of a rehabilitation resource center.

Implementation

The cited RU goals, which provide overall guidance, are circulated to the field as part of the total R&D strategy (long-range plan). Input on RU is provided to the *Rehabilitation Services Manual,* including an overall statement and an RU plan specifying topics to be covered in R&D proposals and describing utilization activities that may follow the R&D effort. Similarly, standards for evaluating RU aspects of incoming R&D proposals are developed for Central Office use.

Major transfer mechanisms include an abstracting and indexing program to make R&D results available in concise form, and a thesaurus and general index. All R&D final reports are stored by NTIS, to provide microfiche and hardcopy reproduction capability. Two Research Utilization Laboratories package and disseminate R&D findings on selected operating problems, evaluate the extent to which the findings are utilized, and in the process develop general knowledge on the utilization process. Research Utilization specialists link research with practice in State agencies. Practices of exemplary service sites are diffused more widely by sponsoring "learning visits" for selective service practitioners. Direct consultation between rehabilitation experts and service agency staff is also used. A number of Regional Rehabilitation Institutes (RRI's) do programmatic research on selected problems on the basis of which they offer help to service agencies. A special effort is now underway in one RRI to promote the use of R&D results from three R&D Centers, followed by evaluation of the RU processes involved. Each of 10 regional offices has an R&D specialist with important RU liaison functions with State service agencies. In addition, Support Services monitors a number of other R&D projects with special RU content.

Technology Transfer Accomplishments

Support Services designed, monitored, and is completing the evaluation of a series of nine Research Utilization Specialist (RUS) projects. The RUS serves as a link between research and practice in State Vocational Rehabilitation agencies. An overall evaluation report has been completed on the projects, along with guidelines for installing the RUS, and a national workshop for interested agency directors is planned for early 1975.

One of the RSA Research Utilization Laboratories established a national clearinghouse of information on the rehabilitation of welfare clients. A project in the completion stage is modeled on the Visiting Psychologist Program of the American Psychological Association. The project matches experts in rehabilitation with expressed needs of service agencies, and analyzes the results of their consultative visits. One product was a good survey of agency needs, and another concerned the utilization of expertise versus R&D results (the former seemed more useful).

National Institute of Education

Enabling Legislation and Mission

The Education Amendments Act of 1972 (Public Law 92-318) authorized the creation of the National Institute of Education to:

Help to solve or alleviate the problems of American education and to promote its reform and renewal;

Advance the practice of education as an art, science, and profession;

Strengthen the scientific and technological foundations of education; and

Build an effective educational research and development system.

To carry out the objectives of the Institute, the Director is authorized, through the Institute, to conduct educational research; collect and disseminate relevant findings; train individuals in educational research; assist and foster research, collection, dissemination, or training through grants or technical assistance to public or private organizations, institutions, agencies, or individuals; promote the coordination of research and its support within the Federal Government; and construct or provide (by grant or otherwise) for appropriate facilities used in this subsection to accomplish its objectives. As used in this subsection, the term "educational research" includes research (basic and applied), planning, surveys, evaluations, investigations, experiments, developments, and demonstrations in the field of education (including career education).

Research Base

The Institute's programs include short-term problem-solving activities, long-term basic research, and dissemination system development and support. The five major program areas include:

Basic Skills. Activities to support educators in their efforts to teach all students the basic skills of reading, language, and mathematics.

Educational Equity. Activities designed to overcome language, racial, or sexual barriers which students encounter in seeking an equal chance for a quality education.

Education and Work. Activities in career-oriented education.

Finance, Productivity, and Management. Activities addressing the impact of different funding arrangements on education; the cost efficiency of new technologies in education; cost-reduction alternatives for schools facing declining enrollments or reduced revenues; and education alternatives for urban and rural school systems.

Dissemination. Activities to promote utilization of research products and knowledge in education through identification and diffusion of exemplary practices; development and support of improved information systems and other activities for their availability and application.

Research Utilization Policy and Objectives

The benefits to schools from the results of educational research and development have been less than optimal. Information on these results has not generally been reported in forms useful to teachers and administrators. Systems involving State, regional, and local education agencies and R&D performers responsible for making knowledge available and helping in its application have not been well developed.

Center (ERIC)—a national system providing ready access to educational information. This system will continue to perform as a complete announcement and retrieval system to make available printed R&D findings.

Other activities for improving access to education information will be supported, including most notably the identification of the information needs of teachers, administrators and others and the design of improved information systems exploiting ERIC experience.

More is needed, however, if systematically developed information is to have a significant impact on school practice. The organized information base must be supplemented by effective organizational and interpersonal linkages with education practitioners, assistance in identifying and specifying their needs and problems and in seeking and utilizing education information in solving those problems.

ODR will sponsor two kinds of activities focusing on this critical linkage function. Funds will be provided to selected State education agencies for developing their dissemination capacity—some receiving support for developing comprehensive programs over a relatively long period of time, and others receiving special-purpose grants for relatively low-cost, one-time efforts to deal with specific State dissemination problems. In addition, a "dissemination secretariat," working through the Council of Chief State School Officers, will receive continued support to maintain liaison among dissemination personnel in Federal and State education agencies.

This implementation effort, to be initiated in FY 1976, will be based on research evidence related to educational change:

1. That the most innovative schools make positive arrangements to ensure the use of current knowledge in decisionmaking to preclude haphazard change, and
2. That sustained and skilled assistance is required for effective utilization.

Consequently, this program will have two major emphases somewhat analogous to those of the knowledge utilization system described previously: the maintenance and improvement of available information about R&D findings and exemplary practice related to specific educational problems; and the development of mechanisms to link effectively the R&D system and the operating educational system. Thus, while the first program is aimed at building a capability to provide knowledge relevant to most local problems, it focuses on the implementation of R&D and exemplary practice to improve education in predetermined problem areas such as reading and career education.

A series of projects will be supported to assist selected State education agencies and their designees in choosing, adapting, and maintaining R&D-based programs or promising practices. The first step will be the collection, interpretation, and communication of existing R&D outcomes related to specific problem areas in forms useful to a wide range of users. In a related effort, selected State agencies will receive support to identify, verify, and disseminate information on exemplary local practices useful to other school districts.

Beginning with the information base that is developed, NIE will support an active utilization program in identified problem areas. Among activities to be supported will be: training of personnel (e.g., in intermediate education agencies or national associations) regarding the R&D outcomes and exemplary practices related to several problem areas; providing implementation support to selected school districts; communicating policy information to State and local decisionmakers with high-priority problems such as declining enrollment and its impact; and technical assistance by R&D organizations with the capability to respond to needs of local educators.

portunities for persons to become expert, through leadership workshops, in assisting schools to implement the IGE support system. This system is comprised of 23 State IGE networks (State education agency, intermediate education agencies, teacher education institutions, and local school districts) and regional (multi-state) IGE centers, in various parts of the country.

- Experienced-Based Career Education (EBCE), a comprehensive high school program, utilizes the community to provide students with nonpaid learning experiences. Dissemination activities include transferring four operational EBCE models to their host local education agencies for conversion to demonstration and training centers. Technical assistance and training will be provided to the school districts. Funds to school districts and operators of work experience programs will encourage variation of the EBCE model and the adoption of EBCE model elements by existing work experience programs, and funds to selected State education agencies will pay for a part-time EBCE coordinator to assist local education agencies in the process of adopting the model.

For additional information contact the personnel indicated at:

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Corinne Rieder
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600-B

Arthur Melmed
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DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Enabling Legislation and Mission

The Department of Housing and Urban Development Act of 1965 provided for the establishment of a cabinet-level department that combined all Federal agencies then dealing with the myriad problems of housing and urban development. This act and later legislative and executive policy statements have defined HUD's major goals:

- to provide an opportunity for decent housing for every American family;
- to promote a suitable living environment for every American family; and
- to strengthen the capability of State and local government to meet public needs.

HUD's research authority was unified in Title V of the Housing and Urban Development Act of 1970. Under this title, the Secretary of Housing and Urban Development is "authorized and directed to undertake such programs of research, studies, testing, and demonstration relating to the mission and program of the Department he determines to be necessary and appropriate."

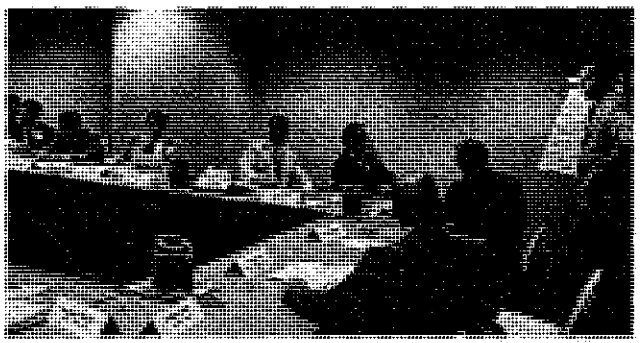
Section 501 of the same title authorizes the Secretary to "provide advice and technical assistance as may be required and to pay for the cost of writing and publishing reports on similar activities and undertakings, not financial, which are of significant value in furthering the purposes of that section. He may disseminate in such form as he determines to be most useful to departments, establishments, and agencies of Federal, State and local governments; to industry and to the general public."

Research Base

Responsibility for research and for the dissemination and transfer of its results is assigned within HUD to the Assistant Secretary for Policy Development and Research (PD&R).

PD&R activity is divided into three major substantive areas. They are: housing, community development, and State and local government research.

To provide each of these three investigative areas with help in making the results of research widely available, PD&R has es-



Michael H. Moskow (Right) HUD Assistant Secretary for Policy Development and Research, briefs a group of local officials from all over the nation on the programs of his office at a meeting in Washington.



The HUD Office of Policy Development and Research exhibit, displayed here at the National League of Cities 50th Anniversary Congress of Cities and Exposition in Houston, Texas, provides information on major recent research efforts to important segments of the user community.



Engine room of HUD's total energy system at Jersey City shows five engine-generators, any three of them capable of meeting maximum energy demands. Two standby engines will permit scheduled maintenance and emergency repairs while delivering full power demands of the development. Cables arcing into floor are power cables to the distribution and control systems. Each set of three carries up to 600 kilowatts at 480 volts.



Mayor Kenneth O. Gibson, of Newark, N.J., HUD Assistant Secretary for Policy Development and Research Michael H. Moskow, and Mayor Arthur Holland of Trenton, N.J., exchange views on local government research needs at a recent HUD-sponsored meeting of local officials.

the general and special constituencies which need the improvements.

Technology Dissemination Responsibility

The Division of Product Dissemination and Transfer was created early in FY 1974 to encourage the practical application and utilization of research findings and products. The division seeks to stimulate public awareness of HUD research activities and to obtain feedback from user groups that would increase the effectiveness of HUD policies, programs and plans.

The main task of the dissemination and transfer staff is to carry out a variety of activities to ensure that money spent for research is invested in useful methods, technological improvements, and more effective management of resources.

Some responsibilities for technology dissemination and transfer are vested in other Assistant Secretaries to promote wider understanding of research products that affect their particular areas of concern. For example, the Housing Production and Mortgage Credit area maintains an Office of Technical Standards that conducts a continuing program of research on building standards and products used in federally insured housing. Another example is the Office of Housing Programs, under the Assistant Secretary for Housing Management. The responsibility of the Office is to encourage transfer of management innovations developed by the research staff in the Public Housing Management Improvement Program.

Implementation

One major task of the dissemination and transfer staff is to help in the design of major research projects before they begin. Members of the Division work actively with each research director at all stages of the planning and research process to ensure potential "transferability." Potential user groups, including key individuals and organizations, are identified, and a dissemination and transfer plan is incorporated in the research design.

The purpose of this planning is to assure a constant flow of information to those potential users identified early in the research design phase. PD&R is planning a field network that would use the regional structure of the Department to bring research products directly to potential users.

The Department has developed in a relatively short time a variety of methods to encourage wider awareness of its research products. They include:

Dissemination

(a) The Division announces new research reports through national publications, PD&R's Research Newsletter, the D/T publication "Recent Research Reports" and special mailings. They are also made available to the public through National Technical Information Service (NTIS), and the Government Printing Office. Information on research in progress is available through the Smithsonian Science Information Exchange and the PD&R status control center.

(b) Publication of the Research Newsletter began on an experimental basis in 1974. Past issues have focused on energy, enhancing local government capacities, and housing technology. Recipients have responded favorably to the Newsletter and are requesting in-depth program information on topics discussed.

(c) The Division has promoted broader awareness of research results through several articles in magazines and journals, the publication of a compendium of research reports and contract awards, and

ment and planning of other facets of urban administration. In Long Beach, California, the focus is on public safety data; Reading, Pennsylvania, is stressing physical and economic development. Wichita Falls, Texas, and Charlotte, North Carolina, are designing a total Integrated Municipal Information System (IMIS). As the various modules within the system or subsystem are identified and proved, the dissemination and transfer process is launched through such organizations as the International City Management Association, the U.S. Conference of Mayors, League of Cities, and through HUD's own dissemination and transfer network.

The Community Management Research program directs the USAC project as well as managing other research efforts. Fire Service Management is one of the vital areas in which HUD research is being adapted for practical use in many cities across the country.

The Uniform Fire Incident Reporting System (UFIRS) uses computers to improve a city's ability to analyze local fire problems in terms of budget expenditures, allocate men and equipment more effectively, support codes and public education programs, and provide better community protection. Developed jointly by HUD and the National Fire Protection Association, UFIRS has been tested and fully documented. Seven cities participated in the early tests and now operate UFIRS. Others are in the process of putting the system into place.

The Fire Station Location Method is a computerized model designed to aid local officials in determining effective fire station site location. Three cities have already tested the method, and 36 others are adapting it for their use. HUD's research staff, using similar principles, is developing a Public Facility Location method to aid officials in locating ambulances, municipal service areas, miniparks, and other public services.

Recently, the Department began a major research effort to strengthen the ability of State and local governments to use the new authority and resources available to them under the New Federalism.

Technology transfer projects related to buildings are a major part of the Department's research effort. Technical standards for all buildings completed under the Federal insurance program require the Office of Technical Standards for the Assistant Secretary for HPMC to approve most building products and techniques used in single and multi-family homes before federally insured mortgages can be issued. This Office transfers its findings through vast Federal housing insurance programs.

Technology transfer has been and continues to be a major mission of the Department. The recent changes in the design of research projects have tended to place more stress on the Dissemination and Transfer process than ever before in the Department's history.

Technology Transfer User Organizations

The user groups interested in community development encompass a wide array of organizations. In addition to governments themselves, they include such diverse organizations as the National League of Cities, International City Management Association, and the National Association of Housing and Redevelopment Officials.

Builders, architects, planners, engineers, and the organizations representing them, are prime users of the building and environmental research of this Department. The general public, the final consumer of housing, represents the principal beneficiary of many of the projects undertaken by the Assistant Secretary for Policy Development and Research.

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DEPARTMENT OF THE INTERIOR

Bureau of Mines

Enabling Legislation and Mission

The Bureau of Mines, established by the Organic Act of 1910, was given the following statutory mandate: "It shall be the province and duty of the Bureau of Mines . . . to conduct inquiries and . . . investigations concerning mining, and the preparation, treatment, and utilization of mineral substances with a view to improving health conditions, and increasing safety, efficiency, economic development, and conserving resources . . . to investigate explosives . . . and to disseminate information concerning these subjects . . ."

Under this statutory authority, the Bureau conducts research in mining technology, metallurgy, energy,* and mineral resources. The Bureau of Mines, as the Federal Government's primary research arm in the mineral and fossil fuel fields, has 19 research centers and laboratories throughout the country.

* Through legislation creating the Energy Research and Development Administration (ERDA), a major portion of the energy program has been transferred from the Bureau of Mines to the ERDA.

Enactment of the 1969 Federal Coal Mine Health and Safety Act (P.L. 91-173) resulted in an extensive industrial health and safety program to protect coal miners as well as a broad-based program of research. The intent of this research effort as defined by Congress is "to conduct such studies, research, experiments, and demonstrations as may be appropriate to improve working conditions and practices in coal mines and to prevent accidents and occupational diseases originating in the coal mining industry."

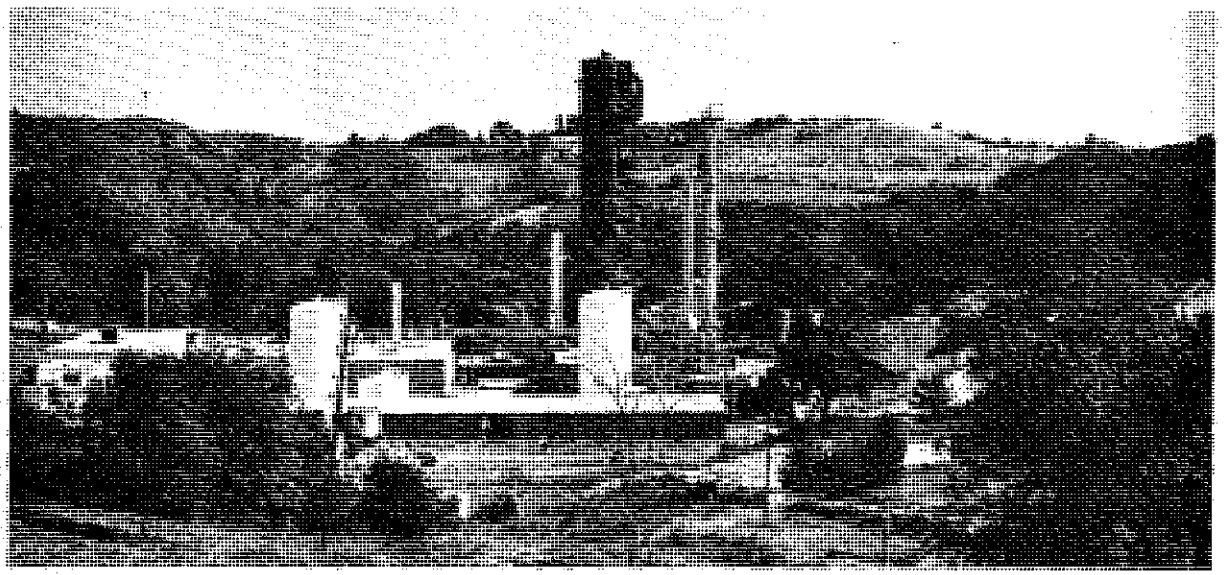
Research Base

The Bureau of Mines has three major R&D program areas: mining, energy, and metallurgy.

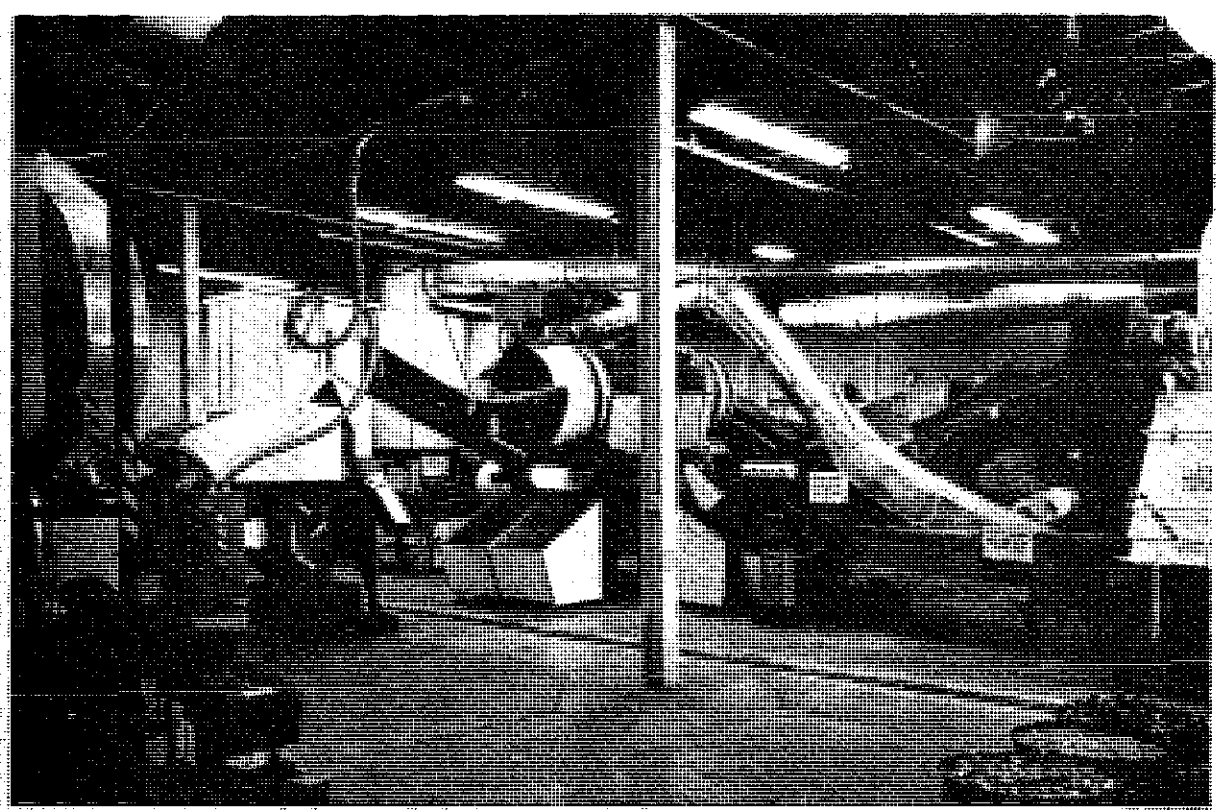
Mining

The Bureau's Mining Research program embraces the areas of Mining Health and Safety, Advanced Mining Technology, and Environmental Research.

(1) *Health and Safety.* The protection of the health and safety of the miner has long



Bureau of Mines 75 ton (coal) per day Synthane Pilot Plant for Producing Substitute Natural Gas from Coal, Pittsburgh Energy Research Center



Bureau of Mines Raw Refuse Pilot Plant, College Park Metallurgy Research Center.

Kellogg, Idaho, to provide engineering data to help meet air quality standards for all base-metal smelters.

The secondary resource recovery research is aimed at developing methods for recovering metals and minerals from mining and industrial wastes, for upgrading and refining these metals and minerals, and for developing uses for them. Over the past few years, the Bureau has developed and operated a pilot plant to recover metal and mineral materials from municipal incinerator residues using conventional mineral processing equipment. An EPA-funded demonstration plant is being built at Lowell, Massachusetts, and research now is focused on reclaiming metals, minerals, and combustibles from unburned refuse.

Minimizing minerals and metals needs covers research that will yield high-quality and improved performance materials having increased durability which will result in more efficient use of mineral resources.

Technology Transfer Policy and Objectives

A mining research technology transfer program was established by the Deputy Director—Mineral Resources and Environmental Development in April 1972. The original committee identified and analyzed health and safety research accomplishments resulting from the Bureau's in-house and contract efforts since passage of the 1969 Federal Coal Mine Health and Safety Act. These accomplishments were defined as "Positive or negative findings directly and demonstrably related to mining problems and which would, if adopted, result in improved practices, techniques, methods and/or devices to the benefit of Health and/or Safety of the miner." Further, the committee assembled these research accomplishments into identifiable packages and for expeditious technology transfer. A permanent Technology Transfer Group on the staff of the Assistant Director—Mining was established at the beginning of FY 1973.

The energy and metallurgy programs have no distinct technology transfer groups, but the program is aimed largely at developing commercial technology for transfer to industry. The goal of the energy program is to develop, to the commercial stage, processes for producing (a) clean fuels from coal, (b) improved oil and natural gas recovery, and (c) oil from oil shale deposits in an environmentally acceptable manner. The goal of the metallurgy program is to develop, to the commercial stage, environmentally acceptable processes for (a) retrieving valuable minerals and metals from wastes, (b) developing new methods of recovering minerals and metals from ores, and (c) improving methods of recovering iron, copper, and aluminum.

Technology Transfer Responsibility

The Mining Research Technology Transfer Group, with a professional staff of four, is located in the Division of Mine System Engineering. This group, charged with planning and assisting in the direction of overall transfer activities, serves as the headquarters' focal point for technology transfer activities in all areas of the Mining Research Program. In addition, each of four Mining Research Centers has a staff member assigned to the Technology Transfer activities. These individuals, assigned by the Research Directors at each Center, assist the Research Director and the Headquarters group in (a) planning, programing, and implementing transfer plans; (b) identifying and advocating to industry, the academic community, and other agencies new Bureau technological developments; (c) serving as a focal point for liaison with other organizations on mining technology; (d) point for liaison with other organizations on

Open industry briefings are held in mining areas to bring the message directly to the operators. Where possible, these briefings are held in conjunction with regularly scheduled mining organization meetings. The meetings are structured to focus attention on items of research of particular interest to members in a given audience. Through FY 74, 11 open industry briefings had been held throughout the mining areas of the country, and five more had been scheduled for the first half of FY 75.

Seven technology transfer seminars already held and others scheduled for FY 75 are designed to promote the application of Bureau-developed technology and to concentrate on specific program areas. Publications, including the new series *Technology News*, are effectively utilized to disseminate research results.

Field demonstrations, the highest form of technology transfer, are being carried on in a number of mines throughout the country. Notable among the demonstrations initiated in FY 74 was the one-year demonstration of the Inherently Safe Mining Systems equipment development program at the Jenny Mine in Kentucky.

Displays at major industry trade shows and conventions are an effective means to make large audiences aware of recent mining research accomplishments.

A new cooperative study program initiated with three coal-mining organizations provides for the training of industry engineers by Bureau personnel on mine design problems. Training at Bureau Centers is followed by work on selected problems in the mines.

Technology Transfer Accomplishments

Mining

Several types of mine communication hardware, developed by the Bureau and its contractors and promoted through seminars, conferences and in-mine demonstrations are being marketed by manufacturers, and the concepts are being embraced by industry. Parallel successes have occurred in the area of underground illumination.

Technology for mine roof monitoring devices developed by the Bureau and its industrial contractors is being transferred at meetings and by demonstrations. Several manufacturers who received nonexclusive licenses are actively marketing this Bureau-developed technology.

Various techniques developed by the Bureau for the removal of methane from coal beds both before and during mining operations have successfully been transferred to industry.

Bureau research in the abatement of noise is being used to suppress noise on pneumatic drilling equipment underground.

A Bureau-sponsored technique for remotely sealing off underground fires recently allowed the rapid reopening of a northern West Virginia mine.

The Bureau's missionary efforts were largely responsible for the widespread use of rock bolts in both coal and metal-nonmetal mines.

Hardware developed by the Bureau or its contractors is being marketed by a number of manufacturers. Bureau-developed techniques are in use in mines throughout the Nation.

Energy

The Bureau of Mines has developed coal analysis techniques that are current standard techniques in use by industry. The hot carbonate gas cleanup process for removing H_2S and CO_2 from gas streams, developed by the Bureau, is in widespread use. The Bureau's coal preparation process, Two-Stage Froth Flotation, is in the early stages of

of $2.4 million from the Environmental Protection Agency. Similar technology developed by the Bureau for processing unburned refuse has formed the basis of plants designed by the National Center for Resource Recovery for the city of New Orleans, and by Teledyne for Baltimore County, Maryland. Small pilot plants to test the Citrate Process for absorption of sulfur dioxide from stack gas have been established at a lead smelter in Idaho, and a powerplant in Indiana. Successful operations of these small plants has stimulated participation by the Environmental Protection Agency in a commercial scale demonstration of the Citrate Process.

The depletion of domestic high-grade iron ore resources is being countered by development of new metallurgical technology for exploiting the abundant but unusable low-grade nonmagnetic taconites of the Michigan iron range. Metallurgical research by the Bureau of Mines has shown how to upgrade worthless nonmagnetic taconite to produce a commercially valuable taconite pellet for use as feed for the iron blast furnace. Stemming from the Bureau process, the United States iron-making capacity during 1974 was increased 5 percent when the Tilden, Michigan, plant of Cleveland Cliffs Iron Co. went on stream. The same process could be adapted to utilize billions of tons of additional low-grade ore in the Mesabi iron range of Minnesota.

Despite an abundance of domestic resources of aluminum-bearing minerals, none of the numerous processes proposed for recovering alumina (the necessary mid-product for making aluminum) from them has proved economically competitive with the Bayer process using bauxite. The Bureau of Mines has initiated research to test and develop the most promising technologies in a small-scale continuous pilot plant, and industry is cooperating in a cost-sharing effort to accelerate the program. New improvements and approaches by industry and the Government for recovering alumina from clay, anorthosite, alunite, and dawsonite will be tested and evaluated in the plant to obtain enough information for selecting the best processes for commercial adoption.

About 15 percent of the 1.5 million tons of primary copper produced annually is obtained by leaching, particularly from low-grade ores for which milling costs cannot be justified. To expand leaching farther, the Bureau of Mines has increased effort on in-situ leaching. Mining, crushing, grinding, beneficiation, and pyrometallurgical operations can be supplanted by this technique. In-situ leaching can become an effective means of unlocking small, low-grade, unminable deposits.

Also, under development is a simple method for the vapor-phase reduction of lead sulfide concentrate that, if successful, will yield an alternative to the cumbersome sintering/blast furnace technology.

Technology developed by the Bureau of Mines has a significant impact on recent U.S. gold production. Leaching techniques applied to deposits at Carlin and Cortex, Nevada, have increased production by more than 50,000 ounces of gold per year. Use of the carbon-in-pulp recovery process increased gold recovery from slimes at the Homestake Mining Co. in South Dakota. Overall, these techniques accounted for about 6 percent of the gold from precious-metal ores. Now, the Bureau is helping transfer the technology to the recovery of gold by heap leaching for previously bypassed low-grade ores and old tailing piles. The latter are important because past recoveries of about 60 percent are increased to over 90 percent by new techniques.

Based on the success with gold ores, the Bureau of Mines is developing low-cost leaching techniques for recovering silver from refractory ores and tailings. Small operators of silver mines are turning to the Bureau for help in the metallurgical processing of ores resistant to conventional

Geological Survey

Enabling Legislation and Mission

The Geological Survey's basic authorization, an Act of March 3, 1879 (43 U.S.C. 31), defines the Survey's mission as "the classification of the public lands and examination of the Geological Structure [*sic*], mineral resources and products of the national domain."

Research is inherent in carrying out the Survey's primary responsibilities to fulfill this mission: to determine the geologic structure; appraise the water, mineral, and mineral fuel resources of the United States; delineate the surface characteristics of the Nation; classify the public lands for their mineral and water-power potential; and supervise mining and oil and gas operations under the mining laws and mineral leasing laws.

The following statutory authorities relate specifically to "technology transfer" of the results of the Survey's activities:

43 U.S.C. 31 Basic authority
43 U.S.C. 41 Publication of reports
43 U.S.C. 42 Distribution of maps and atlases
43 U.S.C. 43 Copies to Congress
43 U.S.C. 44 Sales of copies of data
43 U.S.C. 45 Sale of photographs and records
44 U.S.C. 260 Publications, general
44 U.S.C. 261 Publications, scientific reports
44 U.S.C. 262 Distribution to libraries

Research Base

The Geological Survey's appropriation title, "Surveys, Investigations, and Research," expresses the scope and nature of the Survey's programs.

The primary responsibilities previously noted require extensive field and laboratory research and development in geology, hydrology, geochemistry, geophysics, and photogrammetry, and in related disciplines to determine and appraise useful and responsive solutions to problems in resource planning and development, conservation of resources, safe and economical construction, and in guarding against hazards of geologic origin.

The following major research and development programs are related to budget/appropriation activities:

Alaska Pipeline Investigations

Topographic Surveys and Mapping
- Quadrangle mapping and revision
- Small-scale and special mapping
- National Cartographic Information Center

Geologic and Mineral Resource Surveys and Mapping
- Land resource surveys
- Mineral resource surveys
- Energy resource surveys
- Offshore geologic surveys

Water Resources Investigations
- National Water Data System—Federal Program
- National Water Data System—Federal/State Program
- Critical national water problems

Conservation of Lands and Minerals
- Mineral Lease Management
  - Outer Continental Shelf
  - Federal and Indian lands
- Resource evaluation and classification
  - Outer Continental Shelf
  - Federal and Indian lands

Land Information and Analysis
- Earth Science Application

Hydrologic investigations atlases—the hydrologic investigations atlas is primarily a map report designed to present graphically a wide variety of hydrologic or geohydrologic data. The atlas comprises a principal map, or series of maps, that contain much of the pertinent data. Secondary illustrations in the form of graphs, hydrographs, diagrams, maps of a size smaller than principal map(s), sketches, and photographs may be used to present data that supplement, relate to, support, or clarify the data shown on the principal map(s).

National Map series—
- Family of map products and by-products
- High-altitude, quad-centered photography
- Large-scale maps (1:1,200–1:10,000)
- Standard maps (1:24,000–1:63,360)
- Intermediate-scale maps (1:50,000–1:100,000)
- Small-scale maps (smaller than 1:100,000)
- Color separates and reproducibles from standard line products
- Photographic and orthophotographic products
- Slope products
- Land-use products
- Digital data
- Special-purpose products as required

Journal of Research—A bimonthly periodical containing papers written by members of the Geological Survey and their professional colleagues on various subjects in geology, hydrology, topography, and related earth sciences.

Open Field—Open-field reports include unpublished manuscript reports, maps, and other material made available for public consultation and use. These reports are a medium for making information available to all interested persons.

In addition, the Geological Survey conducts training courses, provides speakers and lecturers at conferences and seminars, and provides technical assistance under actual work conditions. Training courses are conducted primarily for Survey personnel, but many of them are open to individuals from other Federal agencies and from State agencies with which the Survey has cooperative programs.

The LIA Program will stress technology transfer and one proposed activity involves the establishment of regional technical assistance centers that will aid users both in obtaining environmental information and in applying techniques for acquiring, processing, and applying the information.

The Geological Survey's offices in 49 States serve as an interface with other agencies and with the public. The Survey has cooperative programs with other Federal agencies and with numerous State and local agencies, all providing contact points through which information on technologies can be transferred.

Technology Transfer User Organizations

Users range from professionals in the fields of geology, hydrology, and cartography to city planners and managers, and include students and staffs at universities, and individuals and companies in the private sector.

Technology has been transferred to the foreign sector through training programs both in the United States and in other countries and through detailing of Survey personnel under the auspices of the United States Government and international organizations.

Future Plans

The Geological Survey will continue to stress the transfer of technology through its ongo-

non-Federal funding is the minimum for demonstration plant projects.

Technology Transfer Responsibility

OCR does not have a specific organization for technology transfer.

Implementation

Information exchange between OCR contractors and the commercial sector is a continuous operation. One example of this exchange was the establishment of the COGAS Development Company, which used the results of OCR's Char Oil Energy Development (COED) Process as a basis for further commercial development. Recent information reveals that a public utility, a major oil company, and an engineering company are planning to utilize an OCR process for the removal of sulfur from coal.

All organizations concerned with energy and its conversion and applications are interested in and closely follow the OCR program for improved utilization of coal.

For additional information, contact:

Dario Montil
Assistant Director for Planning and Budget
Office of Coal Research
2100 M Street, N.W.
Washington, D.C. 20037
(202) 634-1950

Bureau of Reclamation

Enabling Legislation and Mission

The Reclamation Act of 1902 (43 U.S.C. 391 et seq.) authorized the Secretary of the Interior to locate, construct, operate, and maintain works for the storage, diversion, and development of waters for the reclamation of arid and semi-arid lands in the Western States. To perform these functions the Secretary in July 1902 established a Reclamation Service in the Geological Survey. In March 1907 the Reclamation Service was separated from the Survey, and in June 1923 the name was changed to the Bureau of Reclamation.

Subsequent amendments and supplements to the Reclamation Act of 1902 have authorized specific functions and projects in such a way as to expand the scope of the Secretary's operations under the Reclamation Act to include other aspects of water resources development including research. Specific authority of the Bureau of Reclamation to conduct research is found in subsection 0 of the Fact Finders Act of 1925, as amended, 43 U.S.C. 377 (1964).

The mission of the Bureau of Reclamation is based on stabilizing and promoting the growth of local and regional economies through optimum development of water and related land resources throughout the 17 Western States and Hawaii. The objective of the Bureau's research is to provide scientific information for the support of the overall reclamation program.

Research Base

The thrust of the Bureau's research program is to support its mission. Through such research, procedures are developed or improved to provide for greater conservation of water, more efficient distribution and use of available supplies, and greater economy in planning, designing, constructing, and operating water resource projects. Research

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and stocking by the Government Printing Office these works are available to the general public.

Copies of all research-type reports are sent to the National Technical Information Service (NTIS) for announcement and dissemination upon request. The Technical Services and Publications Branch, Engineering and Research Center, Denver, Colorado, publishes a frequently revised pamphlet listing publications available free and with charge.

The Smithsonian Science Information Exchange (SSIE) is regularly furnished descriptions of new research activities. Information includes objectives of study, funding, location, researchers involved, etc. Reclamation input is included in a catalog of ongoing research, and retrieval techniques may be used to query the SSIE data bank.

Printed output related to technology transfer approximates 35,000 pages per year for all types of technical and informational publications. Programs currently underway are discussed below.

Technical information stemming from the research activities of the Bureau of Reclamation is made available to engineers and scientists employed throughout the Bureau's seven regions as well, and scientists employed throughout the Bureau's seven regions as well as the Engineering and Research Center in Denver, Colorado, and the Commissioner's Office in Washington, D.C.

The National Technical Information Service (NTIS) receives copies of reports on a regular basis by agreement.

New and updated notices of research projects are submitted to the Smithsonian Science Information Exchange periodically for cataloging and dissemination.

Selected Bureau reports are advertised and distributed by the Superintendent of Documents, Government Printing Office.

Abstracts and bibliographic data stemming from the Bureau's research output are sent periodically to the Office of Water Research and Technology, Department of the Interior, for publication in *Selected Water Resources Abstracts.*

Other recipients of technical information include libraries and repositories of universities, State agencies, and other Federal agencies such as the Corps of Engineers, the Tennessee Valley Authority, and the Bonneville Power Administration.

Numerous individual requests for technical information resulting from Bureau activities are received and answered throughout the year.

For additional information, contact the following offices:

Commissioner's Office, Washington, D.C.

Bureau of Reclamation
Department of the Interior
18th and C Streets, N.W.
Washington, D.C. 20240

Contact: Harry F. Avery
Chief, Division of Research
(All research programs)
Edward M. Deas
Chief, Division of General Services

Engineering and Research Center, Denver, Colorado

Bureau of Reclamation
Engineering and Research Center
Denver Federal Center
P.O. Box 25007
Denver, Colorado 80025

Contact: Archie M. Kahan
Chief, Division of Atmospheric Water Resources Management (AWRM program)
Howard J. Cohan
Chief, Division of General Research*
Gunnar N. Thorsky
Chief, Division of Engineering Support
Warren B. McBirney
Chief, Technical Services and Publications Branch
Charles R. Bloedorn
Chief, General Services Branch

* WRPER and ER&D programs.

The Water Resources Scientific Information Center (WRSIC) and its data bank can be accessed through an online terminal network through the Atomic Energy Commission facility at Oak Ridge, Tennessee, a part of the RECON system. At present terminals are located at Ithaca, New York; Madison, Wisconsin; Raleigh, North Carolina; Tucson, Arizona; Blacksburg, Virginia; and Washington, D.C. More terminals are to be added in the coming year. In addition to the WRSIC data base, the sites have access to 15 other data bases to search for documents which relate to answers for their problems. For the users who cannot avail themselves of the online system or who want additional information for perusal, the WRSIC publishes a semimonthly abstract journal *Selected Water Resources Abstracts* and topical bibliographies and state-of-the-art reviews. A listing of reports resulting from OWRT-sponsored research is compiled with a progressive cumulation each quarter to the final fourth, annual issue. A catalog of OWRT research projects with subject, contractor, and investigator indexes is published annually in cooperation with the Smithsonian Science Information Exchange (SSIE). The OWRT does not engage directly in the sale of any of its publications; however, it works closely with the National Technical Information Service (NTIS) and the Superintendent of Documents for the sale of these documents.

Active participation of the State Water Resources Institutes (WRRI) in the Technology Transfer Program has made it possible for OWRT to be acutely aware of the water problems and associated required research in the local areas. Sponsorship of seminars and meetings and public involvement in a limited way in the past has resulted in practical applications of the results of OWRT-sponsored research. The new program emphasis on technology transfer is expected to involve research institutes, Federal, State, and local agencies as well as all types of water-oriented organizations, to bring the problems of the public closer to the solutions offered by the research completed or in progress.

Technology Transfer Accomplishments

An example of a valuable accomplishment was the OWRT sponsorship of a project which produced a comprehensive state-of-the-art study describing the applicability and utilization of currently accepted technology in the oil well drilling industry. The study, entitled "Water Well Technology," was published in 1973.

In an act of information dissemination, WRSIC recently provided one of the Department's bureaus information on completed research and realized a savings of $140,000 when the results were applied to two projects undertaken by that Bureau.

Technology Transfer User Organizations

The users of OWRT comprise individuals and organizations with interests in water-related problems both in the United States and in foreign countries. WRSIC provides information to other Federal agencies, State agencies, universities, industrial concerns, and local governments and individuals upon request. The State Water Resources Research Institutes work locally and among themselves in regions having common interests or problems.

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DEPARTMENT OF JUSTICE

Law Enforcement Assistance Administration

Enabling Legislation and Mission

The Law Enforcement Assistance Administration was established by the Omnibus Crime and Control and Safe Streets Act of 1968 to assist State and local governments by reducing crime and improving their law enforcement and criminal justice systems. The National Institute of Law Enforcement and Criminal Justice has the responsibility to encourage research and development for improving and strengthening law enforcement in accordance with the 1968 Act as amended in 1973, PL 93-83. The Institute's R&D budget in FY 1974 was $35 million.

Within the Institute, there are the Offices of Research Programs Evaluation and Technology Transfer, and a Planning Staff.

Technology Transfer Policy and Objectives

The Institute's mandate has been translated into four areas of responsibility. First, the Institute functions as the research arm of LEAA. Second, it is charged with development of programs which translate research findings into specific recommendations for action at the State and local level; for example, designing the Impact Cities Program which involves a concentrated utilization of resources to reduce stranger-to-stranger street crime and burglary. Third, it has responsibility for the evaluation of LEAA programs. Fourth, the Institute is responsible for technology transfer—the development of programs to ensure that knowledge acquired through research or project experience is made readily available to the operating law enforcement and criminal justice community, through documents, audiovisual media, training, and demonstration programs.

Technology Transfer Responsibility

The National Institute of Law Enforcement and Criminal Justice Technology Transfer Division budget for FY 1974 was $6 million with a headquarters staff of 20.

Implementation

A major concern of the Institute is the effective utilization of research information and



Seminar for police executives in family crisis intervention.

Each package contains a questionnaire regarding the utility of the document to the recipient. The responses to these questionnaires have been most encouraging. In addition, a more formal evaluation is being conducted of the impact of the methadone maintenance and police crime analysis prescriptive packages.

The identification, selection, and detailed operational description of "Exemplary Projects" represents a further means of sharing technology and stimulating the development of more effective programs. Based on such criteria as crime-specific orientation, strong evaluation efforts, replicability and outstanding success in actual operation, approximately 10 projects each year are selected as "Exemplary Projects." A brochure that highlights the major features of these projects and their general effectiveness is prepared and disseminated to all relevant criminal justice agencies. A detailed operational manual is also prepared. Communities interested in taking advantage of exemplary-type project efforts will thus have the technical and other information necessary for implementing similar projects in their own localities.

To date seven programs have been designated Exemplary. They are:

- Community Based Corrections Program, Des Moines, Iowa
- Prosecutor Management Information System (PROMIS), Washington, D.C.
- Citizen Dispute Settlement Program "Night Prosecutor," Columbus, Ohio
- 601 Juvenile Diversion Project, Sacramento, California
- Providence Educational Center, St. Louis, Missouri
- Neighborhood Youth Resources Center, Philadelphia, Pennsylvania
- Public Defender Service, Washington, D.C.

Research Applications are selected from research in priority problem areas that have suggested some innovation that holds promise of immediate and widespread impact on criminal justice operations. The particular innovation is then tested and materials prepared for distribution which show an operating agency the advantages of the innovation, how it should be implemented, what training is involved and some idea of the costs.

Reference and Dissemination Services

These services are provided through four major Technology Transfer Division functions.

1. Library Services are provided for all of LEAA by a small-but-well-stocked library. The Library collection contains approximately 3,500 books and documents and 200 journal subscriptions in the law enforcement and criminal justice area. The Library acquires between 25–50 new titles per month. The Reading Room maintains approximately 1,000 final reports from LEAA-funded projects. During the past year, the Library has serviced 5,000 visitors, answered 7,000 phone inquiries, and responded to 1,150 interlibrary loan requests. The LEAA Library has been responsible for the publication of the LEAA Library Book Catalog which in-



Residents return to community correctional facility from work-release.

The quarterly newsletter called "Research Briefs" was developed in FY 1972 to provide criminal justice operating and planning personnel with a quick survey of Institute-sponsored research. It is also designated to stimulate wider application of pertinent research findings. Each issue focuses on one subject area, presenting an overview of problems and summarizing significant projects and publications. "Research Briefs" is printed as a supplement to the LEAA Newsletter and first appeared in December 1972. Typical "Briefs" produced during this past year include topics on Correctional Intervention, Police, Community Crime Prevention, and Advanced Technology.

The "Research Information Letter" is a monthly information bulletin which is sent to all editors of criminal justice publications of State Planning Agency newsletters. It consists of 2 or 3 topics of current interest including new programs. Some of the more recent subjects discussed in the "Letter" include: Des Moines Exemplary Project, Safety: Bulletins and Transceivers, Innovative Research, Institute Courts Publications, Office of Technology Transfer Training and Demonstration.

Law Enforcement Science Advisor Program

Studies of the technology transfer process have shown that direct communication with a credible information source and firsthand observation of an ongoing program are the best means of effecting the dissemination of knowledge. The Law Enforcement Science Adviser (LESA) Program is a recognition of the importance of personal contacts in the adoption of new products or ideas.

The plan calls for the creation of an experimental program to house a pilot LESA position in three State Planning Agencies (SPA). The program will be evaluated and if expansion is merited additional States will be selected and funded after the initial 12 months of operations.

The LESA's will have four principal functions continuing to complement existing planning and research functions of the SPA and local criminal justice agencies by:

- Analyzing high priority criminal justice programs in the State and advising planners of the implications of current scientific and technological findings on proposed strategies.
- Identifying research questions important to the State's program and assessing the technical and financial resources necessary for obtaining answers through locally based experiments and demonstration projects.
- To collect or facilitate the collection of data required for analysis and evaluation of the technology transfer process and as an input into the determination of widespread information and research needs.
- To screen ongoing criminal justice projects within the State for consideration as "Exemplary Projects" suitable for study and replication by communities facing a similar problem.

DEPARTMENT OF LABOR

Manpower Administration

OFFICE OF MANPOWER RESEARCH AND DEVELOPMENT

Division of Research and Development Utilization

Enabling Legislation and Mission

The Comprehensive Employment and Training Act of 1973 (P.L. 93-203) was enacted "to provide job training and employment opportunities for economically disadvantaged, unemployed, and underemployed persons, and to assure that training and other services lead to maximum employment opportunities and enhance self-sufficiency by establishing a flexible and decentralized system of Federal, State, and local programs."

The Act establishes a Research and Development program containing the following provisions:

> Sec. 311. (a) To assist the Nation in expanding work opportunities and assuring access to those opportunities for all who desire it, the Secretary shall establish a comprehensive program of manpower research utilizing the methods, techniques, and knowledge of the behavioral and social sciences and such other methods, techniques, and knowledge as will aid in the solution of the Nation's manpower problems. This program will include, but not be limited to, studies, the findings of which may contribute to the formulation of manpower policy; development or improvement of manpower programs; increased knowledge about labor market processes; reduction of unemployment and its relationships to price stability; promotion of more effective manpower development, training, and utilization; improved national, regional, and local means of measuring future labor demand and supply; enhancement of job opportunities; skill training to qualify employees for positions of greater skill, responsibility, and remuneration; meeting of manpower shortages; easing of the transition from school to work, from one job to another, and from work to retirement, opportunities and services for older persons who desire to enter or reenter the labor force, and for improvements of opportunities for employ-

for suitable products (such as manuals and guidebooks, when appropriate), to conduct briefings and to provide training and technical assistance, when desired.

The Utilization Division is responsible for annually publishing a projects book containing summaries of ongoing projects and of projects completed during the preceding fiscal year. Each book also contains lists of reports and other products for the previous three fiscal years. The Division distributes "Summaries of R&D Reports" to a wide audience in the manpower field, contributes material to publications of the Manpower Administration about R&D projects and products, supplies copies of reports to meet requests, arranges for the publication of Manpower R&D Monographs, and distributes significant reports and other products to tailored lists.

To promote utilization, the Division relies heavily on face-to-face methods, which it believes most effective. These include briefings of officials; interchanges among R&D grantees, potential users, and agency personnel; conferences on specific subjects; funding of networks through which information and assistance may be channeled.

Efforts are made to obtain coverage for significant R&D findings in technical publications and presentations at professional meetings to reach persons working or researching or teaching in the field of manpower.

Implementation

There is a wide variety of types of R&D projects. All of the following strategy is not applicable to everyone, and it is least appropriate for research aimed at increasing knowledge about the labor market.

When appropriate, R&D grantees and contractors are encouraged to consider from the beginning the probable audiences for their findings and to plan their data collection and products to be most useful to these audiences. Products they are encouraged to produce, if possible, are materials that describe the considerations that need to be taken into account in attempting to replicate or adapt the innovating procedures they have developed. Manuals or guidelines developed for their own use may be helpful to others as a start toward adaptation.

Recognizing that straight reading matter may not always be suitable, some experimentation has taken place with audio and audiovisual packaging of findings. The development of "parachutable" materials has begun, which require no mediation by a teacher or trainer or consultant.

The user is seen as a critical participant in the utilization process, not as a passive recipient of instructions and advice. Projects are urged to involve representative users, when appropriate, in planning, conducting, observing, and guiding their activity. This may involve the use of an advisory committee, or periodic briefings, or the arrangement of site visits. Potential user inputs are respected because they originate in agencies and individuals who will have to adapt or adopt the findings, based on knowing their constraints and the available alternatives.

The concept of a network is central. Formal and informal connections among researchers, developers, agency staffs, professionals, academics, are the means by which knowledge can be transmitted, advice given, and innovations promoted. It is a conscious strategy to add knowledge to such networks and possibly to build or strengthen them.

Networks may be a group of teacher-training institutions in the Southeast acting as advisers to a project and incorporating its procedures into their curricula. Or it can be a section of the American Bar Association promoting the removal of barriers to employ-

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Enabling Legislation and Mission

The National Aeronautics and Space Administration was established by the National Aeronautics and Space Act of 1958 to conduct research on the solutions of problems of flight within and outside the Earth's atmosphere and to conduct activities required for the exploration of space with manned and unmanned vehicles. It was recognized that in achieving this mission NASA would generate a vast amount of scientific and technological knowledge in a great variety of disciplines and fields. The need to maximize the utilization of this knowledge led the Congress, as stipulated in the 1958 Space Act, to call for "... long-range studies of the potential benefits to be gained from, and the problems involved in, the utilization of aeronautical and space activities for peaceful and scientific purposes." Specifically NASA was charged with the obligation to "... provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

Research Base

Planning, coordination, and control of NASA programs are vested in six offices at Headquarters. These offices include Manned Space Flight, Space Science, Aeronautics and Space Technology, Applications, Energy Programs, and Tracking and Data Acquisition. In a recent address, Dr. James C. Fletcher, NASA Administrator, listed the following as the main challenges of the space program and the main directions in which it is moving:

1) Bring the Space Shuttle into operation by 1980.
2) Develop productive new payloads for the Space Shuttle to win practical benefits and new understanding of the Universe.
3) Continue to explore throughout the Solar System with automated spacecraft.
4) Use our space capabilities and experience to solve some of the pressing problems we face today right here on Earth.
5) Develop the new technology for more productive and more far-ranging space missions in the future.

Technology Transfer Responsibility

NASA's technology transfer activities are focused in the Office of Industry Affairs and

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A lightweight, longer duration breathing apparatus developed for firefighter's use by NASA is being evaluated under actual conditions in New York, Los Angeles, and Houston.

The nature of NASA missions has in some cases required that the agency move forward a whole area of technology—making major advances in the state of a single art. Where that takes place, the Technology Utilization Office publishes a survey of the newly advanced state-of-the-art in the form of a "guidebook." These publications are called Technology Utilization Surveys—an example is *Air Pollution Monitoring Instrumentation.* Publications are available either through the Government Printing Office or the National Technical Information Service.

- **New Technology Dissemination.** Another more active form of transfer activity is embodied in the Industrial Applications Center Program and the Public Sector Application Team Program.

  - *Industrial Applications Centers (IAC's).* NASA sponsors six Industrial Applications Centers which work with industrial firms, regional, State, and local government units and universities to make aerospace technology readily available for application to technical problems. The Centers help these primarily industrial users identify and obtain the results of aerospace R&D programs which may be of direct relevance to the user's technical problems. In the 11 years since the initial Center was established, several thousand American companies representing a wide spectrum of industrial classifications have used the available services, for which a fee is charged. The Industrial Applications Center program constitutes a national network providing services specifically tailored to identify aerospace technology directly relevant to the user's technical needs. In 1974, 4,300 industrial firms participated. The Centers, located at universities and nonprofit institutions, have access to a variety of computerized scientific and technical information bases including a wide range of Government-sponsored R&D programs as well as the basic NASA research results.

  - *Computer Software Management and Information Center (COSMIC).* NASA sponsored the development of a wide spectrum of computer programs including numerical analysis, generalized management information systems, complex structural analysis and biomedical monitoring systems. Since many of these programs have wide application in industry, NASA established COSMIC at the University of Georgia in 1966. COSMIC collects all computer programs developed by NASA, and many developed by the Department of Defense and other Government agencies, verifies that they operate properly, then makes them available to U.S. industry at nominal cost. A NASA catalog called the *Computer Program Abstracts Journal* announces abstracts of some 1,400 computer programs in COSMIC's inventory.

Although most programs are developed for specific aerospace applications, many also are suitable for more generalized use. Companies that use computers ordinarily can

technology in public sector areas, NASA started to fund applications engineering projects at NASA field centers in 1971.

These projects are determined by the relevance of NASA skills and capabilities to significant public sector problems. Applications engineering is the effort to redesign or reengineer space and aeronautical technology and demonstrate it in a specific, highly relevant biomedical or public sector application. The product can be a prototype that is carefully evaluated against performance criteria contained in a formalized evaluation protocol. Where possible, the prototype is field tested under actual operating conditions. In many cases the successful transfer is a software product resulting from the special technical or management techniques of NASA technologists.

A project is considered complete when it has met the criteria for transfer. Transfers are of two types, institutional or commercial. An institutional transfer occurs when a public sector institution assumes the responsibility for implementing the solution. A commercial transfer occurs when the solution becomes a commercially available product.

- **Technology Sharing to State and Local Government and Minority Business.** As part of a continuing program to bring technology to bear on State and local problems, NASA has assigned a number of its technologists to work, both part- and full-time, with municipalities to accomplish a number of objectives. The overriding objective is to apply NASA technology to problems of State and local governments which lend themselves to technological solutions. Another objective is the development of a communications network to link the technologists for the purpose of exchanging experiences to the mutual benefit of all members. Not only does the network enable members to be kept aware of successful and unsuccessful applications of technology in other areas but also from the interchange of ideas, new projects can be undertaken when it has been demonstrated that the projects have widespread application.

In early 1974, NASA and the Department of Commerce, Office of Minority Business Enterprise (OMBE) executed an interagency agreement to encourage minority enterprise development through the use and application of aerospace technology. Under this agreement, the Technology Utilization Office works directly with OMBE and the NASA Office of Equal Opportunity Programs in the planning and implementation of regional minority business seminars. A principal objective of these seminars is to encourage the utilization of NASA-developed technology by qualified entrepreneurs in the minority business community. A pilot seminar was conducted at College Park, Maryland, in June 1974, and six additional seminars are planned.

The NASA-OMBE Agreement also fosters a close working relationship between NASA, OMBE, and well-established manufacturers. One outgrowth of this interaction in 1974 has been the adoption by a major retailer of a NASA-developed product which they plan to add to their inventory. A minority vendor will perform the fabrication necessary to convert this new product to the retailer's requirements. Other examples of the adoption of NASA technology by minority firms are expected during 1975.

Patent Policy. Important to industrial participation in the Applications Program is the recent change in NASA patent policy which permits accelerated commercial use of space-related inventions or technology by granting exclusive licenses in a shorter time period than was previously possible. Specifically, NASA can grant exclusive licenses in appropriate cases as early as 9

program, including the computerized information system which was initiated in 1962 and operates from facilities in College Park, Maryland.

The information and data acquired by NASA about the exploration of space and the concomitant human factors, together with the vehicles, instrumentation, associated equipment and materials including fabrication, test, and assembly have been collected, organized, broadly announced, and made readily available to all interested users. Documents generated by Government agencies, other countries, industry, research institutes and universities as well as journal articles, scientific meeting papers and proceedings, patents, etc., are regularly received, analyzed, cataloged, indexed, abstracted, and entered into the NASA Data Bank. The NASA computerized data base contains citations to 1.2 million documents with approximately 7,000 new ones being added each month.

The technical report literature is announced in *Scientific and Technical Aerospace Reports (STAR)* together with records of ongoing research; the openly published literature (journal articles, meeting papers, etc.) are acquired by the American Institute of Aeronautics and Astronautics and announced in *International Aerospace Abstracts (IAA). STAR* is available on a subscription basis from the Government Printing Office and International Aerospace Abstracts from the AIAA.

Information is available through computerized remote consoles called RECON which allows information retrieval from the central data bank. A keyboard, cathode ray tube, and teleprinter enable the user to carry on a dialog with the central computer in College Park to search the entire data base and quickly retrieve pertinent information.

The principal users of the system are the NASA centers, NASA contractors, and the Industrial Applications Centers. The information in the Data Bank is used by all elements of the Technology Utilization Program and is an important resource for the Industrial Applications Centers and the Applications Teams.

The Inventions and Contributions Board

The principal functions of the Inventions and Contributions Board are to: 1) review proposals for waivers of rights and make recommendations to the Administrator; 2) grant monetary awards for scientific and technical contributions that are deemed to have significant value in the conduct of aeronautical and space activities; and 3) consider applications for licenses to inventions covered by U.S. patents and patent applications for which NASA holds title on behalf of the United States. The Board, accordingly, makes recommendations to the Administrator as to whether a nonexclusive or exclusive license should be granted or denied and any special terms or conditions of the license. NASA's authority to grant licenses is an important tool in the technology transfer process.

OFFICE OF APPLICATIONS AND TECHNOLOGY APPLICATIONS

Technology Transfer Policy and Objectives

The problems attacked by the Technology Applications Program are characterized by: meeting a specific, identifiable civil need, other than providing useful information; providing a solution that is operable on the ground or in the atmosphere; and making significant use of the technology and systems management experience that NASA acquired in the management of its R&D program in advanced aerospace technology. In general, the systems proposed are within the mission responsibilities of other agencies and must receive their support to be implemented.

to remote sensing activities. Information is available concerning remote sensing systems capabilities, applications investigations and research and development projects underway, centers of expertise in remote sensing technology and guidance regarding participation in the agency's experimental applications projects.

Activities in this area emphasize NASA assistance in the development of new remote sensing applications and in the transfer of emerging capabilities/technology to the non-NASA user community including industry and all levels of government.

1. Determination of the needs of the broad and diverse communities of potential users of remotely sensed data—whether obtained by satellites (LANDSAT 1 and 2 and EREP) or by medium-to-high altitude aircraft—to provide guidance to NASA's future remote sensing programs.
2. Exposure and explanation to these communities of the data acquired and expected from NASA's flight programs, along with information on systems (computer and otherwise) available for converting these data into information to assist resources and land-use managers in reaching wise, soundly based decisions.
3. Provision or arrangement for training of technical personnel in the State and local government departments that could beneficially use the information derived from remotely sensed data to better perform their functions.

Implementation

NASA supports many research and application-oriented Principal Investigators (PI's) who are exploring the capabilities of satellites and aircraft to obtain remotely sensed data for analysis by photo interpretation or by computer to provide information to a diverse community of decisionmakers in the broad field of resource management—ranging from agriculture through hydrology, land-use control, and geology to water resources. In many cases, the capabilities and expertise of these PI's and/or the results of their research and experiments can be transferred and made available to a broad range of potential users with minimal training and no additional NASA funding.

An excellent example of the use of remotely sensed data by Government decision makers in the non-Federal area involved LANDSAT data, which was computer analyzed and compared with ground truth data by private contractors, and interpreted by the local governing body (the Calista Corporation in Alaska) as a major input in deciding what parcels of land the corporation and its member villages wanted under the terms of the Alaska Native Claims Settlement Act of 1971. A current example of federally financed use of remotely sensed data is the recently initiated Large Area Crop Inventory Experiment (LACIE) jointly funded by NASA, NOAA, and the Department of Agriculture.

One major function of the User Affairs Staff in the Office of Applications is to explore with potential users and jointly with other NASA experts the potential of remotely sensed data in meeting a portion of their needs for information on which to base wise resource or land-use related management decisions.

Office of Energy Programs

Technology Transfer Policy and Objectives

The goal of the Office of Energy Programs is to assist in the attainment and maintenance of national energy self-sufficiency through the application of aerospace technology to terrestrial energy needs.

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NATIONAL SCIENCE FOUNDATION

Enabling Legislation and Mission

The National Science Foundation (NSF) was established by the National Science Foundation Act of 1950. Subsequent amendments and the National Defense Education Act of 1958 provided additional authority. Fundamental purposes of the Foundation are to support a broad spectrum of basic and applied scientific research as well as to strengthen education in the sciences.

Most of the Foundation's research utilization activities take place within the Research Applications Directorate, which is responsible for the Research Applied to National Needs (RANN) program, and the Intergovernmental Science Programs. Under the RANN program, a broad spectrum of problem-oriented research is funded through awards to universities, non-profit organizations, and business firms. This includes basic research required for RANN's supported conduct of its problem-solving function. Research is performed under the Foundation's legislative mandate to support "applied scientific research relevant to national problems involving the public interest."

The Intergovernmental Science Programs (ISP) are intended to assist State and local governments in building a capacity for research management and applications, and in developing better partnership arrangements with Federal agencies as called for in the President's Science and Technology Message of March 1972. There are five ISP Program components: State Government, State Legislatures, Local Government, Academic Public Service, and Federal Laboratories.

In addition to the RANN program's utilization activities, there is a general recognition within the Foundation of the importance of supporting activities intended to accelerate the application of research results. The Education Directorate regularly funds the intensive testing and evaluation of new teaching materials, curriculums, and educational technology which it has developed. The Office of Science Information Services of the National and International Affairs Directorate devotes more than 25 percent of its budget to a user-support program which seeks ways to increase the application of available scientific knowledge and to reduce the cost of its delivery to users. And the National R&D Assessment Program, which is attached to the office of the Foundation's Director, is studying various aspects of the technological innovation process and its socioeconomic effects and the relationship

the RANN program by developing and managing activities aimed at optimizing application of results from sponsored research projects. In addition, ISRU and the Office of Experimental R&D Incentives, also part of the Research Applications Directorate, are involved in activities intended to establish an infrastructure to increase the opportunities for achieving utilization of research. The Incentives Program identifies and tests strategies for Federal Government use in accelerating the application of R&D results in the public and private sectors.

The Office of Intergovernmental Science and Research Utilization, as the focal point for RANN's research utilization activities, has ten professional staff members of whom five devote a majority of their time to this activity. The Office administers a budget of $1 million.

Implementation

Since assumption of research utilization responsibility, ISRU's functions have been to:

a) develop research utilization programs reflecting all RANN line responsibilities

b) establish an organization capability for utilization functions

c) provide guidance to RANN program managers on mechanisms to facilitate research utilization within the context of specific projects

d) identify and market projects with a high utilization potential

e) foster projects to improve communication and transfer between the research and user communities

f) undertake a variety of activities for disseminating research results to the user communities

ISRU's current programs incorporate the experience of other Government agencies and the recognized theories of research utilization contained in the research and descriptive literature. ISRU believes that effective research utilization must be viewed as an integral and continuing part of the research process, and the research itself must fulfill high-priority user needs. Thus, research utilization is viewed as starting at the same time as RANN research, i.e., during problem definition and the identification of user research needs. In identifying needs, ISRU has stressed the importance of including perceptions of the users as well as those of the research community.

Guidelines for RANN research proposals require the inclusion of a utilization plan in all proposals and provide guidance on the content of such plans. Reviewers of proposals are requested to comment on the adequacy of the utilization plans, as well as the plans for research and project management.

ISRU staff activities include: development of the utilization component for RANN's internal research plans and programs; review and approval of utilization plans in RANN research proposals; monitoring (in cooperation with research program managers) actual versus planned utilization progress and activity, and dissemination of research results.

When there are research results having an apparently large utilization potential, ISRU often arranges market studies, particularly if the research output is a marketable product of interest to commercial organizations. This two-step procedure consists of having technically qualified consultants provide a preliminary assessment of the output in light of market needs, competitive products, size of market, possible producers, and possible marketing strategies. After this preliminary assessment, if encouraging, detailed engineering development, patent, and market studies are performed. If the main customers for a specific RANN research output are State or local governments, ISRU arranges for replication of results in ad-

- several activities focusing on developing effective communication channels between Federal agencies and State legislatures

  During 1975 the project's activities are to be centered on three major activity areas:

- an in-depth assessment of S/T staff operations, in order to develop recommendations and necessary background information to assist State legislatures in establishing in-house S/T staff operations;

- initiation of a central clearinghouse effort to disseminate pertinent scientific and technical information to State legislatures;

- comprehensive survey of university-based technical service programs for State government.

- Establishment of the California Innovations Group (CIG) which is an expansion of the successful "Four Cities Project" that linked four California communities with aerospace industry firms. The CIG will be a statewide network for technology utilization comprising ten cities, two counties, several industries, the League of California Cities, the Governor's Science Advisor, the State Assembly Science and Technology Advisory Council, and the California University System.

- Establishment of the Governors' Energy Project, managed by the National Governors Conference and jointly supported by the NSF through ISRU, the Federal Energy Administration, and the Atomic Energy Commission. This project has given the Governors Conference an opportunity to provide the Federal energy research agencies with a State-level view of research needs; to feed back agency research results from Federal projects to the various States; and to develop an interstate information exchange on State-funded energy research, conservation projects, and on techniques and methodologies for energy policy analysis for State decisionmaking.

- Establishment of a Technology Information Exchange funded by an ISRU grant to Public Technology, Inc. Purpose of the Exchange is to provide cities and States with guidance on possible technological solutions to problems identified by those governmental units. Energy conservation reports, which have received laudatory reviews, have been issued, and publications will soon be released on land-use planning and manpower productivity.

- A 2-day conference for legislative leaders from northeastern States was held on the nature of their energy problems, the nature of possible technological solutions to these problems, and the pros and cons of such solutions. This conference was made possible under a grant to the New York State Legislature. Experts on energy technology or the State legislative process presented excellent papers which will be published in formal conference proceedings.

- Sponsorship of an academic-year workshop at the Harvard Graduate School of Design to test a land-use impact model developed under a RANN research grant. Eleven workshop participants represent either State, local, or regional governmental groups. Their participation will allow them to provide decisionmakers with informed opinions as to whether the model should be maintained and operated by the State as a working tool and how their own units could use the model.

Future Program Emphasis

In FY 1973, ISRU's program emphasizes the following activities:

- Continuation of Institution Building—Activities in this area will support successful projects underway and add a few selected projects intended to improve

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SMALL BUSINESS ADMINISTRATION

Enabling Legislation and Mission

The Small Business Act of 1953 created the Small Business Administration to "aid, counsel and protect" the interests of small business. Among the agency's objectives are ensuring that small business concerns receive a fair proportion of Government purchases and contracts, making loans to small business concerns, providing small firms with management assistance, and serving as the advocate for the small business community. The SBA's Technology Utilization Program was established by the Small Business Act of 1958, which requires the SBA "to assist small business concerns to obtain the benefits of research and development performed under Government contracts or at Government expense" and "to provide technical assistance to small business firms."

Research Base

The SBA does not conduct research and development programs. Rather, the SBA's Technical Utilization Program is involved with making available to small concerns the results of R&D performed by other agencies and departments.

Technology Utilization Policy and Objectives

The policies and objectives of the SBA Technology Utilization Program are to assist small business concerns in obtaining the maximum benefit from research and development conducted under Government contracts or at Government expense and to provide small business firms with technical assistance in location, utilization and adaptation of that research and development.

Technology Utilization Responsibility

SBA's Technology Utilization Program is under the direction of the Technical Assistance Division of the Office of Procurement Assistance and is within the area of responsibility of the Associate Administrator for Procurement Assistance. Field Representatives report to the appropriate Regional Directors, while receiving guidance and assistance from the central office in Washington, D.C.

TU Program. They have been able to define more clearly and continue their research and development programs, often saving months of R&D time. Testing laboratories have greatly benefited from knowledge about the latest techniques of nondestructive testing. They have also received valuable information about the latest instrumentation for control measurement, detection, inspection, testing, analysis, etc.

Future New Program Emphasis

The SBA Technical Utilization Program has become a part of the Office of Procurement Assistance, where responsibility for the program rests with a newly established Technical Assistance Division. This Division, in conjunction with the Technical Utilization representatives in the SBA field offices, will stress improved methods to obtain the maximum benefit to the small business community.

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Region IV
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Region VI
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DEPARTMENT OF TRANSPORTATION

Enabling Legislation and Mission

The Department of Transportation Act of 1966 established the Department for the purpose of developing national transportation policies and programs "to provide fast, safe, efficient, and convenient transportation at the lowest cost consistent therewith."

The Act, in part, requires the Department to promote and undertake development, collection, and dissemination of technological, statistical, and economic information, and to consult and cooperate with State and local governments. Technology sharing and technical assistance are therefore basic responsibilities of the Department.

Technology Sharing* Policy and Objectives

From an overall standpoint, the Technology Sharing Program within the Department of Transportation (DOT) consists of the various mechanisms throughout the Department which provide for:

- Communicating with State/local governments, private industry, and universities regarding their technology/information needs and requirements.
- Accomplishing the sharing of technology through such activities as demonstration projects, information dissemination and technical assistance programs, State/local oriented R&D projects, and the like.
- Facilitating the use of technology and information to develop programs, plans, and policies at the State and local level.

Stimulated by an Executive Office thrust in 1972, the DOT has intensified its ongoing efforts to improve its technology sharing and technical assistance processes. Throughout its history the Department had, in fact, been addressing this subject and had taken a number of actions consistent with this objective. Response in the field to this new emphasis has been overwhelmingly favorable. Program formulation has stressed understanding and reflecting State and local needs and requirements in establishing DOT research projects and ensuring that effective delivery mechanisms exist for communicating these research results back into the field.

* Technology Sharing and Technology Transfer are synonymous in the context of this report.

and local planners, its contribution to their information base is clear.

Field Support and Direct Assistance Programs

Direct Federal assistance to State and local governments is usually provided as a support function to federally established program thrusts. In addition, to provide effective support of local decisions and the national scope of its operating responsibilities, the DOT has, by necessity, evolved into a heavily field-oriented agency. All of the Department's operating administrations have field structures, with FAA and FHWA being the most heavily decentralized. These field structures can serve as a local technical resource to draw on and serve as a liaison with the banks of technical and planning knowledge maintained by the Department. The regional Secretarial Representatives provide a direct policy level interface between the Secretary and decisionmakers at the State and local level.

In addition, Intermodal Planning Groups (IPG) act as a Federal Advisory Committee mechanism in each of the 10 Federal regions of the Nation. IPG's are composed of senior field planning representatives of FAA, UMTA, FHWA, and the regional Secretarial Representatives. Other elements of the Department and Federal agencies, such as the Department of Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA), also participate. In addition, there are some headquarters staff, such as FHWA's Implementation Division, which provide direct technical assistance to State and local operational personnel.

Training Programs

Many DOT programs are available to upgrade the executive and technical competence of individuals at the State and local levels. A substantial number of the training activities in this area are conceived as backup to the planning grant programs. At least three approaches to training are recognized under DOT programs. Some programs, such as the apportioned funds of the National Highway Institute or the UMTA Managerial Training Program, contribute to paying for courses taken by employees of State and local agencies. Programs, such as those of the Transportation Safety Institute, train State and local personnel using Federal funds. A third class of programs, such as the FAA's airport planning orientations, are conducted on a totally reimbursable basis, with State and local funds covering all of the trainee's expenses. In addition, any course targeted for in-house employees but relevant to State and local needs is available to State and local personnel under the provisions of Title III of the Intergovernmental Personnel Act. This provides great flexibility and opens a large number of options for non-Federal personnel.

Training Seminars

All DOT organizations use, in varying degrees, seminars, workshops and/or conferences both to disseminate information and to obtain feedback on State/local needs. These include both conferences on a general subject area and workshops on a specific problem or topic of interest. For example, the Department's Program of University Research funded the California Institute of Technology to conduct a series of six seminars on Energy Consumption in Private Transportation covering the general spectrum of energy issues, near term and long term. Several of the special projects conferences sponsored by the Federal Railroad Administration (FRA) fit into this category. On the other hand, the Department's Technology Sharing Program has co-sponsored a workshop with UMTA which focused on the potential of demand-responsive transportation. UMTA has sponsored a very successful series of training sessions on the use of their Urban Transportation Planning System (UTPS) methodology. All DOT elements also participate financially in training seminars con-

Urban Mass Transportation Administration (UMTA)

The UMTA became a part of DOT in 1968 and operates a program directed toward improving public transportation services in urban areas. UMTA provides funds to buy and build capital facilities and to develop new transit technology. DOT describes the logic of the UMTA program as: UMTA capital grants provide funds for State and local government to apply technology; UMTA technical studies grants provide funds for States/locals to decide on the technology to apply; the UMTA RD&D program provides the urban transit technology which can be applied; and the UMTA managerial training grants and university research and training grants provide funds for expanding local urban transit knowledge and research at local levels and at universities.

Overall responsibility for disseminating UMTA's research results to the user community rests within its Office of Transit Management (UTM) which, in FY 1976, identifies technology sharing as a major program activity. Key factors here are devising new methods for communicating research results, testing and demonstrating their use as successful transfer mechanisms. As part of their program of activities, UTM participated with the Office of the Secretary in a prototype workshop on demand-responsive transportation in June of 1973 to validate a state-of-the-art document prior to its dissemination. Two more scheduled on Priority Techniques for High Occupancy Vehicles and others in different subject areas are being programed. The UTM also serves as the repository for all technical reports produced by the UMTA as part of its Transit Research Information Center Service.

UMTA's Office of Transit Planning includes, and identifies as a separate line item for the first time in FY 1976, a program of information dissemination for its service and Methods Demonstration activities. Its purpose is to ensure that the demonstration activities are documented and readily available and the information generated is in the form readily assimilated by the community of transportation information users in the field. This requires not just a passive recording of results and the publication of technical reports, but the creation of an active public relations and publicity program designed to establish awareness, engage the interest of,



UMTA's TRANSBUS program provides for demonstrations to be operated by local governments and operating properties in cities. Results of the demonstrations will be documented and disseminated to other municipalities throughout the country.

tion (FCP) has evolved by merging the viewpoints and proposals of research specialists (both State and Federal) with those of the operating officials and users—the State and local governments.

Implementation Environment

To achieve its objective, the program emphasizes the development of an environment that is conducive to cooperative nationally coordinated implementation efforts by FHWA, State highway agencies, and other highway organizations. It also emphasizes systematic management of the research and assessment of the success of implementation, including the benefits realized. Some objectives to strive for in developing this environment are to:

- Obtain the interest for full cooperation and support of top management in both State and Federal organizations.
- Involve practicing engineers in research and development process to ensure that research is addressing real-world problems.
- Ensure that sufficient funds are provided for the necessary implementation, field test, and evaluation phases of a research project to be sure that results are ready for the practicing engineer to apply with confidence.
- Provide solutions to the real problems of practicing engineers.
- Present research findings in a form or language that can be readily understood and immediately used by the practicing engineer. Often a research report does not meet this objective, and a special user package must be prepared.
- Provide educational programs so that practicing engineers can better understand the benefits to be derived from adopting new technology.
- Provide a management framework that is flexible, avoids duplication of effort, minimizes coordination requirements, is responsive to needs, and does not involve a lot of redtape.

Development Role

In FHWA, a principal role in technology transfer is the translation of research results into practical usage—to make research practical. This is a role of the Office of Development and is increasingly important because experience has shown that technology usually cannot go directly from research to practice without significant translation and preparation. Development includes such things as fabrication, testing, evaluation, debugging, pilot presentations, manual preparation, lesson plans, teaching curriculums, slide/tape shows, and computer programs. Development is often overlooked in technology transfer. The conversion from research to practice is usually *not* simple and quick.

The Implementation Division within the Office of Development is the primary FHWA mechanism for coordinating technology transfer. It operates within a management concept that seeks coordinated and cooperative interaction not only between States and the FHWA, but also between the research and operating units within the FHWA.

At Headquarters, implementation managers are designated for each FCP project. They participate throughout the research process and develop plans for scheduling translational and promotional activities. In the field, FHWA Division Offices are the primary points for gathering and transferring technical advances from and to the States. Division Offices report progress and innovations to Regional Implementation Committees established to administer technology transfer. These Committees review all progress statements and choose the appropriate dissemination mechanism, either to other Division Offices within the Region or to Headquarters if national dis-

of the research and development and the promotional effort. Cumulative reactions are evaluated and results used to improve both the product (R&D) and the implementation effort, as required. Thus, FHWA's program is "closed-loop." Evaluation and follow-up after the promotion phase are very important to its effectiveness.

Federal Railroad Administration (FRA)

The FRA was also created by the 1966 Act. The purpose of FRA is to consolidate Government support of rail transportation activities, provide unified and unifying national policy for rail transportation, and conduct research and development activity in support of improved rail and ground transportation.

The demonstrations conducted by the FRA are designed to meet specific objectives of the High-Speed Ground Transportation Act of 1965. These objectives call for measurement and evaluation of public response to such factors in transportation services as ". . . new equipment, higher speeds, variations in fares, improved comfort and conveniences and more frequent service . . ."

Approximately 80 percent of the FRA R&D program is for the purpose of providing products to be utilized and applied by organizations other than the Federal Government; the ultimate users are mainly the railroad industries and State and regional governments.

The Railroad Safety Program provides the basis for setting and enforcing minimum standards for railroad operation, including track maintenance, equipment maintenance, hazardous materials handling, operating procedures, safety promotion, training, and R&D. Enforcement of Federal Safety Standards is through eight regional inspectors. When the FRA regional organization is fully operational, regional personnel will work closely with individual State DOT's in safety-related areas. Additionally, FRA is developing a concerted State participation program for the training of State inspectors.

To assure that the necessary safety information is available, the FRA is developing a Safety Information System (SIS), including a computerized Railroad Accident Information Reporting System (RAIRS), which, when completed, will improve dissemination of vital railroad accident information. Inherent in this overall system is quick response to local requests, for example, information on hazardous material accidents to provide local firefighting and police personnel with round-the-clock guidance on the handling of hazardous material accidents.

The Grade Crossing Safety program is being conducted jointly by the FRA and the FHWA. The major current activity is a State-by-State Grade Crossing Numbering and Inventory program. When completed, this program will provide necessary information for the development of a national response to the Grade Crossing program. Pilot projects with certain States have been recently completed. An important element of this program is the dissemination to State and local governments of technical criteria for national standards in Grade Crossing improvement and countermeasures.

Another activity directed to State and regional levels is assistance in railroad planning. A recent effort undertaken by FRA will develop a manual for use by State and local planning agencies to assist them in establishing their State rail plans under provisions of the Regional Rail Reorganization Act of 1973. In addition, State and local governments are targeted for many of FRA's Special Projects program activities such as

heavy emphasis on new techniques and technologies in air traffic control today and in future, airport development, environmental policy and planning, and general aviation.

The FAA participates in annual meetings held by the National Association of State Aviation Officials (NASAO) and the Airport Operators Council International (AOCI) to exchange ideas and share FAA technology advancements with State and local governments. FAA Regional Directors also meet annually with State and local government officials to exchange ideas and plan for new types of equipment affecting movement of aircraft within specific regions.

National Highway Traffic Safety Administration (NHTSA)

Although the NHTSA RD&D is primarily for the purpose of supporting regulatory functions, extensive interaction is required (and occurs) between NHTSA and State and local representatives.

Among some of the more prominent NHTSA mechanisms and programs related to technology sharing are the National Conference of Governors' Highway Representatives made up of individuals, designated by the Governor of each State and responsible for the administration of the State's highway safety program. The Governor's Representative position, mandated by the Highway Safety Act of 1966, serves as a link between Federal, State, and local highway safety programs. The Conference and its two subgroups (the Executive Board and the Policy and Procedures Committee) meet individually and collectively with NHTSA at frequent intervals to discuss mutual problems and the future direction of highway safety programs. The communication process is heightened by the working relationships which have developed between most of the Governor's Representatives and the 10 NHTSA Regional Offices.

The National Motor Vehicle Safety Advisory Council includes four State and local government officials from a total membership of 22. The Council is charged by statute to advise the Secretary of Transportation on proposed Federal vehicle safety standards and programs. The 35-member National Highway Safety Advisory Committee (of which seven members are State and local officials) has a similar role for the Department's activities and functions related to highway safety. A third committee, the Youths Highway Safety Advisory Committee, is composed of young people between the ages of 16 and 24. Although this committee has no specific representation of State and local officials, it does not have strong ties to State and local government activities.

Of the R&D programs sponsored by the Research and Development Office of NHTSA, three are directly in support of State and local organizations in the areas of traffic safety research, accident investigation and analysis, and vehicles in use research. In addition, the NHTSA demonstration programs, conducted primarily under the direction of the Traffic Safety Programs Office of NHTSA, represent the key means for test, evaluation and implementation of ideas and research results in an operational environment. These programs are conducted cooperatively with State and local organizations. Further, NHTSA grants are provided to State agencies and political subdivisions of State and community highway safety programs.

To improve highway and traffic safety considerations in the planning processes, the NHTSA has recommended that highway safety representation be added to the Intermodal Planning Groups.

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TRISNET, a network of transportation information services which includes a computerized information retrieval system for selected resumes of technical literature and ongoing research, has been enthusiastically received by field users testing the system.

Multi-Modal Coordination

The OST component of the Technology Sharing Program has three elements. One of these, a program of multi-modal coordination, is the primary activity of a single, focal point at the Departmental level—the Office of R&D Policy in the Office of the Assistant Secretary for Systems Development and Technology. Its responsibilities include being informed of Departmental research activities, working upon request with the modal administrations in developing and conducting demonstrations of innovative techniques for information dissemination, fostering cooperation between operating administrations through liaison activities in response to requests for information, particularly those crossing jurisdictional lines, and feeding back, through guidance to the DOT, R&D program user needs and requirements from the field.

Information Services Development

A second element of the OST Technology Sharing Program is supporting the development and eventual full-scale operation of a network of transportation services called the Transportation Research Information Services Network (TRISNET). Not only will this network provide one-stop access to Department-wide information on DOT ongoing research programs, but, as currently envisioned, it will link into other national data bases as well (such as those of TRB, NTIS, . . .) to provide service to transportation-oriented technologists and planners for the majority of their information needs.

Components of TRISNET to date include the Highway Research Information Service (HRIS), the Maritime Research Information Service (MRIS), the Highway Safety Information Service (HSIS), and the Railroad Research Information Service (RRIS). Phasing into TRISNET are the Air Transportation Research Information Service (ATRIS) and UMTA's Transit Research Information Center.

Technical Program Development

The Transportation System Center in Cambridge, Massachusetts, is the technical arm of DOT. Since 1970 it has provided systems and technical planning, engineering, and technical support and research and development program management. Work at the Center is conducted by three major technical directorates: Transportation Systems Concepts, Transportation Systems Development, and Technology.

As part of the effort to improve the technology sharing process of the Department, the Secretary in October 1972 formally designated the TSC as the primary focal point in support of the Department for the exchange of technical, economic, and planning information with State and local sectors of the transportation community. The primary role of the Center in the technology sharing process is its support of the Department in the active and effective packaging and dissemination of the results of research, development, and demonstration in the field of transportation, and to provide technical focus on the OST Technology Sharing support activities.

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VETERANS ADMINISTRATION

Enabling Legislation and Mission

The Veterans Administration was created in 1930 by consolidation of the Veterans Bureau with the Bureau of Pensions and the National Homes for Disabled Volunteer Soldiers. The VA is charged with providing to eligible veterans and their families the benefits made available for them by law. Among the benefits is health care administered by the Department of Medicine and Surgery, whose functions are "those necessary for a complete medical and hospital service, including medical research."

The Department's Research and Development budget in FY 1975 was $94 million. Included under this budget are medical research, prosthetics research, and health services R&D. The VA, in addition, conducts research, development, and/or technological evaluation of construction and equipment in the health care field.

The Administrator of Veterans' Affairs is authorized to disseminate technical information from VA research activities so that the community at large may benefit. Specifically, 38 U.S.C. 216 charges the Administrator to make available the results of research in the field of prosthetics, orthotic, and sensory aids. In a broader way, 38 U.S.C. 5054 provides for the dissemination of medical information freely to parties outside the VA.

Technology Transfer Policy and Objectives

The Veterans Administration regards its responsibility for research and development as twofold. The work in almost all instances is designed for the benefit of veterans, although, in many instances, the benefits are extended to the country and the world at large. The VA intends to make the generated technological information as generally available as is feasible.

Technology Transfer Responsibility

Because of its mission, organization, and operations, individual investigators in the Veterans Administration generally publish their own results, and no specialized group is charged with responsibility for technology transfer.

Implementation

Medical Research

The biomedical research program is essentially a decentralized intramural operation

Diagnostic Products of the Food and Drug Administration when the necessary medical device legislation is passed.

Construction

The Research Staff, Office of Construction, of the VA investigates building technology largely through studies performed by private contractors. The results provide the basis for policies and design criteria for the VA hospital construction program.

The reports are made available to other agencies and the public through publication by the Government Printing Office. A press release then announces availability of the documents at the GPO.

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THE SMITHSONIAN INSTITUTION

The Smithsonian Institution was created by act of Congress in 1846 in accordance with the terms of the will of James Smithson of England, who in 1826 bequeathed his property to the United States of America "to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men." In receiving the property and accepting the trust, Congress determined that the Federal Government was without authority to administer the trust directly, and therefore, constituted an "establishment," whose statutory members are "the President, the Vice President, the Chief Justice, and the heads of the executive departments."

There are three organizations within the Smithsonian Institution with a formal responsibility for disseminating information about research in addition to the many papers published in professional journals by research investigators.

The Smithsonian Press

The emphasis upon publications as a means of diffusing knowledge was expressed by the first Secretary of the Smithsonian Institution. In his formal plan for the Institution, Joseph Henry articulated a program that included the following statement: "It is proposed to publish a series of reports, giving an account of the new discoveries in science, and of the changes made from year to year in all branches of knowledge."

This keynote of basic research has been adhered to over the years in the issuance of thousands of titles in serial publications under the Smithsonian imprint, commencing with *Smithsonian Contributions to Knowledge* in 1848, now terminated, and continuing with the following series: *Smithsonian Annals of Flight, Smithsonian Contributions to Anthropology, Smithsonian Contributions to Astrophysics, Smithsonian Contributions to Botany, Smithsonian Contributions to the Earth Sciences, Smithsonian Contributions to Paleobiology, Smithsonian Contributions to Zoology,* and *Smithsonian Studies in History and Technology.*

In these eight series, the Institution publishes original articles and monographs dealing with the research and collections of its several museums and offices and of professional colleagues outside the Institution. Such papers report newly acquired facts, interpretations of data, and original theory in specialized fields. The publications are distributed by mailing lists to libraries, laboratories, institutions, and specialists

applications. This information thus provides an effective mechanism for follow-up and offers users an opportunity to expedite the exchange of more detailed information about problems encountered or preliminary results.

Implementation

By maintaining a computerized data base of research in progress, the Exchange provides the Nation's community of scientists and research managers with a means for closing the information gap between the time a research project is started and the time its results are first made available. SSIE receives over 100,000 individual research project notices each year from more than 1,300 Federal and private sources of research support. The active file, which contains up to two fiscal years of information, averages 180,000 basic and applied research projects in all areas of the life, physical, social, behavioral, and engineering sciences.

The basic record in the SSIE system is the single-page Notice of Research Project, a form which is usually prepared for submission to the Exchange at the time a grant or contract is awarded or an in-house project is authorized. New Notices are submitted annually on projects which continue from year to year. This Notice contains essential information about each project—*who* is supporting and *who* is conducting *what* research, *where* and *when* the research is being performed and, in most cases, it includes a brief 200-word summary of the work to be carried out.

All projects registered by SSIE are indexed by a professional staff of scientists and engineers using a hierarchical classification system to allow retrieval at both very broad and very specific levels, depending on the needs of individual users. Subject indexes are completely open-ended, so that they can be modified whenever new concepts appear, new index terms are added, and obsolete terms deleted, as the nature of summaries and search requirements change. Consistent, interdisciplinary indexing of each project is also assured, regardless of the source of the input document or the scientific specialty of the principal investigator.

Transfer of Information About Research

The Exchange works closely with both Federal and non-Federal organizations to meet their needs for information about ongoing and recently terminated research. In addition to meeting with such organizations independently, the Exchange has an Advisory Council made up of 21 members, 16 of whom are representatives of Federal agencies and 5 of whom are representatives from non-Federal organizations. This Council provides advice on the information needs of the scientific and technical community and on ways in which the relationship between their organizations and the Exchange might be improved as a means of enhancing the value and use of the Exchange as an information resource.

The method for providing services and the types of services provided by the Exchange are described in the following paragraphs.

The SSIE professional staff responsible for subject indexing is also responsible for the retrieval of information in response to user requests. Retrospective searches of the data base are conducted on-line, giving the scientists the flexibility of modifying search strategies during the course of a search. SSIE also provides selective dissemination of information (SDI) services; conducts searches by investigator name or by administrative criteria; constructs extensive tables of data; and prepares camera-ready copy for the publication by Federal agencies of directories of current research in broad areas of interest. A number of other indexing and information processing services are also available to

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Office of the Assistant Administrator for Commercial Development
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Economic Development Administration
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Office of Technical Assistance
14th Street and Constitution Avenue, N.W.
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Office of Product Standards
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Patent and Trademark Office
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scientists and research managers, depending upon their specific information requirements.

The directories, or catalogs, of ongoing and recently completed research prepared by the Exchange are compiled in response to a need for dissemination of information from the data base to a large scientific audience. Current compilation efforts in areas of high national concern include: energy R&D in Canada and five Western European countries; pesticides research; disaster research and technology; cancer research; and water resources research, among others.

In many cases, the Exchange combines its information with bibliographic data, in the belief that the value of the resulting information products is significantly enhanced. Summaries of aerospace research in progress are now appearing in each issue of NASA's *STAR*, for example, and under an agreement with NTIS, combined information from both the NTIS and SSIE data bases may be obtained from either organization.

SSIE information services are designed to provide, to the extent possible, complete and timely information on research in progress to aid in both the conduct and the management of scientific activities. They provide an effective mechanism for referral of those seeking more detail about current research efforts by identifying individuals and organizations which can supply more information on their projects. SSIE data also serve as a point of entry into the bibliographic literature and assists investigators in identifying possible sources of funding or opportunities for scientific collaboration. In serving the research manager, SSIE provides a means for avoiding unwarranted duplication of research and an information resource which supports program planning and evaluation needs.

SSIE serves thousands of users in all sectors of the U.S. research community: scientists in private industry, Federal, State, and local governments as well as universities.

For additional information on specific services available contact:

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throughout the world. Additional information on this program can be obtained by contacting Mr. Gordon Hubel, Director, Smithsonian Institution Press, Smithsonian Institution, Washington, D.C. 20560, Telephone 381-5143.

Office of Public Affairs

The Office of Public Affairs publishes a quarterly report of ongoing and published Smithsonian research in *Research Reports*. *Research Reports* is mailed to universities, Federal departments and agencies, science writers and to national information media representatives in Washington and New York. Additional information on this program can be obtained by writing or calling Mr. Carl Larsen, Director, Office of Public Affairs, Smithsonian Institution, Washington, D.C. 20560, Telephone 381-6218.

Smithsonian Science Information Exchange, Inc.

Enabling Legislation and Mission

The Smithsonian Science Information Exchange (SSIE) was established in 1949 by the then six Federal agencies engaged in the support of research in the medical sciences. The Exchange is now operated and controlled by the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men created by Act of Congress on August 10, 1846 (U.S.C. 41 et seq.). The Exchange is presently the major national source for information on current and recently terminated research in all fields of science. Its purpose is to provide information both to Federal and private organizations and individuals for use in facilitating the planning, management, and coordination of scientific research. Inherent in the use of this information is the need to avoid unwarranted duplication of research efforts and provide a mechanism for increased communication among organizations and individual scientists with similar or related research interests.

Research Performed by SSIE

The Exchange itself engages in research designed to improve methods for the indexing, storage and retrieval of information about ongoing research. While such information is primarily intended for in-house use it may often be of benefit to organizations both in the Federal and non-Federal sectors engaged in similar activities. Information on the results of these studies is made available through presentation of papers at both national and international meetings and through publication in appropriate professional journals.

Research Performed by Other Federal Agencies

The Exchange, by serving as the national source for information on research in progress, obtains a brief summary of virtually all basic and applied research supported by the Federal Government and by many non-Federal funding organizations. The data base covers projects which are just beginning, as well as projects which have been underway for several years, and it includes in-house research as well as funded grants and contracts. The dissemination by SSIE of interdisciplinary information about ongoing research provides, among other things, a mechanism for the identification of the organizations supporting specific research projects, the location at which the research is being carried out and, perhaps more importantly, the names of investigators concerned with similar research problems, techniques or

administered by the 130 participating hospitals. The investigations are of the same type as those conducted in other research-oriented hospitals and of interest to all biomedical scientists. The results are therefore transmitted through publication in scientific and medical journals and through verbal presentation at meetings of scientific and medical societies. Knowledge is further disseminated less formally by participation of visiting scientists or students in the research itself.

Although research results are reported as is other biomedical work, VA investigations in progress and the publications resulting from them are summarized annually. The information is published in a report "Medical Research in the Veterans Administration" as a House Committee Print of the Committee on Veterans' Affairs.

Large-scale cooperative clinical studies by the VA customarily report their results also in scientific journals and at biomedical meetings. Rarely, the results are published by the Veterans Administration as special documents, the latest being "The Modern Management of Hypertension" in January 1973.

Prosthetics Research

The program of this service includes prosthetics, orthotics, and sensory aids. The results of research are disseminated in part by publication and verbal presentation in established media.

In addition, the VA has cooperated with the Department of Defense, the American Academy of Orthopedic Surgeons, and the National Research Council, in publishing books on orthopedic devices and sensory aids. It co-sponsored, with the NRC, a journal *"Artificial Limbs"* and now publishes the *Bulletin of Prosthetics Research,* a semiannual biomedical journal.

Since 1947, the VA has joined other agencies in supporting and supervising a succession of courses in three universities. Other courses have been sponsored by the VA alone. This program is the primary means of disseminating new technology to the physicians and technicians who apply advances in the fields of prosthetics, orthotics, and sensory aids.

Health Services Research and Development

No special provisions have proved necessary for reporting investigations into novel or untested systems for delivering health care. Established channels of communication within the research community serve to transmit information of the VA programs. As this new research expands, it will use two additional information systems—Experimental Technology Incentives Program (ETIP) and Computer Operations Software Management and Information Center (COSMIC).

Supply and Equipment Evaluation

The Veterans Administration for some time has had a program to identify and evaluate advances in medical supply and equipment technology. A quarterly newsletter reporting the results is circulated within the agency and supplied to others on request.

Although the VA does very little testing, it conducts a hearing aid test program utilizing the National Bureau of Standards. The results are published and distributed through Government consumer channels.

The VA is currently cooperating with the ETIP, National Science Foundation, and George Washington University to develop techniques for disseminating procurement technology. The aim is to educate less-sophisticated buyers in the procurement of medical equipment. This effort will subsequently be broadened to include cooperation with the Bureau of Medical Devices and

In both cases, TSC's program includes provision for bringing State/local people to TSC for training, seminars, residency programs, etc., and for making information and people from TSC available to visit State and local areas to assist in their technology selection processes. In many instances, the Center's roles require the gathering of information and support from various modal administrations. For example, a number of local agencies have expressed interest in learning of techniques available to improve traffic flow within their communities and have responded positively to the possibility of a seminar on the subject of TSC. For such a seminar the Center will draw support from the UMTA and FHWA on their efforts in this area, in addition to any methodologies and technologies that the Center itself has developed.

A recent workshop, held in Philadelphia in June 1974 and jointly sponsored by the OST and UMTA Technology Sharing programs, tested the method of using a conference to validate a pre-prepared Technology Sharing document on Demand-Responsive Transportation prior to its dissemination in the field. Experts in the subject area, as well as transportation planners and operators in the field, participated in the conference and during the working sessions to critique the document, which was revised accordingly and disseminated. Over 2,000 copies are in the field on a no-charge basis for single copies. Response to both the method and the document was overwhelmingly favorable. Topics proposed for future documents include rural transportation, priority techniques for high-occupancy vehicles, and carpooling strategies.

Other OST Programs

Within OST's Office of the Assistant Secretary for Environment, Safety and Consumer Affairs, the Transportation Safety Institute provides safety training courses for State and local government officials and industry representatives in the field of transportation. The Aviation Security Program has been most successful in stopping the attempted hijacking of aircraft in the United States. Training of the airport officials has been an important part of the program. Over 1,000 law enforcement officials have been trained. Pipeline Safety Seminars have reached 2,200 industry and State personnel. One hundred and fifty State officials and 200 industry personnel have received training in accident investigation, hazardous materials safety and inspection techniques.

The OST-sponsored BART Impact Program is a multi-disciplinary, comprehensive assessment of the impacts of a modern rail system on the San Francisco Bay Area. Special focus of the program is on the transferability of its results to other urban areas. The Department of Housing and Urban Development is co-sponsoring the program with DOT.

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U.S. Coast Guard (USCG)

As with the FAA, the USCG R&D programs are primarily in support of its operational missions. In performance of these missions, however, the USCG does interface to a large extent with State and local personnel. It maintains close working relationships with State and local governments in the broad realm of marine law enforcement, search and rescue, marine environmental protection, port safety, boating safety, and ice navigation. It stimulates the introduction of new marine technology by means of formal schools, by field demonstrations, and by soliciting local and State assistance in the development of contingency plans for handling natural disasters and major spills of polluting substances, as well as the evolution of vessel traffic systems for pertinent ports.

As recognized experts in small boat technology, the Coast Guard imparts this knowledge to State and local governments through various regional seminars on boating safety. The Office of Boating Safety publishes a Boating Safety Circular on an irregular basis about six times a year. This publication, mailed to State and local governments as well as manufacturers and dealers, reaches approximately 20,000 boating interests. It contains notices of proposed rulemaking and final rulemaking regarding boating standards. The Act also provides for financial assistance to the States to develop and improve their boating safety programs and establishes a Boating Safety Advisory Council, one-third of which is State membership. Both of these programs provide for an interchange of information.

A recent USCG action in response to the technology sharing thrusts was to invite several State officials to serve as "official observers" on the Coast Guard Science Advisory Committee.

An interesting "personal exchange" effort of the USCG is the voluntary "recall" to active duty of State and local officials who are also Coast Guard Reserve Officers. An example was the case of fire department officials from both New York and California who worked within the Office of Research and Development on problems associated with the Coast Guard's Ship Fire and Safety Test Facility at Mobile, Alabama.

Office of the Secretary (OST)

While each of the operating administrations within the DOT has its own programs of technology sharing, tailored to the specific needs of its own user community, sharing activities are also programed at the OST level and are designed to both support and complement the mechanisms of the modal administrations. Specifically, the goals of this OST component are to foster the continued development of well-integrated DOT mechanisms for effecting the transfer of technology from the Department's research programs to appropriate users at State and local levels; and to ensure that the needs of State and local governments, public institutions, and industry are being fed back into an integrated, coordinated program of research and development throughout the Department.

conferences and workshops in the areas of transportation planning, urban rail facility and relocation problems, railroad/highway crossing safety, and the role of railroads in meeting the Nation's energy and pollution requirements.

The DOT has assigned to FRA the lead role in hardrock tunneling technology, which is applicable to highway and local transit interests as well as rail interests. Specific contracts have been awarded nationwide to universities and other research centers to develop cost-beneficial hardware improvements in the tunneling area, with the ultimate objective of sharing with State, local, and industry interests.

A unique mechanism for sharing is the High Speed Ground Test Center at Pueblo, Colorado. Under the direction of the FRA, this Center is planned as the site for tests and demonstrations to be conducted for both public and private interests to acquaint them with the capability of both rail and more advanced systems and to assist them in establishing these for their areas. This role for the Center is comparable with the desire to make greater use of Federal laboratories in assisting industry, State, and local governments in technology application.

Beyond the efforts in technological test and investigation, the FRA has conducted a series of studies relating to the economics of railroad transportation. Projects relating to the car shortage problem, network capacities, specific commodity analysis and intermodal opportunities are representative of this activity.

In terms of dissemination of information, the FRA produces and distributes a number of other documents on their various activities such as accident statistics, general railroad research studies, and advanced technology reports.

Federal Aviation Administration (FAA)

The FAA is the third modal administration having a capital grant program and an associated planning grant program. (The other two are UMTA and FHWA.) The FAA Planning Grants are for funding planning agencies to perform airport system planning and for public agencies to engage in airport master planning (the Federal share is two-thirds of the costs). As in the case of the UMTA Technical Studies Grants, these funds are not to be used for research and development.

The FAA operates a course designed to orient non-Federal personnel to the latest concepts in airport planning and engineering and in available Federal-aid mechanisms. The course is for personnel of the aeronautical industry, municipal officials, airport planners, and consulting engineers interested in airport planning and development under the Airport Development Assistance Program (ADAP). Part of its R&D program is devoted to developing/updating information and information services for use by airport operators, owners, and planners in the areas of airport safety and airport design/layout/construction.

In achieving its operational, regulatory, and planning functions, the FAA directly interfaces with State/local governments and industry. A prime example of this interface is the FAA's Aviation Review Conference which provides a forum for users, industry, and State and local governments to meet for the purpose of exchanging ideas and developing cooperative methods in planning the aviation system. A wide range of topics is covered during the planning conference with

tribution is deemed advantageous. Conversely, Division Offices transfer new technology to their State which has originated from other sources.

Preparation

The implementation process begins when current and past products of R&D are screened to determine technology ready for dissemination. Output from all highway organizations is reviewed, whether it be local, State, private, national, or international. Implementation Report Forms are one means for identifying implementable results from State highway research although personal contact by FHWA personnel in each State is the most effective communication. Results from the FCP in FHWA are identified in the Office of R&D.

Once an item is identified and judged to have potential, plans are prepared to accomplish the steps necessary to achieve effective implementation. These steps may be very simple or quite complex, but plans are always scaled to the effort required and the potential of the item.

"How-to-use" kits are then prepared since research reports are often not suitable as operating tools to apply new technology. "User packages" generally consist of some combination of field orders, manuals, specifications, graphs, data tables, films, training materials, or other educational documentation. Size, composition, and complexity of the package depend upon the need.

The Implementation Division is responsible for packages prepared directly from FHWA research programs. States are encouraged to develop user packages on studies in which they are involved, once selected by the FHWA for implementation.

A 2-3-page summary flyer popularizing research breakthroughs is produced by the Implementation Division to attain awareness and to determine user interest. Each flyer briefly describes a technology advance and identifies sources of additional information.

Resources from the Implementation Division and the National Highway Institute (NHI) are used jointly to develop and conduct programs for educating and training the highway community in the use of new technology. Implementation activities include pilot or preliminary conferences and seminars on selected technical projects. After trial presentations and refinements, programs are usually transferred for regular, continuous use.

Promotion

Once the user package is completed, the product is ready for promotion. Packages are distributed to the field Regional and Division Offices for transfer to the States. In addition, two other major FHWA technology transfer programs come into play. The Demonstration Program (Region 15) and Experimental Program (Office of Highway Operations) are primary means of promoting new technology. The Demonstration Projects Program provides States with federally funded field applications of new technology, whereas the Experimental Construction Projects enable them to field test newly developed construction processes, material and equipment as a part of their normal Federal-aid construction program. These activities allow necessary field testing and evaluation of new technology to verify that it is ready for practical application.

While primarily a joint Federal-State effort, these programs result in spin-offs which can be easily picked up by such other users as counties and municipalities. In fact, specific distribution and dissemination programs are employed by FHWA implementation to reach these jurisdictions.

Closing the Loop

Following the promotion effort, FHWA monitors user reaction to determine adequacy



The Urban Traffic Control/Bus Priority System (UTCS/BPS) is an instrumented real world laboratory used to test and evaluate new and advanced concepts of traffic control, designed by the Federal Highway Administration (FHWA) and its research contractors and operated jointly by FHWA and the District of Columbia.

and develop enthusiasm among transit operators, local officials, and community groups.

Another recent action of UMTA to improve the technology information transfer process is the establishment of a field organization. In each of the 10 Federal regions, UMTA representatives work closely with State and local governments.

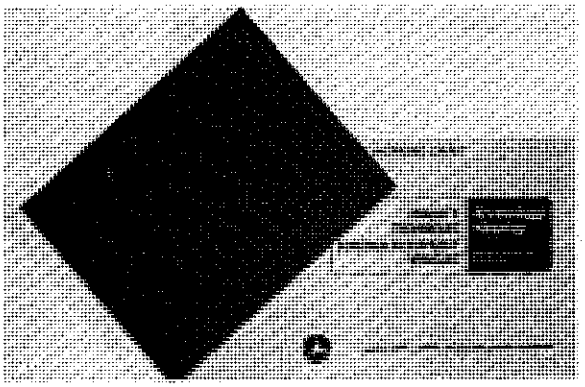
The UMTA Transportation Planning System (UTPS) exemplifies technology sharing in action. The program is intended to provide State and local planners with the latest technology in transit planning tools to assist in solving their local transit problems. The program's goals are to build computer-based tools for multimodal transportation planning, demonstrate and validate these tools in pilot cities, disseminate the tools to local planning agencies and continually reevaluate and improve the tools as a result of their application in local communities. A recent addition to the UTPS training/user symposia (11 of which have already been held) is the one-day course for managers which provides an overview of the UTPS tools. Four of these have been held since October of 1974; six more are scheduled before September 1975.

The UMTA is working with FHWA on a series of three-day sessions where programs are directly responsive to questions submitted in advance to symposium attendees. Another UTPS addition, called "Dial UTPS," provides its field users direct access to UMTA headquarters via their computer terminal for the purpose of asking questions about problems encountered. Answers are returned within a day, and other UTPS users have access to both questions and answers via their own terminals if they so desire.

Federal Highway Administration (FHWA)

The FHWA program over the years has probably been one of the two most effective technology-sharing programs of the Federal Government (the other being the Agricultural Extension Program). In fact, State and local technology sharing could quite correctly be described as the original mission of FHWA's predecessor, the Office of Road Inquiry, created before the turn of the century. The FHWA programs and mechanisms over the years have resulted in very close working relationships with State highway organizations, and perhaps more importantly have fostered the development of extensive highway planning and research capabilities at the State level.

Today, all 50 States are major partners with the FHWA in the formulation of highway research and development programs. The Federally Coordinated Program for Research and Development in Highway Transporta-



State-of-the-art documents on critical technologies such as demand-responsive transportation and priority techniques for high-occupancy vehicles are validated at workshops with State and local officials prior to their widespread dissemination in the field.

ducted by outside groups such as the Transportation Research Board (TRB).

Development of Information Resources

All DOT elements have programs focusing on the packaging and dissemination of information developed at the Federal level which address State and local problems. This area includes the development of summary or handbook documents summarizing the state-of-the-art in critical areas and activities to distribute them to appropriate State and local personnel (or, at least, make them aware of their existence). Covered are not only transportation data summaries but also information on the state-of-the-art in promising technologies and improved planning methodologies for application in the local decision-making process. In addition, each of the organizations within DOT either have or are developing information services to serve their clientele. The Transportation Research Information Services Network (TRISNET), being developed within the Office of the Secretary, will tie these services together.

State and Local RD&D Programs

The technology transfer function in many cases resides within some RD&D programs of the DOT. The FY 1974 research, development, and demonstration (RD&D) budgets of the DOT operating administrations (in millions) were as follows: FHWA, $37; FRA, $49; UMTA, $66; U.S. Coast Guard (USCG), $17; FAA, $105; and National Highway Traffic Safety Administration (NHTSA), $53.

Specific RD&D programs are conducted either with State and local organizations, or to enhance/promote State and local activity. The actual conduct of RD&D at the State and local level can obviously contribute significantly to the transference of knowledge and the upgrading of State/local capabilities in planning, design, implementation, construction, and operation of transportation systems, as well as developing new options for general use and deployment. The most notable programs along these lines are elements of FHWA's Highway Planning and Research work, the FRA demonstration program, and segments of UMTA's RD&D program.

Safety Programs

Several DOT programs provide funds for the development, management, and execution of safety programs at the State and local level. Especially notable in this area is the NHTSA State and community highway safety work. There are also safety-oriented training programs such as those of the Transportation Safety Institute or FRA's State Certification Program which focus on developing safety abilities in local agencies to support Federal grant and program activity. It should also be noted that some programs such as the USCG's boating safety work are primarily aimed at the general public.

The major technology transfer programs within each DOT operating administration and within the Office of the Secretary of Transportation (OST) establish the linking mechanisms between their respective State, local, and industry clientele and their RD&D programs, products, and outputs.

Increased intensification of the Technology Sharing/Technical Assistance throughout the Department should continue to be a major element of DOT policy.

The two main goals of the Department's Technology Sharing Program are:

a. To ensure the continuous development of timely, relevant information on transportation and transportation-related technology packaged to be useful to its intended recipients.

b. To provide efficient and effective mechanisms for disseminating this knowledge to State and local users.

Implementation

The diverse responsibilities and organizations within the DOT, the diverse elements at the State and local level, and the very nature of the process for effecting improvements (with its technical, political, funding and human resources aspects) require a variety of mechanisms and programs to be utilized in the Technology Sharing/Technical Assistance role. The Department considers the following programs and mechanisms to be contributory to the assistance process.

Planning Assistance/Grant Programs

DOT provides funds to assist in developing both long-range transportation plans and short-term improvement programs to enhance the operation of existing transportation services. They assist local decision-making by supporting complete and thorough analyses of intended transportation system alternatives and the evaluation of improvements already installed.

The major funding sources in this category are the Federal Highway Administration's (FHWA) Highway Planning and Research (HP&R) Program, Urban Mass Transportation Administration's (UMTA) Technical Studies Program, and Federal Aviation Administration's (FAA) Airport Planning Grant Program. Activities funded under these programs are coordinated by the provisions of DOT Order 1130.2. This order, dated March 16, 1973, establishes annual unified work programs for intermodal planning. This requirement for unified work programs applies to all urbanized areas doing area-wide urban transportation planning and assistance of more than one DOT operating administration. The development of the unified work program is the joint responsibility of area-wide planning agencies, State DOT's or highway departments, and other planning or operating agencies authorized to conduct transportation and related planning and implementation within metropolitan areas. Unified work programs will serve as support to applications for DOT planning funding participation where funds from more than one modal administration are involved. As such, they are a catalyst to draw together individual modal efforts into an effective intermodal planning program.

Several portions of the UMTA Technical Studies Program focus on development of management capability at the State and local level, in addition to the conventional transportation planning process. These grant programs, originally classed as part of the Technical Studies activity, are appearing separately for the first time this year.

In addition, some support to the planning process is provided by the National Transportation Study (NTS), the primary purpose of which is to provide the Executive Branch and the Congress of the United States with information useful in the formulation of future Federal expenditure programs in transportation. As such, information is developed through an extensive survey of the transportation needs and projected capital improvement programs reported by States, local governments, and the private sector, and by internal DOT analysis. Although not primarily aimed at the requirements of State



Implementation

The SBA Technology Utilization Program prepares and disseminates publications on technology having industrial applications. SBA also periodically publishes descriptive literature on the TU Program to make small businessmen aware of the program's existence and to advise them of the services available. Included in the descriptive literature are Reader Service Cards which enable the interested small businessmen to advise the appropriate Technical Utilization Officer of their needs for technical assistance. The TU Officer will, in response to the reader service card, contact the small businessman and assist him in locating and applying available technology. The most recent publication describing the TU Program was mailed to more than 100,000 small businessmen.

The SBA TU program relies on the technology transfer efforts of other Federal agencies. In addition to relying on the National Technical Information Service for a large part of the technical publications used in the TU Program, SBA has had the cooperation of NASA, the Department of Defense, the National Bureau of Standards, other Federal agencies, large business concerns, universities and State governments in carrying out the TU Program.

In addition to publications and technical assistance, SBA has sponsored or cosponsored conferences, seminars, workshops, and clinics with various Federal Government agencies, and has worked with technical information centers, trade associations, other nonprofit organizations, State and local governments in providing information on available technology.

Technology Transfer Accomplishments

- An instrument company was able to improve its use of materials: needing information about how to handle rare metals, they contacted their TU Officer. Within a few hours, they were talking with an expert from a Government agency who gave them the needed information. They were able to save money and countless hours of research time.
- A small manufacturer of surgical dressings improved his production equipment: information supplied through the TU Program led to the use of ultrasonic sewing machines. This improvement saved him $1,000 per machine each year.
- A small machine shop improved its processing methods: involved in rehabilitating diesel engines, the shop used technology from the TU Program to increase its efficiency in drilling holes, at a yearly savings of $114,000 in labor.
- A small company had a problem cleaning up water discharged from their plating operations. Technology provided through the TU Program, on the reclamation of metals from electroplating wastewater, resolved the problem to the satisfaction of all parties, from a production and an ecology standpoint.

Technology Utilization User Organizations

The SBA Technical Utilization Program is useful to small businessmen in various areas. For manufacturers and allied service trades, technology available through the TU Program has proven useful in promoting future growth, providing new processing methods, reducing bulk and weight of products, improving product reliability, etc. Small manufacturers and related service firms have been helped with products ranging from concrete to industrial chemicals and electronic equipment.

Firms engaged in testing or research and development have also been helped by SBA's

the ability of State and local governments to define their research needs, to participate in the research process, to validate research results, and to apply such outputs to government policies, operations, and problems. Such projects as the previously mentioned Urban Consortium for Technology Initiatives, the California Innovations Group, and the Governors' Energy Project of the National Governors Conference are examples. Support is expected to be provided for the demonstration phase of a cooperative Federal agency program to explore the utility of the Agricultural Extension Service as a vehicle for transferring environmental planning and management information to State and local governments.

- Expanded Activities in the Private Sector—As the RANN program begins to produce more research outputs appropriate for application in the private sector, greater emphasis will stress developing institutional links to increase the probability of industry's acceptance and utilization. It is expected, for example, that ISRU will be working with a number of major trade associations in an effort to inform their members of the RANN programs outputs of potential interest.

- Continuation of Support for Accelerating Acceptance of RANN Projects with High Utilization Potential—One of ISRU's utilization strategies, given limited resources, is to work with RANN program managers in identifying a number of promising projects which appear to be successful and which are producing outputs of significant impact. ISRU then develops utilization activities tailored to the specific projects. These might include evaluations and field testing; special conferences, meetings, workshops, or seminars; preparation and distribution of audio-visual materials; preparation and distribution of special publications; and presentations to public and private policy and decisionmakers. Projects under consideration include enzyme technology, scientific instrumentation, coastal zone management techniques, range management modeling to increase yields of beef and lamb, and high gradient magnetic separation.

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ditional settings for careful documentation and evaluation of results.

In-house training on utilization is provided for both RANN and ISRU personnel through presentations featuring scholars and practitioners in the field of research utilization.

A distinguishing feature of the RANN program, and one with pervasive implications for utilization of its outputs, is the diversity of research supported and the variety of results. Research is conducted in the areas of energy, environment, productivity, and resources. Concerns addressed may deal with issues that are technological, social, human, economic, and, directly or indirectly, political in nature. Outputs may be hardware, processes, methodologies, data, or reports. Potential users from the public and private sector may include a variety of interest groups within those sectors. For example, a project on cable television licensing was of interest to private franchisers, municipal governments, public interest groups, and Federal agencies concerned with telecommunications policy.

ISRU's well-established Intergovernmental Science Programs permits access to an informal RANN Extension System. This includes a network of organizations and institutions that have dealt with ISRU, understand RANN's utilization goals, and are willing to field test RANN outputs or arrange for their testing. Specifically, ISRU's intergovernmental science projects have involved cities, States, and universities that either are "laboratories" where RANN products can be tested or which can arrange tests with otherwise dubious users. In the past year, significant steps have been taken to formalize some of these arrangements through the establishment of the California Innovations Group and the Urban Consortium for Technology Initiatives. In addition, through an ISRU-sponsored Federal laboratory liaison program, testing of RANN products can be performed in DOD laboratories and other Federal installations.

Technology Transfer Accomplishments

Examples of significant recent ISRU-sponsored achievements in a variety of areas include:

- Establishment of the Urban Consortium for Technology Initiatives. The Consortium's purposes are to convene senior representatives of the Nation's 27 largest cities (population of 500,000 or more) and of six large urban counties to identify and assign priorities to their problems; search the available technology for solutions to these problems; and develop a national agenda of local government research needs which Federal mission agencies and private firms can use in developing their research programs. A grant to Public Technology, Inc., provides funds for coordination and logistical support required by the Consortium.
- Project support to the National Conference of State Legislatures (NCSL) to provide a full-time staff for the NCSL Committee on Science and Technology which has initiated a comprehensive effort to strengthen the scientific and technical resources available to members and staff personnel of the 50 State legislatures. Over the past year the Committee has undertaken several projects to meet with these objectives. These include:
  - a nationwide survey of the science and technology resources utilized by State legislatures;
  - sponsorship of a technology-oriented exhibit at the 1974 National Legislative Conference Annual Meeting;
  - assistance in the development of the legislative training programs on energy and mass transportation;
  - sponsorship of national workshop on the States' Role in Radioactive Material Management;

between Government policy and technological innovations.

Research Base

RANN's research programs are assigned to five divisions: Advanced Energy Research and Technology, Advanced Environmental Research and Technology, Advanced Productivity Research and Technology, Exploratory Research and Problem Assessment, and the Office of Systems Integration and Analysis.

A staff of approximately 85 program managers administers a FY 1975 budget of $141.1 million.

Research Utilization Policy and Objectives

The Office of Intergovernmental Science and Research Utilization (ISRU) provides general guidance and some financial support for RANN's utilization functions. It was formed in July 1972 when the existing Office of Intergovernmental Science Programs was assigned responsibility for research utilization activities in support of the RANN program. These expanded responsibilities were reflected in the changed name of the Office.

Objectives of ISRU's Intergovernmental Science Program are:

- Advancement of the understanding of public issues and problems having scientific and technological content at the State and local levels of government, and assessment of needs and opportunities for more effective application of science and technology;
- Demonstration of innovative science and technology planning and decisionmaking processes related to State, local, and regional problems;
- Stimulation of selected State and local government experimentation, on a pilot basis, with science and technology systems in the context of their own needs and resources;
- Encouragement of the adoption of new systems which show promise for enhancing State and local ability to incorporate science and technology into public programs;
- Improvement of communication between persons and groups concerned with science and technology at the Federal, State, and local levels of government.

In support of RANN's research utilization activities, ISRU has the following additional objectives:

- Develop policies, programs, procedures, and detailed plans to promote full utilization of RANN research.
- Stimulate the development of public and private user capability to implement RANN research results.
- Support the RANN program in the conduct of research utilization activities.
- Promote full dissemination and diffusion of RANN research.

Thus, responsibility for RANN's governmental utilization functions builds on the existing Intergovernmental Science Program which is concerned with developing the capabilities of State, regional, and local governmental units for using science and technology in their decisionmaking and program operations. An expanded emphasis includes user needs and involvement in the private sector as relevant to the scope of RANN research interests.

Research Utilization Responsibility

Within the Research Applications Directorate, the Office of Intergovernmental Science and Research Utilization supports

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Implementation

Past and ongoing aerospace activities throughout NASA have identified technologies which are directly relevant to terrestrial energy. These include energy conversion, transmission and storage, materials, remote sensing and rapid data handling applied to energy resource location, energy and environmental conservation systems, and reliability enhancement technology. Through various formal and informal contacts with other Federal, State, and local governments and the private industry, these technologies are presented to potential users. To ensure the ultimate transfer and utilization of these energy-related technologies, NASA works with the user to the degree necessary for implementation. For example, briefings have taken place with public utility executives on fuel cells and incentives for solar heating of houses.

Technology Transfer Accomplishments

An example of NASA aerospace technology being utilized by other Federal agencies is the Modular Integrated Utility System (MIUS), sponsored by the Department of Housing and Urban Development (HUD). The MIUS concept involves the integration of utility services (electrical, heating, cooling, solid and liquid waste management) to buildings and small communities. Waste heat is recovered from on-site electrical power generation and used in heating and cooling, water processing, sludge drying, etc. The inflow water, as well as the outflow, may be processed. Solid waste, including sludge, can be used as a supplementary energy source. The integrated utilities approach, in addition to reducing air and water pollution, obviously offers potential savings in energy. Analyses of typical installations have indicated energy savings of up to 36 percent, fresh water savings of 9 percent, a 48-percent reduction in wastewater effluent, and a 74-percent reduction in solid waste.

NASA has provided HUD with detailed performance specifications of prototype MIUS facilities and is assisting HUD in demonstration sites selection as well as final systems design.

Other ongoing projects include an automated longwall shearer and underground coal extraction technology for the Department of the Interior, wind energy systems technology and solar heating and cooling technology for the National Science Foundation, automotive gas turbine technology and an energy conversion alternatives study for the Energy Research and Development Administration, and lean engine internal combustion and study of automotive aerodynamic drag for the Department of Transportation.

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Implementation

The new applications proposed to the Technology Applications Program are originated by NASA's technologists who conceive of innovative civil systems while engaged in their normal aerospace activities. The innovations are then screened by special NASA Task Forces to assure that they have the requisite characteristics. They are also ranked, competitively, for the significance and the contribution made to its solution. Other factors evaluated are the relevance of the proposed NASA role, the length of time required before benefits are provided, the amount of resources required to develop the system, the ready identification of the user and the status of use acceptance of new technology, and the availability of a NASA Field Center to pursue the project. Having passed this filtering process successfully, the initiative is studied for technical feasibility and then systems engineered to provide the basis for a program plan which describes the implementing steps, resources, and schedules required to develop its innovative system. With this in hand (and occasionally while this background is being developed), the user is approached and the system presented. When the user-mission agency accepts the proposed system, NASA is prepared to provide project management and implement the project.

Technology Transfer Accomplishments

A principal project has been the Activated Carbon Wastewater Treatment System (ACTS), which was the basis for a grant request by the Orange County Sanitation District, California, for a $3.5 million, 1,000,000-gallon-per-day municipal pilot plant which was accepted by the Environmental Protection Agency.

The ACTS is a new sewage (wastewater) treatment process, developed at the Jet Propulsion Laboratory, that converts sludge—the waste product in wastewater—into activated carbon which in turn is used to treat the wastewater. The system's principal advantages are that (1) it eliminates the problems associated with the disposal of sludge, (2) it generates a valuable and costly water treatment chemical-activated carbon, and (3) it extracts from the sludge conversion process sufficient bio-gas to meet nearly all the energy needs of the system. Preliminary cost studies of ACTS suggests that cost savings of 25 to 40 percent can be expected from this system.

At the completion of the laboratory development of the process, JPL constructed a 10,000-gallon-per-day truckbed-mounted demonstration pilot plant. The Orange County Sanitation District, California, invited JPL to test the mobile demonstration unit at their principal sanitation facility. At the conclusion of the three-month field test, both JPL and the Orange County Sanitation District declared the test an unqualified success.

Orange County then prepared a proposal for a $3.5 million EPA grant to construct a 1,000,000-gallon-per-day municipal pilot plant. The EPA has evaluated and approved the grant; the pilot plant is under design and will be fabricated for test within two years.

Projects for which studies are now being prepared include a system for location of railroad freight cars for the Department of Transportation, a water treatment system for Mississippi, an emergency medical system for Texas, and systems for an unmanned submersible for exploring mineral resources for the U.S. Geological Survey.

User Affairs Office

Technology Transfer Policy and Objectives

This office is a central contact for the agency in the dissemination of information relating

months after the patent application has been filed and announced as available for licensing. If NASA decides to grant an exclusive license, the prime consideration will be whether such a license is necessary to bring an invention to practical application.

Both nonexclusive and exclusive licenses can be granted under pending patent applications. Previous regulations called for a longer waiting period, that is, until the patents had been issued for a minimum of 2 years by the U.S. Patent and Trademark Office.

Technology Transfer Accomplishments

A current applications engineering project undertaken with Technology Utilization Office funds has resulted in the development of an improved, lightweight firefighter's breathing apparatus based on NASA portable life-support systems technology. The technical direction was provided by technologists at the Johnson Space Center while assistance in dealing with the fire service was provided by an Applications Team, Public Technology, Inc. A User Requirements Committee made up of fire chiefs, city managers, union and other fire service representatives has worked with NASA during the program. After extensive testing by NASA, prototype equipment was released for field tests by fire departments in New York, Houston, and Los Angeles in late 1974 and early 1975. Most of the features of the NASA-developed system will be included in a commercialized version which is expected to be introduced in 1975.

Technology used in remote patient monitoring systems used in care of Skylab astronauts has been adapted by a Houston firm in the development of an ambulance-carried compact medical unit that contains essential equipment designed to meet heart patients' diagnostic and therapeutic needs at the scene of an emergency. The unit, called TELECARE, which weighs just 50 pounds, is now carried in emergency vehicles in Houston and has been credited with saving a number of lives.

A related project has been the application of the Inspace Medical Support System (IMSS). The IMSS is a profusely illustrated medical checklist or handbook for astronauts who while trained in first aid might need additional information to treat injuries and other medical problems while in space. This handbook is being expanded to include obstetrics and pediatric information and will then be made available to medical personnel such as paramedics for training and use.

Technology Transfer User Organizations

The Technology Utilization Office involves a significant amount of governmental interagency cooperation and joint funding of projects. Formal or informal cooperative ventures are underway with the Department of Health, Education, and Welfare; the Department of Housing and Urban Development; the Bureau of Mines; the Department of Transportation; the Environmental Protection Agency; the Law Enforcement Assistance Administration; the National Bureau of Standards; the National Science Foundation; the Veterans Administration, and others. Also, more than 75 medical schools and health-care institutions are involved, as well as such widely disparate groups as the New York State Urban Development Corporation, the National Academy of Engineering, and the New York City Government.

Scientific and Technical Information Office

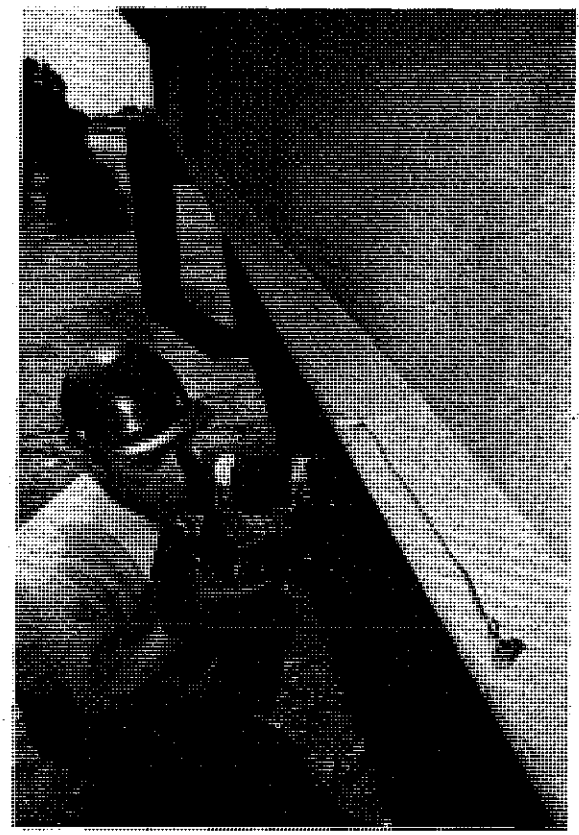
The Scientific and Technical Information Office has the prime responsibility for NASA's scientific and technical information

utilize COSMIC programs at a small fraction of the cost of original development. The price of the program depends upon its size and complexity, but generally ranges from $500 to $1,000.

- *Application Team Program; Public Sector Applications Teams.* This program, begun in 1965, involves a core of Technology Applications Teams located at research institutes and universities and staffed by professionals from a variety of disciplines. These teams work with investigators to carefully define important biomedical and public sector problems for which it appears that relevant aerospace technology may exist. The team member prepares a problem statement which includes a definition and detailed description of the problem, inadequacies of currently available technology, constraints and restrictions on potential solutions and the impact of potential solutions. Based on this statement a search for solutions to the problem is made throughout NASA laboratories and in the computerized data bank.

There are two distinct groups of teams—Biomedical Applications Teams and Technology Applications Teams. The Biomedical Teams actively participate with major medical institutions in the United States in defining significant health care problems which are potentially solvable through the adaptation of NASA technology. The Technology Applications Teams concentrate in the disciplines of transportation, urban construction and safety, and public safety.

It is almost always necessary to adapt NASA-generated technology so that it may be usefully applied elsewhere. A key requirement for the successful transfer of technology is the active involvement of potential users and those with technical expertise. The Teams act as couplers in the process.



An engineer checks the installation of Randomdec, a method of detecting dangerous defects in highway bridges based on aerospace-derived techniques for mathematically analyzing structural fatigue in aircraft.

The methodology used by the Applications Teams involves: (1) problem identification, definition and acceptance; (2) search for potential solutions to problems by manual and computer information searching, circulation of problem statements to NASA Field Centers, and contacts with NASA engineers and scientists; (3) evaluation of potential solutions; (4) implementation and adoption, by problem originators, of identified solutions to non-aerospace medical and public sector problems; and (5) documentation.

- *The Applications Engineering Approach*—Because of the need for adaptive engineering as a prerequisite to successful application of aerospace

Technology Utilization which is responsible for Technology Utilization, Scientific and Technical Information, and Inventions and Contributions. The Technology Applications Program of the Office of Applications is responsible for applying NASA's aerospace-derived technology and systems management knowledge to large-scale ground-based technology systems problems in the civil sector—Federal, State, and local. The User Affairs Office in the Office of Applications is a central contact point for NASA in the dissemination of information relating to remote sensing activities. The Office of Energy programs is responsible for coordinating NASA's support to other Federal agencies conducting energy research and development. It also manages existing NASA programs applying aeronautics and space technology to the generation, transmission, storage, conservation, use and management of energy in non-aerospace applications.

OFFICE OF INDUSTRY AFFAIRS AND TECHNOLOGY UTILIZATION

Technology Transfer Policy and Objectives

To assist in carrying out congressional obligation the NASA Technology Utilization Program was initiated in 1962. The Program's objectives are to:

- Increase the return of the national investment in aerospace research and development by encouraging additional uses of the knowledge gained in those programs.
- Shorten the time gap between the discovery of new knowledge and its effective use in the marketplace.
- Aid the movement of new knowledge across industry, disciplinary, and regional boundaries.
- Contribute to the knowledge of better means of transferring new knowledge from its point of origin to its points of potential use.

Implementation

Technology Utilization Office

The principal thrust of NASA's Technology Utilization Program is ensuring that new aerospace technology is brought to the attention of American industry and others, including Federal agencies and State and local government agencies, so that it may be adapted and applied for the user's benefit. Flexibility and the need to respond to changing user needs are underlying features of the major program elements. These programs are:

- **New Technology Identification and Evaluation.** NASA R&D contracts require that new technology developed in the course of contract work be fully reported. Such innovations and developments are evaluated and if appropriate announced as publicly available. Over 4,000 *Tech Briefs* have been published. These are single-page announcements of innovations, inventions, and improvements thought to have potential utility outside aerospace. Most are supported by additional technical data which are made available to the reader upon request. *Compilations* are collections of *Tech Brief* items, published under one cover, which announce innovations and improvements that fall within a single technical category. Thirty compilations containing some 1,000 different items have been published. These documents are available through the National Technical Information Service.
- **Publications.** Innovations of special significance or complexity are announced via *Technology Utilization Reports* and provide more extensive descriptions than given in a *Tech Brief*.

ment of ex-offenders and working with community leaders.

A specific program of the Office of Manpower Research and Development, not administered by the Utilization Division, is aimed at building a network of manpower researchers and teachers. This program provides assistance to doctoral candidates for writing dissertations on manpower topics, and to scholars for post-doctoral work. The Office also provides Manpower Institutional Grants to 13 institutions of higher learning for development of a capacity to perform work on manpower. The 13 grants awarded in 1974 were aimed at the development of curricula and a training capacity to meet needs of prime sponsors (State and local governments) funded under CETA.

Regional offices of the Manpower Administration are charged with providing guidance to CETA sponsors on the operation and planning of their manpower programs. Efforts are underway to increase RO capacity to use available knowledge, including R&D findings, in performing that function. These efforts include the development, in cooperation with one regional office, of a catalog of available and useful materials, and the building of a capacity to seek and transform items which meet the specific requirements of sponsors.

Technology Utilization Accomplishments

Through the network of southeastern teacher-training institutions mentioned previously, an R&D developed procedure for training administrators and teachers in the use of individualized instructional systems is now widely used in several States.

Through the work of the American Bar Association, 12 States have removed barriers to the employment of ex-offenders, and eight more are expected to follow.

Through the network building of several R&D grantees, there is a widespread understanding and increasing use of major interventions in the correctional system, including pre-trial diversion of first offenders, mutual agreement programing (which assures release from prison at conclusion of an agreed-upon training plan), and supported work projects.

Audiences for manpower R&D findings and products include:

- Policy makers
- Program planners
- Standards writers
- Supervisors and operators of manpower service delivery organizations
- Trainers and consultants
- Job seekers
- Academicians and students

Emphasis will be increasingly on developing services for and relations with regional offices and CETA prime sponsors.

For further information

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ment and advancement through the reduction of discrimination and disadvantage arising from poverty, ignorance, or prejudice.

(b) The Secretary shall establish a program of experimental, developmental, demonstration, and pilot projects, through grants to or contracts with public or private nonprofit organizations, or through contracts with other private organizations, for the purpose of improving techniques and demonstrating the effectiveness of specialized methods in meeting the manpower, employment, and training problems, however, nothing in this subsection shall authorize the Secretary to carry out employment programs experimenting with subsidized wages in the private sector or with wages less than those established by the Fair Labor Standards Act of 1938, as amended, for employment subject to that Act. In carrying out this subsection with respect to programs designed to provide employment and training opportunities for low-income people, the Secretary shall consult with such other agencies as may be appropriate. Where programs under this section require institutional training, appropriate arrangements for such training shall be agreed to by the Secretary of Labor and the Secretary of Health, Education, and Welfare.

(c) The Secretary shall conduct such research and investigations as give promise of furthering the objectives of this Act either directly or through grants, contracts, or other arrangements.

Research Base

The Manpower Administration has been established to implement the responsibilities assigned to the Department of Labor for conduct of work-experience and manpower training programs and administration of the Federal State Employment Security System.

Technology Utilization Policy and Objectives

The Manpower R&D program was established under the Manpower Development and Training Act of 1962. Dissemination activities had been undertaken from the start, but by 1966 it was recognized that special efforts were required to promote the utilization of appropriate findings. In addition to activities designed to distribute R&D products and to make them available to inquirers, a special staff was established with responsibility for promoting utilization. This staff, called the Division of R&D Utilization, is one of the constitutent divisions of the Office of Manpower Research and Development.

The goal of the Utilization Division is to promote the use of R&D products and findings in the making of policy, in the planning of programs and program activities, in the delivery of services, in training and technical assistance for agency staffs, and in academic studies.

The Utilization Division has varied in size from eight to eleven staff members, including two or three secretaries. In order to monitor the several hundred projects that may be ongoing at any one time under OMRD auspices, a "buddy" system was organized. Each project in OMRD is assigned not only to a project officer in another division but also to a member of the Utilization Division staff. The Utilization buddy is responsible for consulting the project officer and the project staff on activities that might be undertaken to promote utilization of the project's findings. The buddy draws attention to the need to identify audiences, to plan to satisfy their needs for information and evidence of effectiveness, to involve them, when possible, in ongoing observation and guidance, to plan

Training and Demonstration Program

The Training and Demonstration Program includes the new "Supplemental Criminal Justice Training" as well as a program of demonstrating research findings. Both programs focus on person-to-person contact as effective technology transfer methodology.

The Supplemental Criminal Justice Training Program conducts a series of seminars nationwide on selected advanced criminal justice practices, resulting from Exemplary Projects, Prescriptive Package and other outstanding research, which offer superior features for significant improvement of the administration of criminal justice and crime reduction. Senior executives of State and local criminal justice agencies, as appropriate to the particular subject area, are invited to attend a 2- or 3-day seminar in their geographical area. Basic policy issues and implications as well as implementation methodologies are presented. Extensive multimedia training packages are provided to aid attendees who desire to implement the subject program in their agencies. Normally four or five different training programs are conducted nationwide each year, with senior executives from all of the larger criminal justice agencies invited. Funds for supporting such local implementation are not available from the Institute.

The Advanced Criminal Justice Practices Demonstration Program supports implementation in a few, highly selected, local criminal justice agencies of the most outstanding new criminal justice management and operations concepts from the training program. The goals are to provide nationwide publicity for the new concepts as well as to conduct advanced broad-scale multi-location evaluation of the concepts. Selected cities must have a high degree of commitment and capability to institutionalize the particular concept and must agree to promote the concept through receiving interested visitors and traveling to conferences and other opportunities for discussions. Normally, one or two different concepts are selected for demonstration programs annually, in about five communities for each. Usually, supporting funds are planned for 18 months, followed with local support for permanent continuation. Medium-sized cities/counties are normally selected—large enough for large-scale implementation but not so large as to engulf the project. Independent evaluation contractors are funded for comprehensive evaluation of all sites in each advanced criminal justice concept.

Current activities of the training and demonstration program involve five large city/county demonstration sites for each of two programs, Community Based Corrections and Police-Family Crisis Intervention. The training program is providing 10 regional seminars to about 500 senior criminal justice officials in each of five program areas including Juvenile Diversion, Citizen Dispute Settlement and Police Crime Analysis Units, in addition to the two demonstration project subjects.

Law Enforcement Standards

The publication and dissemination activities include a series of specialized documents originating from the Law Enforcement Standards Program including national voluntary equipment standards, user guidelines, state-of-the-art surveys. These and other reports will assist law enforcement and criminal justice agencies in the selection and procurement of quality equipment.

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cludes the holdings of the LEAA Library, the Federal Bureau of Prisons Library, and the Drug Enforcement Administration. The catalog is published in three separate volumes: Title, Subject, and Author. Supplements are issued annually to keep the catalog current. Copies of this catalog are available through the Superintendent of Documents, U.S. Government Printing Office.

2. Publication and dissemination of Institute research and program reports is also a function of the Technology Transfer Division. In the past year, this function has reviewed, edited, and processed for printing nearly 50 documents resulting from research and development performed by grantees, contractors, and its in-house activities. The documents have been published in formats such as: *prescriptive packages,* which synthesize the best available research information; *exemplary projects,* which identify, evaluate, and recommend for widespread use outstanding successful local experiments and operations; *monographs* and *research reports* which present research studies and findings to operating agencies and personnel; and *NILECJ Standards* and *Guidelines* that assist law enforcement and criminal justice agencies in the selection and procurement of quality equipment. The documents are selectively disseminated to law enforcement and criminal justice agencies and to registered users of the National Criminal Justice Reference Service; and made available to the general public through purchase from the Government Printing Office and the National Technical Information Service, Department of Commerce.

3. The International Criminal Justice Clearinghouse was authorized by the Amendment Act and was expanded to function as an international clearinghouse is the successor to the National Criminal Justice Reference Service (NCJRS) which was established in order to provide a central information reference source for the Nation's law enforcement and criminal justice community. It has a broad-based collection of data covering all aspects of law enforcement and criminal justice including LEAA research and development and action grant project reports and studies. The data base also includes publications, books, audiovisual and other documentation materials from a wide variety of government and non-government sources. The data base contains bibliographic identification and an abstract of each item in the system. Liaison has been established with International Information Sources. Free services are provided to all users.

   The role of the National Criminal Justice Reference Service (an international clearinghouse) in disseminating of research and planning information is fulfilled in three major activities: 1) selective notification of information based on registered user profiles; 2) by responding to specific search requests; 3) distribution of LEAA publications. During calendar year 1974 the number of registered users increased by 8,288 to a total of 25,400. Selective Notifications (abstracts) of new materials totaled more than 3 million. Specific information requests, which may require a letter response or more complex service including retrospective searches in the data base, amounted to 13,861 actions. Products delivered in response included 404,100 abstracts. The entire data base consists of about 10,000 items of which 3,334 were accessioned in 1974. The distribution of LEAA publications during the past year totaled 379,660 in response to more than 350,000 individual requests.

4. Special Information Program is responsible for producing Research Briefs, Research Information Letter, special brochures and flyers, the Institute's annual report, and other public information such as Newsletter articles, speeches, press releases, etc., pertaining to National Institute activities.

new technology. With the reorganization of the Institute in November 1973, emphasis was increased on this process of technology utilization, and prime responsibility for the task as assigned to the Office of Technology Transfer.

To accelerate the adaptation of new techniques, the Technology Transfer Division has developed a number of special technology sharing programs. The general aim of these efforts is to improve and strengthen links between the criminal justice research and operations communities. The goal is to bring research findings to practitioners in a usable form and encourage its implementations.

Major Technology Transfer Division programs are as follows:

- Liaison and Coordination Program
- Development and Model Programs
- Reference and Dissemination Services
- Law Enforcement Science Advisor Program
- Training and Demonstration

The Liaison and Coordination Program

This effort involves the establishment of regular personal contacts between Technology Transfer Division staff and representatives of LEAA Regional Offices, State Planning Agencies and other research organizations, pertinent Federal agencies, and professional organizations. The purpose of these formal liaison arrangements is to permit direct interpretation and communication of Institute policies, operations and research products, as well as to provide feedback that will increasingly involve operating agencies in the establishment of national criminal justice research goals and priorities. Included is the Seminar Program which brings national authorities to the Institute for presentations, which are video recorded at the LEAA television studio. The tapes are widely disseminated to Regional Offices and State Planning Agencies.

Model Programs

This program focuses on the need to communicate more effectively to criminal justice administrators and practitioners significant research and program experiences. The three principal elements of this program are: (1) preparation and dissemination of Prescriptive Program Packages; (2) identification and dissemination of information on Exemplary Projects; (3) assessment of the operational implications of Institute studies through Research Applications.

Prescriptive Program Packages represent an effort to synthesize the best available knowledge and operational experience in selected areas of criminal justice administration. In essence the packages or guidebooks are combined state-of-the-art reviews and how-to-do-it manuals. The aim is to develop program models that permit local administrators to follow, step by step, those details necessary to establish and operate viable action projects. In addition to implementation procedures, the models focus on general staffing and budget requirements, anticipated problems and obstacles, measures of effectiveness, model legislation and references to specific ongoing programs.

Packages have been published in the areas of prosecutor case screening, police-community relations, methadone maintenance, diversion of the public inebriate from the criminal justice system, police crime analysis units, improved services for misdemeanants, and neighborhood team policing. Anticipated shortly are packages on the evaluation of correctional programs, offender job training and placement, and police robbery control projects.

In preparation are reports on the use of civilians in police work; improving police investigative effectiveness; community involvement in law enforcement; prison legal grievance procedures; delivery of health care in correctional institutions; and multi-agency narcotic units.

Office of Land Use and Water Planning

Enabling Legislation and Mission

Legislation: Land Resource Management Assistance (proposed).

Mission: Coordinate development of departmental policies and programs for land use and water planning assistance on non-Federal lands.

Research Base

Development of guidebooks for use by States and other levels of government on:

1. Methods of identifying, evaluating, designating, and managing critical environmental areas of regional concerns; and
2. Methods of handling data and information in support of critical environmental areas programs.

Technology Transfer Policy and Objectives

Identification and development of cooperative intergovernmental technical assistance programs for assisting States and Indian tribes in land resource allocation planning and management programs.

Implementation

Guidebooks to be completed by June 1975 will provide less progressive States with an evaluation of the more progressive ones in critical environmental areas and data handling programs. Both projects utilize State agency sources of information with data handling project including additional sources. A mix of Federal, State, university and private consultants is used to review and critique the plans and progress of projects at intervals through workshops. Guidebooks in loose-leaf form provide for updating.

Technology Transfer User Organizations

Organizations that can benefit from the guidebooks are State personnel in resource allocation planning or management agencies and any group with interest in critical environmental areas.

For additional information contact:

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Charles Meyers
Data & Information Handling Project
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Office of Water Research and Technology

Enabling Legislation and Mission

The Office of Water Research and Technology (OWRT) was established and operates under the authority of the Water Resources Act of 1964 (Public Law 88-379, as amended by Public Law 89-409 and Public Law 92-175) and under the Saline Water Conversion Act of 1971 (Public Law 92-60, as amended) and under the Joint Resolution (Public Law 85-883, as amended). It started operations on July 17, 1964, as the Office of Water Resources Research and by Secretary's Order No. 2966 of July 26, 1974, was reorganized and consolidated with the Office of Saline Water into the new Office of Water Research and Technology under the Assistant Secretary, Land and Water Resources, to provide a broader-based organization for coordinating water research and development programs.

Its mission is to implement the Act of 1964 by stimulating, sponsoring, providing for, and supplementing "programs for the conduct of research, investigations, experiments and the training of scientists in the fields of water and of resources which affect water," and in this way "assist in assuring the Nation at all times of a supply of water sufficient in quantity and quality to meet the requirements of its expanding population."

Research Base

One function of OWRT is the administration of a cooperative program with a Water Resources Institute (WRRI) in each State, the Virgin Islands, Puerto Rico, Guam, and the District of Columbia. These units are charged with developing a problem-oriented research program in cooperation with Federal, State, and local water organizations working cooperatively on many projects to engender effective technology transfer.

Another segment of the program involves contracting with institutions, companies, or individuals who develop research proposals which can assist in solving the water problems of concern to the Department of the Interior programs.

The third segment of the program involves a water resources information system about ongoing work in the water field by all water agencies and individuals. The Water Resources Scientific Information Center (WRSIC) has established a machine-retrievable information bank for this program.

Research and development in saline water conversion is a newly acquired addition to the program, resulting from the reorganization within Interior, which consolidated the Saline Water Program with other water resources research.

Technology Transfer Programs

The Technology Transfer Program in the new organization of OWRT will assess and interpret OWRT research results pertinent to identified water-related problem areas. Such activities as the dissemination of information will continue and the system will expand to include online machine terminals at a number of field locations to make the computer data bank of information available to more potential users. Interpretive reports, seminars, and other techniques to bring researchers and users together will produce an enhanced program of research and development utilization in the water resources decisionmaking processes.

activities are organized into three main programs.

The Atmospheric Water Resources Management (AWRM) program is a comprehensive development and adaptation program designed to meet the Nation's growing water needs by managing precipitation with weather modification techniques.

The Water Resources Planning and Engineering Research (WRPER) program is directed toward improving knowledge about the nature and occurrence of available water; to determine to best advantage the social, economic, environmental, and institutional aspects of water resources development; and to improve the technology of water distribution, use, and management.

The Energy Research and Development (ER&D) program is designed to develop ways to provide clean, nonpolluting energy sources including research in geothermal and pumped-storage technology for more effective use of these resources in meeting the Nation's energy needs.

Technology Transfer Policy and Objectives

Technology transfer is an essential part of Bureau of Reclamation activities related to its mission. Researchers, designers, and planners are actively encouraged to make the findings of their efforts available to the engineering and scientific communities through reports and oral presentations, and resources are made available to employees to carry out this objective. Report preparation is required for all significant studies.

Program objectives include assuring timely availability to the general public of all research and design findings and avoidance of duplication of effort with other agencies and institutions.

Technology Transfer Responsibility

Most of the Bureau of Reclamation's research and development and related activities are performed at (or under the auspices of) the Engineering and Research Center at Denver, Colorado. The components in the Engineering and Research Center administering technology transfer directly include the Technical Services and Publications Branch, Division of Engineering Support; and the General Services Branch, Division of Management Support. The former is responsible for editing, reviewing, and formatting all technical publications generated at the Center. The latter processes all draft manuscripts into printed form and distributes and/or sells the final product.

Implementation

Technology transfer is accomplished through preparation and dissemination of technical reports and papers; oral presentations at local and national professional society meetings; participation in the work of standards committees established by industry and technical societies; exchange programs with other agencies, domestic and foreign; and biennial meetings with other agencies having engineering and research objectives related to those of the Bureau of Reclamation.

The Office of the Commissioner (Washington, D.C.) and the Engineering and Research Center (Denver, Colorado), have active programs for the generation of publications to report results of engineering and research studies, with related activities at the Bureau's seven regional offices. Comprehensive manuals and monographs are prepared for use and dissemination by Reclamation offices, and through publication

ing programs and through its widespread field organization. In addition, the primary objective of the Land Information and Analysis Office will be the transfer of information and technology. Emphasis will be on the translation of natural resources information and on techniques for application of that information by nontraditional users—planners, managers, and other officials in the non-Federal governmental and private sectors.

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Russell G. Wayland, Chief
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Office of Coal Research

Enabling Legislation and Mission

The Office of Coal Research (OCR) operates in accordance with Public Law 86-599, which provides for a contract research program for improved methods utilizing our national coal reserves.

The OCR Program is described in the Office of Research and Development report entitled "Energy Research Program of the U.S. Department of the Interior, FY 1976 (Preliminary)." The Program generally concerns the conversion of coal to alternative energy* forms but includes the utilization of coal as well. Appropriate engineering evaluations and economic assessments are made to guide decisions in the various program elements.

Technology Transfer Policy and Objectives

All OCR projects are intended to be used by the commercial sector to promote rapid exchange of information. Technical progress reports are placed on open file. Publication of task or project reports follows the completion of specific tasks. OCR contractors are encouraged to participate in technical meetings where the results of their work are presented. Seminars are arranged to acquaint representatives from the industrial sector with the progress in specific program areas.

The transfer of results is frequently accelerated by financial participation in pilot or demonstration plant programs. For pilot plant projects, OCR guidelines require one-third non-Federal funding, while 50 percent

* Through legislation creating the Energy Research and Development Administration (ERDA), a major portion of the energy program has been transferred from the Office of Coal Research to ERDA.

Resource and Land Investigations Program*
Geography
Environmental Impact Analysis
Earth Resources Observation Systems*

Technology Transfer Policy and Objectives

The Geological Survey develops techniques and methodologies to enhance its ability to accomplish its mission. These techniques and methodologies range from methods for geochemical prospecting to techniques for monitoring urban storm runoff and from development of systems for plotting land-use maps from satellite videotapes to the design of thematic maps showing potentially hazardous areas for land development. One of the basic objectives of the Survey's proposed Land Investigations and Analysis Office (LIA) is to assure the results of these in-house efforts are fully utilized by other Federal agencies and by organizations in the States and private sectors. LIA responsibilities encompass both bureau-level and departmental-level activities, the latter through departmental programs for which the Survey is the lead agency.

Implementation

The major technique used by the Geological Survey for technology transfer is the publication of reports and maps. Publications are oriented toward the reporting of results of investigations of the Nation's natural resources, but include information on the techniques and methodologies used in the studies. The Survey issues publications in the following series:

Book Publications—

Professional papers—comprehensive large-size reports on the results of resource studies of topographic, hydrologic, paleontologic, and geologic investigations.

Bulletins—final or progress reports on the results of resource studies and of topographic or geologic investigations, shorter contributions to economic and general geology, and descriptions of Survey instruments and techniques.

Water-supply papers—reports on the geology, hydrology, quality, recoverability and utilization of water resources.

Circulars—reports in a simpler or less permanent format of relatively local or restricted interest or of temporary usefulness.

Water-resources investigations—reports of cooperative programs of local interest for which no cooperator-managed publications program is available, and reports of Federal activities not approved for publication in a formal Survey series. Most WRI's are made available by the National Technical Information Service.

Techniques of water-resources investigations—manuals on techniques describing procedures for planning and executing specialized work in water-resources investigations of the Survey.

Maps—Miscellaneous Investigations and Miscellaneous Field Studies are map series established to provide an outlet for maps not falling logically into other series. These cover a wide range of subject matter, including results of multidisciplinary studies and of data and information compilation and synthesis.

* DOI Program—USGS lead agency

techniques. Steadily increasing prices and the demand for silver are stimulating considerable interest in development of new low-cost methods for recovering silver from deposits of low-grade and refractory ores of which none can support construction of new milling facilities.

Technology Transfer User Organization

Area of Technology	*User*
Mining and reclamation research	Mining companies; State and local governments, especially metal divisions
Coal combustion	Utility companies
Synthetic fuels; waste-to-oil conversion	Utility and petroleum companies, chemical process industry; gas industry; small industries requiring clean sources of power
Natural gas and pretroleum simulation	Petroleum and gas companies
Oil shale	Petroleum and chemical companies
Urban refuse	State and local government; scrap processors
Junk cars	Scrap processors
Stack gas cleaning	Copper and lead smelters; powerplants
Waste stabilization	Mining and ore beneficial operations
Industrial wastes	Iron and steel mills, nonferrous metal processors, aircraft and auto industry, metal finishers

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application by industry. The Bureau has developed a strip-mine reclamation process, based on the use of powerplant fly ash, that is currently being used by both Government and industry. The Bureau's basic coal chemistry research has produced data in reaction thermodynamics, mechanisms, and kinetics which are the basis for many synthetic fuel conversion processes under development. Techniques developed by the Bureau for prevention of spontaneous combustion in stored coal depots and for the reduction of ash deposits in utility boilers are in use today.

The Bureau's gas combustion oil-shale retorting process, originally developed in the 1950's, has been the starting point, through technology transfer, for several improved systems developed later by others: an industry model with a markedly improved unit throughput rate in the mid-1960's; the Brazilian Petrosix process being demonstrated for industry-scale operations in Brazil; and the Paraho retort now in early stages of demonstration and scale-up by an industry group using the Bureau's experimental facilities at Anvil Point, Colorado, under a leasing arrangement.

The following current projects are aimed at developing processes for commercial application:

- The production of substitute high BTU natural gas, low BTU gas, and low-sulfur liquid fuels from coal. The Bureau, in developing the Synthane and Hydrane processes for the production of high BTU gas, is currently operating a 75 ton/day (of coal) Synthane pilot plant. Another Bureau development, the stirred fixed-bed gas producer (for low BTU gas), will be scaled up to commercial size in a joint program with the Office of Coal Research and the Tennessee Valley Authority. The Bureau has entered into a cooperative research agreement which provides industrial support for the development of the Synthoil coal liquefaction process.
- Processes for removing sulfur dioxide from flue gases economically and reliably.
- Processes for increasing boiler efficiency and availability.
- A low BTU gas combustor for use in a combined power cycle based on low BTU gas from coal.
- Techniques for effectively reclaiming strip-mined land.
- A combustor capable of producing a hot, clean gas suitable for MHD power production.
- A process to produce a low-sulfur fuel oil from urban and agricultural refuse and/or cattle manure.
- Improved processes for recycling waste lubricating oils.
- Improved processes for secondary and tertiary recovery of petroleum.
- Non-nuclear methods of natural gas stimulation including massive hydraulic fracturing, chemical fracturing, and deviated wells.
- Processes for in-situ shale oil and in-situ shale gas production.

Metallurgy

Technology for the smokeless incineration of junked automobiles has been transferred to more than 29 scrap processors through the media of published technical reports combined with personal contacts between the users and Bureau representatives. These techniques have resulted in more than six applications of Bureau technology for recovering nonferrous metals from nonmagnetic shredder rejects. The Bureau's process for extracting valuable materials from incinerated urban refuse will be demonstrated on a 250 ton/day scale by the city of Lowell, Massachusetts, under a grant

mining technology; and (e) planning and executing special briefings, films, documentaries, and information programs to promote use of improved technology to the mining industry.

In the Metallurgy and Energy programs, no distinct group or individual is responsible for technology transfer. The responsibility for the overall program lies with the Assistant Director—Energy, and the Assistant Director—Metallurgy.

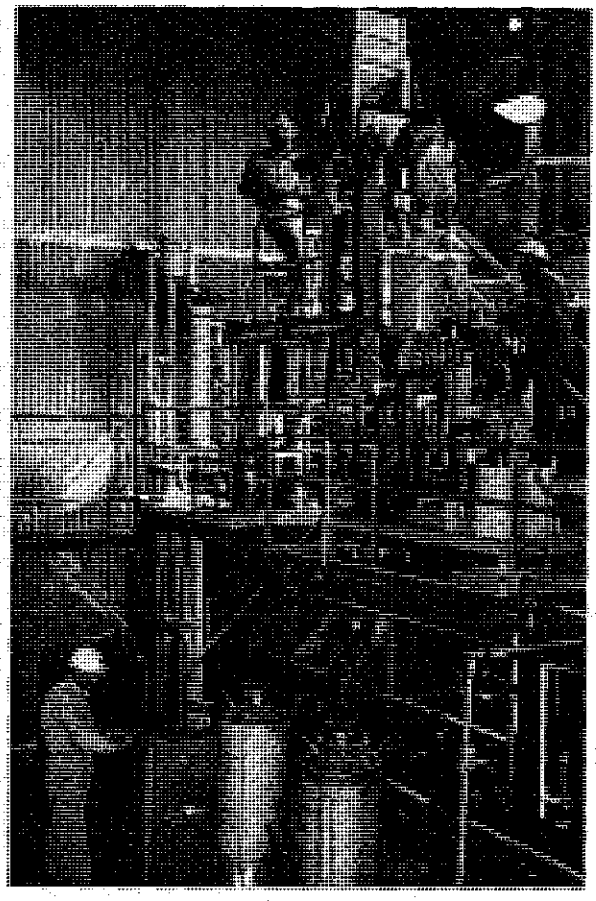
Implementation

Bureau of Mines strategy for technology transfer covers a number of activities. Dissemination of technical information to potential users is considered a major task conducted in a number of ways. The Bureau produces its own publication series of Information Circulars, Reports of Investigation, Bulletins, and Technical Progress Reports. In addition, research papers by Bureau personnel are presented at numerous technical meetings and published in technical journals and trade magazines. Bureau participation in industry briefing sessions, seminars, and trade shows is another mechanism for technology transfer. Technology transfer activities are enhanced by joint industry-Bureau demonstration projects, construction and operation of large-scale pilot plants, cooperative research programs, cost-shared research contracts, and effective use of Government patents through licensing. Research at the process development unit (PDU) and pilot plant levels are important in demonstrations of technology for transfer to user groups. For example, two large-scale pilot plants have been used to develop the technology for recovering valuable materials from incinerated and unburned urban refuse. More than 1,000 persons visited these pilot plants in the last year to gain technical information for their own programs. Also, the Bureau of Mines has begun operating the fourth major pilot plant for producing substitute natural gas from coal, based on the Bureau's Synthane process. Numerous industrial research groups have visited this plant to obtain information for the development of other synthetic fuel plants.

In addition to the above activities, the Bureau of Mines Technical Liaison Committees constitute an important forum for technology transfer. As an example, the Bureau spearheaded the formation of the Mine Waste Stabilization Liaison Committee. This committee evolved from research on the stabilization of mine wastes, which has demonstrated new methods for alleviating the environmental problems in test areas on the waste piles. The Bureau also supports a number of technical symposia, one of which is a biennial symposium on resource recovery. The Bureau's State liaison program enhances communication with State and local government as well as industry. With a liaison officer assigned to each of the 50 States, the Bureau maintains an increased capacity for expediting technology transfer.

Identification of applicable mining research technology has been aided by incorporating special sections on technology transfer in the work plans and reports. These sections, prepared by researchers, indicate the availability of the technology and relate the researcher's ideas on the best ways to transfer the technology to industry. The continuous identification of industry need is accomplished through questionnaires, review of industry statistics, and personal formal and informal contacts with mining industry (labor and management), manufacturers, and personnel of State and Federal regulatory agencies, such as the Interior's Mining Enforcement and Safety Administration.

Matching needs with accomplishments is conducted through "marketing" effort and/or assistance to regulatory agencies in the preparation of regulations.



Overall view of the Bureau of Mines Alumina miniplant at Boulder City, Nevada to process domestic aluminum ores.

environmentally acceptable methods of using coal and oil shale and methods of stimulating natural gas and oil production.

The coal program is aimed at environmentally acceptable processes for producing and utilizing coal. Some of the projects under development are:

- The production of natural gas from coal.
- Liquefaction of coal.
- Low BTU gas from coal and power generation.

Additional programs are underway on underground coal gasification, basic coal chemistry, and strip mine reclamation.

The petroleum and natural gas program is aimed at processes for:

- Heavy Oil Recovery.
- Earth Fracture Systems.
- Automotive Fuels.
- Oil Shale.

Metallurgy

The purpose of the Bureau of Mines metallurgy program is to improve the Nation's minerals and metals position. The program is providing the scientific and technical information to encourage and stimulate the nonfuel minerals industry to make expeditious advances in technology to assure an adequate and continuing supply of mineral raw materials at acceptable costs and with minimal waste and environmental degradation.

The Assistant Director—Metallurgy is responsible for the conduct of this program at eight field research facilities: Albany, Oregon; Boulder City, Nevada; College Park, Maryland; Reno, Nevada; Rolla, Missouri; Salt Lake City, Utah; Tuscaloosa, Alabama; and Twin Cities, Minnesota. Two staff divisions, Metallurgy and Solid Wastes, assist in planning, formulating, managing, and evaluating the program. The Division of Solid Wastes is responsible for the environmental aspects of the program.

There are four program objectives. Advancing minerals technology research is conducted to achieve major improvements in metals and minerals processing; nonmagnetic taconite resulted from this research.

Effecting pollution abatement research is aimed at developing methods for eliminating air, water, and land pollution as byproducts from the processing of minerals. A major pilot plant using a citrate solution to absorb SO_2 is being tested at the Bunker Hill lead smelter at

been an important part of the Bureau's research goals. Added impetus has been provided by the Coal Mine Health and Safety Act of 1969 through direct funding for work in this area. A somewhat smaller effort is conducted in the area of Metal and Nonmetal Health and Safety.

(2) *Advanced Mining Technology.* Improving existing techniques and developing new technology for mining minerals from ore bodies of constantly dwindling grade, and ore bodies not amenable to existing mining methods, are key goals of mining research. Recent energy shortages have spurred a drastically increased effort in coal mining and oil shale mining research. Research on improved metal and nonmetal mining technology is also pursued.

(3) *Environment.* The mining industry has historically been accused of giving inadequate attention to the problem of environmental protection. Present priorities insist that mining operations be included with due concern for subsequent land use. Bureau research activities attack the problems of surface subsidence, acid mine drainage, refuse bank fires, waste bank stabilization, and reclamation of surface mined lands.

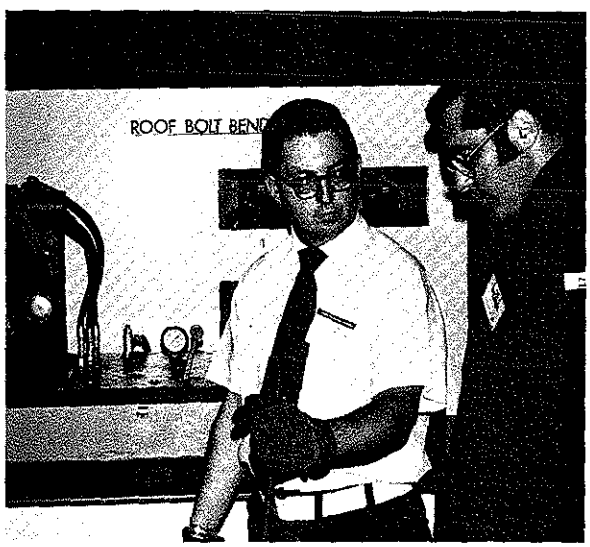
The four Mining Research Centers at Pittsburgh, Pennsylvania; Denver, Colorado; Twin Cities, Minnesota; and Spokane, Washington; are the operating arms of the research program.

Energy

The Bureau's energy program, the largest in-house Federal research effort devoted to fossil fuels, is conducted at six research centers at Pittsburgh, Pennsylvania; Morgantown, West Virginia; Bartlesville, Oklahoma; Laramie, Wyoming; San Francisco, California; and Grand Forks, North Dakota. The ongoing programs emphasize development of







Bureau of Mines personnel shown discussing and demonstrating new mining technology with mining personnel at industry meetings.

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brochures on important research efforts such as Modular Integrated Utility Systems (MIUS), Total Energy, the Annual Housing Survey, and the Urban Observatory Program.

(d) The Division has stepped up its dissemination of executive summaries of research reports to enable potential users to decide whether the full reports would be useful to them.

(e) The Department has adopted standards designed to ensure uniformity and quality control of research reports prepared by contractors.

(f) Displays, exhibits, and presentations on research results have been prepared for use in conferences, national and regional conventions, and similar meetings, to provide selected audiences with information on research programs that affect their interests.

(g) A mailing list of major user groups has been computerized to assist in dissemination of recent research to appropriate groups and individuals within those groups.

Product Transfer

(a) Early in 1974, the Department revised the requirements for preparing requests for contract services to assist dissemination and transfer activities. These changes are aiding the development of new and improved user-oriented research projects to promote wider use of research results.

(b) Communication with the user community has been expanded. PD&R representatives are meeting with user representatives, attending national and regional meetings sponsored by user groups, and sponsoring surveys of research needs. The staff also encourages users to provide HUD with suggestions for priority research topics.

(c) A major project began in 1974 to review and evaluate completed HUD research for its transferability potential to State and local governments.

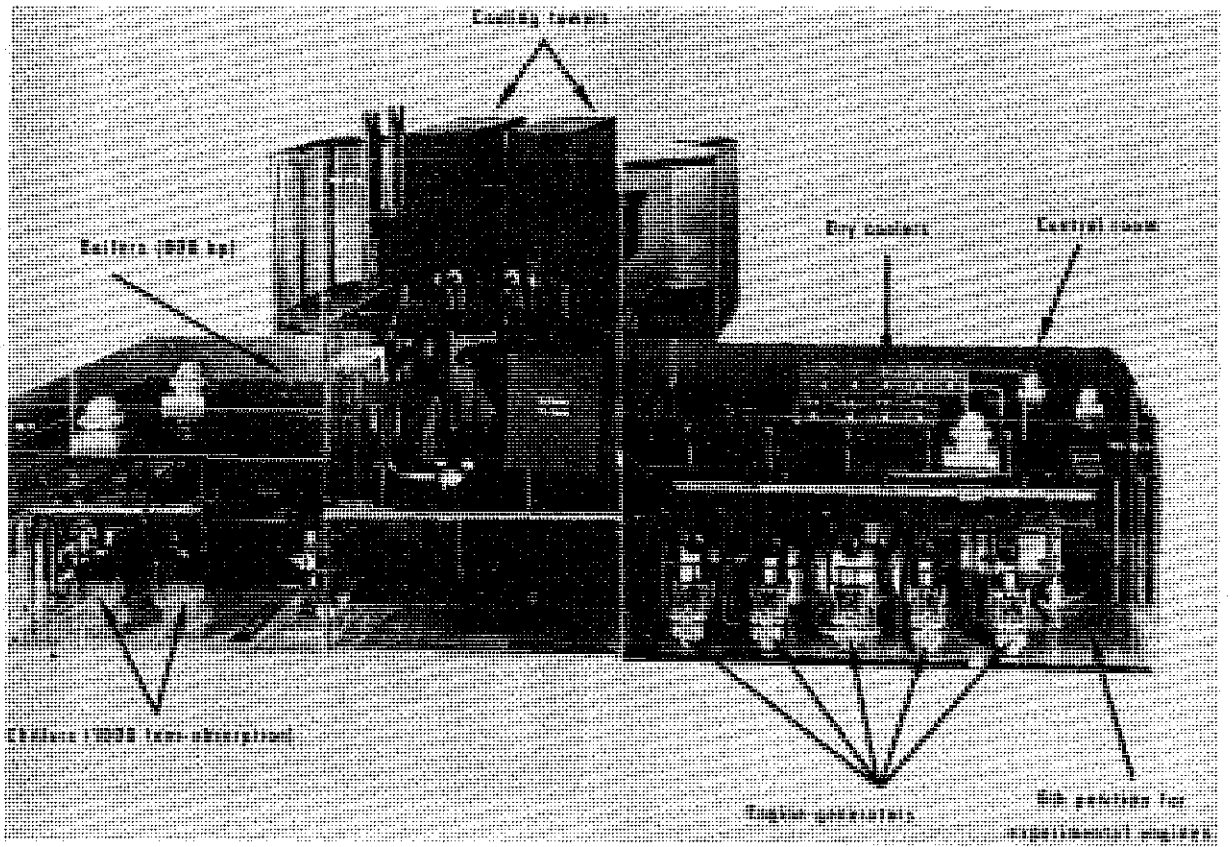
Technology Transfer Accomplishments

Transfer of products of HUD's research programs is a dynamic process that begins with the basic research design. The Housing and Community Development Act of 1974, with its emphasis on State and local government decisionmaking, has helped to set priorities in HUD research into areas dealing with better management methods for State and local governments.

Beginning in 1969, the Urban Information Systems Interagency Committee (USAC), with HUD as the lead agency, began research in the development of city-operated, computer-assisted information systems to help communities in delivery of services, management, and planning. Key systems and subsystems are now transferable and many transfers already have been made, particularly those consisting of individual modules dealing with specific problem areas of municipal governments. In many cases the transfer has been made with no further investment by the Federal Government.

Dayton, Ohio, is one of five cities participating in the USAC project. HUD awarded the city a research contract to develop an integrated public finance data subsystem. The work already has resulted in a cost displacement saving of $101,000 in 1973, and future savings of $73,000 a year is expected. More importantly, five of the individual modules developed in the Dayton experiment are being adapted for use in three other cities. Forty-three other Ohio cities are using the Dayton tax module, spending little or no Federal money beyond the original research contract.

The other cities involved in the USAC project are developing systems to improve manage-



HUD's total energy system (model above) is a forerunner of utility systems that will, in the future, conserve energy, protect the environment and aid community development across the Nation.

decisionmaking tools for the chief executive of local general-purpose governments.

One aspect of this emphasis includes a broad-based program designed to:

- Improve university and college programs, particularly those in public administration, to better prepare students for management roles in the public sector;
- Improve and expand in-service training and development programs and materials for elected and career officials of cities and urban counties of varying sizes and governmental forms;
- Support State and local training and development efforts through a network that provides backup consulting services, program development information, clearinghouse services of new concepts and methodologies, and evaluation of training ventures.

Technology Transfer Policy and Objectives

HUD research stimulates positive change by conducting technological and managerial research, demonstrating new systems and methods for application by other elements of government and private enterprise, and by generally improving the knowledge of the housing and community development processes.

Encouraging wider use of new technology and methods requires effective dissemination and transfer of knowledge and techniques to

tablished a Division of Product Dissemination and Transfer.

Research programs, both current and planned, cover a broad spectrum. Some are discussed below.

Housing Research

A priority in HUD research is the continuing effort to develop improved programs for assisting low-income families to obtain decent housing. A process using direct cash assistance for this purpose is undergoing rigorous testing in the multiyear Experimental Housing Allowance Program. This major investigation is seeking answers to policy questions about the feasibility of a national operating program.

How would recipients use cash payments for housing? How would the marketplace react to such a program? What types of agencies would best administer such a program? Separate experiments in selected locales are underway as part of the attempt to answer these questions.

In cooperation with HUD's Office of Equal Opportunity, PD&R's research on equal opportunity/fair housing is seeking new methods for State and local governments and private institutions to achieve national fair housing goals.

PD&R also is sponsoring research to encourage special designs and alternative housing types to meet the special requirements of the elderly and the handicapped.

In cooperation with local communities, private industry and other government agencies, researchers in housing safety are concentrating on ways to remove poison hazards from lead-based paint.

Innovative techniques which might slow down the rising costs of new housing, in terms of construction, land, operating and financing costs, are the focus of major new research initiatives.

A research program, which has tested new management techniques within 13 local public housing authorities, is continuing to investigate how to improve the management and maintenance of both subsidized and unsubsidized multi-family dwellings.

Community Development Research

PD&R is studying the complex problems associated with the decline of neighborhoods and is sponsoring and evaluating specific attempts by certain localities to preserve neighborhoods. One major objective is to adapt successful methods to other declining neighborhoods.

Local communities are testing an approach which may halt decline in subdivisions characterized by high default rates. Researchers also are designing other methods aimed at preventing and treating defaults on multi-family properties.

Researchers are trying to measure the impact of environmental standards on America's housing supply and housing costs. One important effort to overcome barriers to community development is the Modular Integrated Utility System (MIUS) Program. MIUS supplies energy for space heating and cooling by on-site generation of electricity. MIUS also recycles solid and liquid wastes for additional resource conservation and environmental benefits. Some components of MIUS are currently providing services to an apartment/commercial complex in New Jersey and are undergoing careful evaluations. A full-scale MIUS demonstration is planned to be operational by 1977.

State and Local Government Research

Enactment of the Housing and Community Development Act of 1974 has led to special emphasis on research and demonstrations to provide and promote the use of improved

Supporting ODR's two major strategies are activities concerned with new approaches and with monitoring the impact of R&D on educational practice. Planned for FY 1976 are experimental projects in dissemination and utilization, including innovative building projects in conjunction with education-related professional organizations, big-city school systems, and institutions of higher education. The processes of adoption and adaptation of specific R&D-based products at the school-building level will be monitored in a sampling of schools to determine what happens to R&D products in actual practice. Selected features of the R&D system will be examined to better understand how education knowledge is generated so NIE's dissemination and R&D support programs can be expanded and improved.

Demonstration projects are also being supported during 1975 and 1976 to communicate the operational aspects of promising practices and programs including the following:

- A program at the Center for the Study of Evaluation is developing and disseminating evaluation materials which will provide practitioners with strategies for routinely incorporating feedback from evaluations into school practice.
- A program, Individually Guided Education (IGE), has developed a new pattern of school operation where students are grouped not by grades but roughly by age limits (ages 4-6, 7-9, etc.), aptitudes, and stages of personal development. Implementation is directed to providing op-

General Audience	*Sub-Audience*
Practitioner	Elementary and secondary school staff
	School district staff
	Intermediate unit staff
	State education agency staff
	Institutions of higher learning—education staff
Professional interest	Teacher organization members and staff
	Subject area associations of educators
	Education research association members and staff
	Administrator association members and staff
Research and development	Institutions of higher learning—Research staff in education-related areas
	Research institutes, laboratories, consulting firms—staff in education-related areas
	Publishers of education-related products
Policy or legislative	Local school boards—members and staff
	State school boards—members and staff
	Governance boards for institutions of higher learning—members and staff
	Education committees in State legislatures—members and staff
	Education committees in U.S. Congress—members and staff
	Federal education advisory or policy councils—members and staff
Public interest	Students
	Parents
	Community groups concerned with education
	Special interest groups concerned with education (for example, minority groups and women)

The principal objective of the Office of Dissemination and Resources is to increase the impact of educational R&D on school practice by building a self-maintaining system for conveying the educational R&D findings, educational materials and curricula, and descriptions of exemplary local practice, to the teachers, administrators, and policymakers in the schools of the Nation. The most useful model of such a system for knowledge dissemination and utilization is the U.S. cooperative agricultural extension system, with its integrated, multi-level system for linking research to practice. NIE's dissemination program adapts the experience of this model by borrowing applicable features, such as the use of "extension agents," mixed funding, and subject specialization, while conforming to the obvious differences between agriculture and education.

Research Utilization Responsibility

In its mission, the National Institute of Education works in partnership with other R&D organizations to improve educational practices. Among several Institute strategies employed, the highest priority has been given to the dissemination and utilization of R&D findings and methods. Within the Institute, the Office of Dissemination and Resources (ODR) has the major responsibility for improving the dissemination and utilization systems in education.

Implementation

The overall approach of the Office of Dissemination and Resources recognizes the key role the States play in building an effective, comprehensive knowledge utilization system in education. This approach recognizes that States are legally responsible for education in the United States; that they are unique in their ability to allocate a range of resources for regulation, finance, and leadership in education; and that their strategic position links the R&D community to a substantial majority of educational practitioners. Although States and their designees—intermediate education agencies such as county offices and educational service centers—are the mainstays of the effort, professional associations, big-city schools, and higher education institutions will be included as programs develop. The following two major strategies are pursued by the Office of Dissemination and Resources to meet NIE's dissemination objective:

Maintaining and improving systems for the utilization of general education knowledge; and

Developing the capacity of education agencies to implement exemplary local practice and educational R&D addressing specific education problems.

Technology Transfer Accomplishments

In building a system for knowledge utilization, the following two findings regarding the dissemination-utilization processes are considered:

1. Practitioners in all fields rely most heavily on readily accessible information, whether or not it fully meets their needs; and
2. Interpersonal communication plays a vital role in the process of adopting or adapting new ideas.

The program therefore has two major thrusts involving existing activities: the maintenance and improvement of the education knowledge base to enhance its scope and accessibility; and the development of important linkages between that knowledge base and teachers, administrators, and policymakers. A cornerstone of this program is the Educational Resources Information

Support Services also monitored a program that evaluated a sample of R&D projects. The results have been incorporated into standards for evaluating incoming proposals. RSA will soon publish abstracts of about 2,500 R&D projects for use in the field and the Central Office. One staff member is developing options for using telecommunications in service delivery, and another is preparing films related to RU and rehabilitation. Also, a number of RSA films are stored in and circulated by the National Audiovisual Center. One RRI is beginning programmatic research on RU by concentrating on promoting use of results from three Research and Training centers and measuring impact of such use. Another recently funded RU project will disseminate filmed and printed international rehabilitation material on the severely impaired in an attempt to promote use of such information in domestic programs.

Technology Transfer User Organizations

The main users are some 100 State Vocational Rehabilitation agencies and Agencies for the Blind. Working with these agencies, directly and indirectly, are some 15,000 rehabilitation counselors, an indeterminately large number of rehabilitation social workers and nurses, 15,000 physical therapists, 11,000 occupational therapists, 1,200 psychiatrists, 25,000 speech pathologists and audiologists, 3,600 prosthetics and orthotics specialists, a large number of specialized personnel serving the blind and deaf, and an estimated 12,000 other specialists such as recreational specialists. There are also about 3,000 rehabilitation workshops of all kinds, each with administrators, supervisors, and foremen.

The ultimate users of much of the rehabilitation technology are, of course, the various categories of disabled persons themselves, who are numerous. In 1973, more than 1 million disabled persons were actively served by the State agencies, and 360,000 of these were closed as rehabilitated. In addition, the RSA Central Office and regional staff make administrative use of rehabilitation technology and research results.

Future or New RU Program Emphasis

The broad future goal of the listed RU activities is to coordinate R&D management, program evaluation, needs assessment, program development, and RU activities themselves to assure a productive R&D and utilization of its results to solve real operating problems in service programs. In this way, over a period of time R&D and service programs will become more relevant to each other and will improve substantially.

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- Rehabilitation Research and Training Centers in colleges and universities to conduct advanced research in rehabilitation, and the training of rehabilitation research and service personnel. Funds are included for services rendered to handicapped persons in connection with such research and training.
- Rehabilitation Engineering Research Centers to develop methods for applying advanced medical technology and other knowledge to help handicapped persons. This includes cooperative research with public and private agencies to promote new scientific knowledge, equipment, and devices to help the disabled; and cooperation with State agencies to develop systems of information exchange to promote the prompt utilization of engineering and other research results to help the handicapped.
- A program of spinal cord injury research that includes research projects, assures dissemination of research findings among all spinal cord injury centers, encourages new approaches by all investigators and service providers seeking to help such injured persons, and maintains close working relationships with all other organizations engaged in similar efforts.
- A program of spinal cord injury research that includes research projects, assures dissemination of research findings among all spinal cord injury centers, encourages new approaches by all investigators and service providers seeking to help such injured persons, and maintains close working relationships with all other organizations engaged in similar efforts.
- A program for international rehabilitation research, demonstration, and training to develop new knowledge on the rehabilitation of handicapped persons in the United States. Information that other nations have found useful will be applied in the United States. Technical assistance and exchange of experts in rehabilitation with other nations will be included.

In addition, a related program to support the training of various professionals serving the handicapped (in such areas as rehabilitation medicine, counseling, social work, physical therapy, speech pathology, and prosthetics) is authorized under another section of the act. Other sections authorize grants to expand or otherwise improve rehabilitation services, and funds for vocational training and other services for handicapped persons.

Research Utilization Policy and Objectives

The long-range Research Utilization (RU) goal is to formalize and install an RU system that will fit RSA needs and circumstances, and maximize total impact of the following RU activities:

- To build into RSA R&D programs a better potential for valid, usable results by new RU-oriented planning, reviewing, and monitoring activities.
- To improve both research and service programs by evaluating active and/or completed R&D projects and the impact of the latter on the field, and by feeding R&D findings back to managers, researchers, and service agencies.
- To improve RSA R&D information activities to specifically facilitate research utilization.
- To increase the use of R&D results by linking research projects, findings, and personnel with R&D users.
- To encourage service agencies to develop a capacity for self-renewal and ongoing problem-solving.
- To generate or otherwise acquire new general knowledge on the diffusion and adoption of innovations and, in particular, knowledge on the "natural history" of

ly toxic chemical substances found in man's environment.

- To determine the basic biological processes for chemical toxicants in animal organisms.
- Development of improved methodologies and test protocols for evaluating the safety of chemical toxicants.
- Development of data that will facilitate the extrapolation of toxicological data from laboratory animals to man.
- Conducts additional research programs as may make appropriate use of facilities and expertise of the Center and contribute to its overall scientific capability.
- Develops, as a national resource, Center's programs in close cooperation with other agencies, such as the National Institutes of Health and the Department of Agriculture.

Implementation

The National Center for Toxicological Research disseminates its research findings and methodology developments in a number of ways. Significant findings are published in the scientific journals, presented at various scientific meetings, and interactions with interested participants on site. In addition, the Center publishes an annual report to identify its major research activities and cooperates with various segments of the media to develop feature articles, which includes trade journals, newspapers, radio, and television. Numerous educational, professional, and scientific groups tour the facilities to observe the unique capabilities of the Center.

Technology Transfer Accomplishments

NCTR has developed an automated information system to assist in experiment management and scientific report writing. The flexibility of the system allows rapid updating as the state of the art improves and new software units are designed. The present data bases in the NCTR minicomputers are stored in the large FDA computer in Washington, D.C., and the information is readily retrievable. The technology has been shared with Omni Corp., the Upjohn Co., The Dow Chemical Co., Riker Labs., Inc., Tracor-Jitco, Litton Bionetics, NCI, NIH, M. D. Anderson Hospital and Tumor Institute, Bureau of Drugs, and Bureau of Foods.

Pathological data generated by the various NCTR investigators is recorded from the time of necropsy to the final histopathological examination of the slides. Mark-sensitive forms record the data which are transferred to the computer system via an optical mark reader. All pathological information is stored in the FDA computer and retrieved at the time of scientific report writing. This system has proved to be of major interest to The Dow Chemical Co., Omni Corp., and the Upjohn Co.

Negotiations are underway with the General Services Administration for the preparation of a technology package which could be available to other Government agencies.

An ad hoc group was appointed to assist in the development of a protocol for improving the methodology for teratological research. This protocol was utilized by NCTR, FDA Bureau of Foods and Biotest Laboratories in the evaluation of the teratological potential of amaranth utilizing Osborne-Mendel and CD strain rats. The results obtained showed no significant teratological effects which would result in banning the dye. Analysis of this unique joint Government-industry study revealed several problem areas to be considered in future studies of this type.

The primary mission of NCTR is long-term feeding studies of chemical toxicants. To facilitate such work, a new mouse feeder (patent pending) was developed to prevent fecal and urinary contamination of the diet and to

and local government use in assuring food safety and quality.

- Plans FDA surveillance and compliance programs and evaluates progress toward objectives of planned program and regulatory activities relating to foods, food additives, colors, and cosmetics.
- Reviews industry petitions and recommends promulgation of regulations for food standards and for the safe use of color and food additives. Collects and interprets data on nutrition, food additives, and environmental factors affecting the total chemical insult posed by direct and indirect food additives.
- Analyzes regulatory samples as necessary to support Bureau compliance programs.

Research Utilization Policy and Objectives

Bureau of Foods has actively encouraged technology transfer through regular programs of publication and distribution. These programs include publication of scientific papers and reports in the open literature; presentation of papers and talks at scientific, technical, and trade meetings; sponsorship of several serial publications and of occasional monographs; and the generation of internal reports of scientific work not necessarily intended for publication, which will be stored in retrievable form.

Implementation

It has been a longstanding policy of Bureau of Foods to encourage its scientific personnel to publish their findings in the open scientific literature. To encourage production of high-quality papers, the Bureau instituted an internal peer review system for scientific manuscripts in 1961. This system is monitored by the Technical Editing Group of the Bureau. This Group also provides full editorial and typing assistance and assists with other details of publication such as proofreading, ordering reprints, and paying publication charges. In 1974, Bureau of Foods scientists published over 100 papers and reports in approximately 40 different journals. Some of these papers were also presented at open scientific and technical meetings. In addition to these, more than 50 talks were given to technical, trade, and consumer groups. Ten Bureau scientists accepted invitations to contribute chapters to scientific and technical books.

Bureau of Foods sponsors the serial publication, *FDA By-Lines,* which is published six times a year. Each issue contains 50-60 pages. The articles are essentially technical in nature; they may be reports of current research, instructional material, a general overview of a situation in which FDA is concerned, a special bibliography, useful data which led only to negative findings or which is not publishable in conventional journals for various reasons, and the like. In addition to FDA personnel, *By-Lines* circulates to State and municipal agencies, other Federal agencies, foreign governments, libraries, universities, and industry.

Twice yearly the Bureau issues "Selected Technical Publications," a compilation of reprints of the published papers described above. This publication is intended chiefly for archival purposes, since most of the articles have been in print for at least 18 months at the time "Selected Technical Publications" appears in print. It is distributed chiefly to libraries and other institutions in this and foreign countries; emphasis is given to distribution to underdeveloped countries with limited information facilities.

Bureau of Foods also sponsors "Bacteriological Analytical Manual for Foods," a compilation of methods and techniques used for microbiological analysis within FDA. The manual is made available outside FDA by

This effort involved participants from "Eastern Bloc Nations" and "Western Bloc Nations" and from both academically based and governmentally based research institutions. This meeting accomplished an interchange and understanding of scientific technology between all of the above-listed components far superior to all previous attempts through other means.

The Bureau maintains a mailing key of approximately 5,000 individuals or organizations. The key is split into three main categories: medical applications, biological effects, and electronic products. Within these major groups are included such subgroups as: State and local agencies, other U.S. Government agencies, research and development laboratories, hospitals, libraries and information services, universities and schools, professional associations, commerce and labor associations, international agencies, and the mass media.

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BUREAU OF BIOLOGICS

Enabling Legislation and Mission

The regulation of biologics (serums, vaccines, etc.) began in 1902 under the direction of the Hygienic Laboratory. In 1937 the National Institute of Microbiology was established. In 1948 the regulation of biologics, etc., was under the direction of the National Institute of Allergy and Infectious Disease at the National Institutes of Health. In 1960 the Division of Biologics and Standards was established. The Division was then transferred to the FDA and became the Bureau of Biologics.

The Bureau of Biologics with its six Divisions and Administrative Offices:

- Administers regulation of biological products shipped in interstate and foreign commerce under the biological product control provisions of the Public Health Service Act and the Food, Drug and Cosmetic Act.
- Inspects manufacturers' facilities for compliance with standards, tests products submitted for release, establishes written and physical standards, and approves licensing of manufacturers to produce biological products.
- Plans and conducts research related to the development, manufacture, testing, and use of both new and old biological products to develop a scientific base for establishing standards designed to insure the continued safety, purity, potency, and efficacy of biological products.
- Administers applicable provisions of the Federal Food, Drug and Cosmetic Act as they pertain to human drugs that are biological products.
- In carrying out these functions, cooperates with other bureaus of FDA, other PHS organizations, governmental and international agencies, volunteer health organizations, universities, individual scientists, nongovernmental laboratories, and manufacturers of biological products.

Research Base

The Bureau's major research and development programs comprise projects, namely, Viral and Rickettsial Products, Blood and Blood Products, Bacterial Products, and the Office of Efficacy Review. The latter project is concerned with the review of all licensed

Technology Transfer Accomplishments

Apart from the intramural research studies being conducted at the Division of Veterinary Research, some 22 extramural research contract studies are being conducted in FY 1975.

Examples of recent Bureau-sponsored achievements in a variety of areas include:

- Develop and evaluate improved methods of determining the margin of safety for organosphosphates applied to domestic animals.
- The effects of low-level antibiotic feed supplements on the carrier state of Salmonella in domestic animals.
- Monitoring drug residues in milk from the use of commercial mastitis preparations.
- Evaluation of models for the study of cardiotoxicology of human and veterinary drugs.

Future Program Emphasis

In FY 1975, the Bureau's research program includes the following activities: continuation of both intramural and extramural research in four major categories: Drug Residues; Antimicrobials; Carcinogens; and Reevaluation of Approved Drugs.

The majority of the extramural research contractors are academic institutions and therefore probably influence industries' acceptance and utilization of new screening techniques. Publications of new research data in professional journals assists the practicing veterinarian in regard to the efficacy and technical application of new veterinary drugs.

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BUREAU OF RADIOLOGICAL HEALTH

Enabling Legislation and Mission

The Bureau of Radiological Health, which became part of the Food and Drug Administration subsequent to Presidential Reorganization Plan No. 3 of 1970, and later assignment by the Assistant Secretary for Health in May 1971, operates under the delegation of authority as set forth in the Public Health Service Act (Secs. 301, 311, 354-360F), and the Food, Drug and Cosmetic Act (Secs. 501-505, 507, 508, and 510).

The Bureau of Radiological Health develops and carries out a national program designed to assure the safe and efficacious use of potentially hazardous ionizing and nonionizing radiation, and to control the unnecessary exposures of man to this radiation.

Research Utilization Policy and Objectives

The Bureau of Radiological Health consists of five divisions and other offices:

- Conducts an electronic product radiation control program, including the development and administration of performance standards.
- Plans, coordinates, and evaluates surveillance and compliance programs relating to radiation exposure.

the fields of medical devices and diagnostic products. These standards include voluntary and regulatory standards, tentative and recommended standards, recommended practices, purchasing specifications, policy statements, glossaries of technical terms, and proposed standards. The standards identify criteria such as performance, sensitivity, accuracy, materials, safety, durability, and other areas relevant to the safety and performance of medical devices and diagnostic products. Additionally, the listing serves as a basis for the continuing review of the adequacy of existing standards and as a guideline for the development of new standards. The MDDPSS is published annually; significant changes throughout the year are published as addenda to the survey.

Available technology in the medical device and diagnostic product areas is being broadly disseminated through the various proceedings surrounding our classification efforts. Extramural panels of experts are classifying devices and diagnostic products into three categories based on degree of potential hazard to human health. The panels, consisting of seven voting members and two nonvoting members representing industry and consumer groups, bring together extensive expertise on the developmental, manufacturing, and application aspects of these products. Additional expertise is provided by use of consultants possessing unique knowledge of specific products, or specific aspects of products. Other interested parties, including manufacturers, are encouraged to present their knowledge and viewpoints during the open (public) portion of meetings. Panel meeting agendas are published monthly in the *Federal Register* and also mailed to interested parties. Resulting summary minutes, including classification results, are likewise distributed to persons on the same mailing lists and are also available for public review in the Office of the Hearing Clerk. These actions provide an open exchange of technological information on all facets of medical devices and diagnostic products.

List of Users

Organizations on the various mailing lists to receive meeting agendas and minutes include manufacturers, trade associations, professional associations, research organizations, testing laboratories, universities, standards organizations, hospitals, publishers, law firms, and military units. Individuals include consultants and other interested parties.

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rule research is supported and directed by those operating units who have the immediate needs for the desired research products. The Bureau and agency have a very effective mechanism for dissemination of research findings in the *Drug Bulletin,* a periodic newsletter-type publication directed to all practicing health professionals in the country. In addition close ties are maintained with the compendial organizations to assure an immediate dissemination of relevant research findings to these scientific standard-setting bodies.

Technology Transfer Responsibility

As noted above, it is the responsibility of each Bureau and field laboratory director to adapt to useful application and/or communicate within appropriate scientific circles, all significant findings from research conducted within or on behalf of their problems.

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BUREAU OF MEDICAL DEVICES AND DIAGNOSTIC PRODUCTS

Enabling Legislation and Mission

The Bureau of Medical Devices and Diagnostic Products (BMDDP) was established as published in the *Federal Register* (39 F.R. 5812) on February 15, 1974. The fundamental mission of the Bureau is based on the statutory authority of the Federal Food, Drug and Cosmetic Act.

The Bureau of Medical Devices and Diagnostic Products:

- Develops FDA policy regarding the safety, efficacy, and labeling of medical devices and *in vitro* diagnostic products;
- Collects and evaluates data on significant hazards to the public health which may be caused by the use of medical devices and diagnostic products;
- Develops and recommends regulations and changes in or addition to FDA legislative authority necessary to protect the public health;
- Evaluates the safety, efficacy and labeling of medical devices and diagnostic products and recommends their classification into regulatory categories;
- Conducts research and coordinates the development of standards for appropriate categories of medical devices and diagnostic products;
- Publishes approved standards and regulations specifying good manufacturing practices in the *Federal Register;*
- Develops, plans, coordinates and evaluates FDA surveillance and compliance programs for medical devices and diagnostic products, and initiates compliance actions as necessary;
- Provides assistance in the handling of legal actions on medical device and diagnostic product matters;
- Operates a National Medical Device Experience Monitoring System;
- Provides the Commissioner with authoritative advice on significant existing and anticipated problems in the area of medical device and diagnostic product safety;
- Develops and disseminates educational materials on medical device and diagnostic product problems in conjunc-

Food and Drug Administration

Enabling Legislation and Mission

The Food and Drug Administration (FDA) has authority under the Food, Drug and Cosmetic Act which was enacted by the Congress in 1938. It replaced the first Food and Drug Act passed by the Congress in 1906. Since 1938, the Food, Drug and Cosmetic Act has been amended several times. Other acts under which FDA has authority are the Fair Packaging and Labeling Act of 1966, the Radiation Control for Health and Safety Act of 1968, the Public Health Service Act, and the Tea Importation Act. In addition to these, FDA has limited authority under other statutes such as the Meat, Poultry, and Egg Act, the Federal Caustic Poison Act and the Import Milk Act.

FDA is the Federal Government's primary consumer protection agency. The mission of the FDA is to protect the public health of the Nation as it may be impaired by foods, drugs, biological products, cosmetics, medical devices, ionizing and nonionizing radiation-emitting products and substances, poisons, pesticides, and food additives. FDA's regulatory functions are geared to insure that: foods are safe, pure, and wholesome; drugs, medical devices, and biological products are safe and effective; cosmetics are harmless; all of the above are honestly and informatively packaged; and that exposure to potentially injurious radiation is minimized.

The total FDA budget for FY 1975 was $195,356,000 and consists of six Bureaus: Biologics, Drugs, Foods, Radiological Health, Medical Devices and Diagnostic Products, Veterinary Medicine; the National Center for Toxicological Research; and Administrative Offices.

BUREAU OF DRUGS

Enabling Legislation and Mission

The Food, Drug and Cosmetic Act provides the statutory basis for FDA's regulation of drugs for human use. The human drugs regulatory program broadly covers the areas of: manufacturing, safety and efficacy, product labeling, and research in human subjects. Primary responsibility for the program is vested in the headquarters-based Bureau of Drugs. It is subdivided into subprograms: new drug evaluation, drug monographs, compliance, biometry and epidemiology, pharmaceutical research and testing, information systems, and planning and evaluation. While the bulk of the scientific activity is conducted or directed by the Bureau, an important portion of the program is implemented in accord with headquarters direction by a nationwide field staff.

Research Base

Research is conducted both intramurally by Bureau headquarters and field laboratory scientific staff and extramurally under contract and grant support to outside investigators. While there is no bar to the support of basic research, historically, Bureau and field research have been almost exclusively directed to applied research in direct support of the regulatory activities. Specific areas of research pursued in the human drugs program are as follows:

Drug Safety and Efficacy

Testing Methodology

A continuing need exists for new and better methods for predicting or confirming the effects of drugs in humans through tests in animals. The Bureau's extramural and intramural research programs include development and evaluation of animal models for pharmacological and toxicological testing.

Drug Toxicity in Animals and Humans

The ultimate test of the toxicity of drugs only occurs in the course of large-scale use in

tion, formal presentations at professional meetings, and publications. Research results from demonstration projects have been summarized for each content area. Literature reviews have been prepared on rural mental health, sheltered programs, social problems and community participation, systems research and administration, allied services, children's mental health services, clinical facilities, and program evaluation.

The Services Development Branch also maintains an active program of studies on the research utilization process itself. Through contracts or collaborative grants, a number of publications have emerged on the topic of technology transfer. A five-series report entitled *Planning for Creative Change in Mental Health Services,* distributed to some 15,000 users; *Evaluation* magazine, now distributed to some 30,000 readers periodically; and *Innovations* magazine sent regularly to 12,000 readers.

From the results of studies conducted through the Mental Health Services Development Branch, succeeding generations of improved methods of technology transfer have been developed: (1) Improved methods of planning and conducting research, such as inviting the participation of user/consultants; (2) more vigorous and polished special publications by investigators, with continued value placed upon traditional journal dissemination but with new emphasis on attractive manuals to compete for user attention and employment; (3) person-to-person presentations of results through traveling or on-site demonstrations of the use of new technology; and (4) technical assistance on planned organizational change. A training manual to increase the competence of change consultants at the regional, State, and local levels is soon to be published. As a result of adopting new policies and practices concerning its own efforts in technology transfer, the Branch has demonstrated that the utilization rate of completed projects (by a gross criterion of specific identities of off-site users of project findings) has increased from 11 percent in 1968 to 84 percent in 1974. For just the R&D investment of the Branch alone the improvement represents a saving of over $5 million per year—the cost of projects that otherwise would have failed to reach the criterion of successful utilization.

Technology Transfer Accomplishments

The objective in this example is to further increase the effectiveness and efficiency of community mental health center (CMHC) operation through the adoption of needed technology. The first step involves a periodic survey of problems experienced by CMHC personnel, both currently and as anticipated. For instance, in the most recent survey CMHC staff expressed a need for technology related to preventive services in the area of child mental health. The second step also involves a survey of all CMHC's across the Nation to determine what technical innovations others have had success with regarding the assortment of priority needs. A third step is the retrieval of available knowledge relating to the primary needs reported by the CMHC's. This retrieval is carried out by the NIMH's Mental Health Services Development Branch, employing traditional devices for knowledge retrieval plus a new system for on-site access. At both NIMH and interested CMHC's, a small, inexpensive "typewriter terminal" is connected to a center at UCLA in which recent research reports in brief form are stored. The fourth step entails providing each CMHC with a loose-leaf binder containing innovative technologies and research information relevant to a specific need. Additions are mailed to the centers as they are obtained. A fifth step is to provide those centers requesting assistance with consultants who offer help in planning for organizational change in the adoption of the new technology. As a sixth step, the NIMH stimulates needed research on technology not found to be available elsewhere. Such

point for the collection and dissemination of information on alcoholism and alcohol abuse. It has answered inquiries from the general public and the professional community, provided reference services, distributed documents, developed new materials and publications, and compiled directories of alcoholism programs and federally supported activities.

National Clearinghouse for Drug Abuse Information

This unit, established in 1970, has operated both as a central source for the collection and dissemination of drug abuse information for all Federal agencies and is a coordinating information agency for groups throughout the country involved in drug abuse programs. It has operated a nationwide network of drug abuse information centers, developed drug abuse resource materials, and responded to inquiries from the general public as well as from special groups such as educators and research scientists. It also has operated information systems covering international drug abuse programs, the world literature on drugs, and Federal grants and contracts concerned with drug abuse.

National Clearinghouse on Mental Health Information

This Clearinghouse was established in 1962. It has built up a strong program for collecting, storing, retrieving, disseminating, and publishing scientific information on all aspects of mental health, gathered from worldwide sources. It annually has added about 35,000 documents (primarily journal articles), in abstract form, to its computer files and has handled about 500 inquiries a month from students and professionals in mental health fields. As is true of all three of the Institutes' clearinghouse operations, NCMHI emphasizes the dissemination of results produced through its own research support program.

The NIMH Division of Scientific and Technical Information carries overall responsibilities for promoting and coordinating the dissemination of knowledge among all operating divisions of the Institute. Further, that division is responsible for components carrying out mental health education, technical services, graphic services, special reports, public inquiries, general communications, as well as the National Clearinghouse for Mental Health Information. NIDA supports a similar program, the Division of Scientific and Program Information.

The NIMH Mental Health Services Development Branch carries responsibility for promoting the direct transfer of technical knowledge into the delivery of mental health services, particularly among States, mental hospitals, and community mental health centers.

Implementation

Approaches toward promoting technology transfer common to all three Institutes of ADAMHA have been referred to under the section on Policies, above. Beyond the standard strategies, however, many of the research and development components carry out programs uniquely appropriate for their own content and clientele. Several examples will be given here.

Psychopharmacology Service Center

The Psychopharmacology Service Center, established in 1956, has had as its principal activity the fostering of the dissemination and use of research information. For some 15 years it has published *The Psychopharmacology Bulletin* which is distributed to 6,000 researchers throughout the world. *Psychopharmacology Abstracts* (abstracts of published literature) also was originated by this program. The branch supporting the



Weekly meeting of consultants on technical assistance, Mental Health Service Development Branch, NIMH.

The mental health hospital improvement grant program represents a conduit through which new technology can be adopted among mental hospitals of the Nation. The purpose of such grants is to improve the quality of care, treatment, and rehabilitation of patients toward encouraging transition to open institutions and developing more cooperative relationships with community programs for mental health. Its enablement is the PHS Act, Section 303(a)(2), P.L. 78-410.

The community mental health centers program also provides an opportunity for the assimilation of new knowledge into service programs. Project grants provide funds, on a formula basis, to improve the organization and allocation of mental health services and to provide modern treatment and care within a geographical community of the consumer. The legal basis is the Mental Retardation Facilities and Community Mental Health Centers Construction Act of 1963, Part A, Title II, P.L. 88-164, as amended by P.L. 89-105, and 90-30, 90-574, 91-122, 91-513, and 91-515.

Research Base

The National Institute on Alcohol Abuse and Alcoholism supports knowledge development in the biomedical and behavioral areas. For example, one recent project has dealt with brain monoamines and their relevance to sleep and alcoholism. Another has studied the neurobiological correlates of chronic alcohol consumption. In the behavioral area a project has dealt with how people at the mid-career station of life cope with alcoholism. Another is addressed to socialization of

effort to utilize available satellite communications technology to upgrade the quality of health care currently provided to remote, isolated populations such as those in the Tanana Service Area of Alaska.

The primary objectives of the ATS-6 experiment are to evaluate the ability of outreach personnel to effectively use advanced satellite telecommunications in a real environment; evaluate the impact of broadband communications on health care; evaluate tradeoffs between technological capabilities and the level of training, and evaluate the use of interactive video for continuing education of remote hospital personnel and village practitioners.

Health Maintenance Organizations: Over the past 10 years the size of the health industry in this country has greatly increased. Costs have accordingly spiraled upward. The advent of Medicare and Medicaid placed particularly severe strains on resources even in light of attempts to cope with the increased demand. Exploration of new techniques offered HMO's as a potentially viable alternative to the existing fee-for-service system. Legislation was passed in late 1973. The prepaid group practice model provides an incentive for keeping costs down and quality high, and consequently HMO's emphasize preventive medicine, early disease detection, patient and physician education, and support increased use of other health professionals to enable more efficient use of physician time.

Division of Hospitals and Clinics of the Bureau of Medical Services: In carrying out its primary mission of providing medical care to designated beneficiaries, the Division supports a program of biomedical research, clinical investigation, and health service investigational drug evaluation. The hospitals and clinics of the Division have quality-of-care assurance programs to assure that the latest technology in patient care is used in training, education, and research activities in cooperation with other hospitals and medical centers in the community.

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Alcohol, Drug Abuse, and Mental Health Administration

Enabling Legislation and Mission

The Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA), formed in 1973, deals with the sociomedical problems of alcohol abuse, drug abuse, and mental illness. The major subsidiary components of ADAMHA are the National Institute on Alcohol Abuse and Alcoholism, the National Institute on Drug Abuse, and the National Institute of Mental Health. In all three institutes research and development programs are carried out in coordination with training and services programs.

Enabling legislation relevant to research and development activities and to the transfer of knowledge may be summarized as follows:

NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM

The legal basis for alcohol research programs is the PHS Act, Sections 301, 301(h), 304; P.L.

programs into broader health care settings.

- To develop improved measures of the impact of programs on target populations, manpower productivity, and quality of care.
- To implement strategies that assure maximum utilization of present and proposed financing mechanisms to support HSA objectives and programs.
- To develop and implement approaches that will enable programs to expand their services by capturing all the third-party reimbursements to which they are legally entitled.
- To develop a conceptual redesign of the health delivery system for medically underserved people in the context of national health insurance.
- To increase program and management adequacy to ensure the most efficient and efficient use of human and financial resources at all HSA levels and within HSA programs and projects.
- To identify and implement strategies that assure achievement of improved efficiency in HSA-supported programs and projects, and to use those programs and projects as laboratories for testing innovative management techniques.
- To develop and implement methods for more rapid identification and positive resolution of management and administrative problems in HSA direct service programs and grantee projects.
- To develop an improved and well-integrated planning and evaluation effort, based on a sound data base tied to decision-making processes.
- To develop, install, and operate effective manpower management, quality assurance, and operational planning systems and programs throughout HSA.

Research Utilization Responsibility

The efficient and effective management of the Health Services Administration and the optimal operation of its programs rests with the Administration and is accomplished through planning and evaluation techniques, periodic program and project monitoring, the funding of health care demonstration projects, provision of direct care services, dissemination of research findings and general information sharing.

Implementation

The HSA serves chiefly as beneficiary of technological advances which are, in keeping with the mission of the agency, transferred to the ultimate consumer of health care. HSA usage of technological findings is just as diversified as the types of technological research:

The Bureau of Community Health Services provides a national focus for improving health care organization and delivery, and thus

- Facilitates the development of locally based programs of health service delivery.
- Initiates activities which provide alternative methods of health service delivery and health maintenance.
- Enhances the capacity of existing health service programs for full participation in the major public health financing systems—Medicare and Medicaid.
- Administers programs providing specific service to specific populations including family planning, maternal and child health care, and migrant care.
- Directs programs which assure accessibility to health care in underserved areas.
- Improves quality and contains costs of services provided in grant-initiated health service delivery programs.

- Establishment of a National Health Planning Information Center to ease the exchange of information concerning health services, resources, and planning and resource development practice;
- Development of planning approaches and policies;
- Provision of other technical assistance as needed.

Implementation

These activities will be carried out by the agency as well as through grants and contracts. The agency is required, in addition, to help in meeting the cost of planning, developing, and operating centers for multidisciplinary health planning development and assistance. A minimum of five centers—distributed geographically across the country—are scheduled to be in operation by June 30, 1976.

The participation of health planning professionals in both the design and implementation of these projects will be critical to their eventual success.

The Center for Health Resources Planning Information is currently being designed. When completed, it will provide health planners with information needed to improve the planning process and to make decisions on future resource needs. The Center is being planned in cooperation with the National Technical Information Service, which will maintain a complete file of all health resources planning information, announce availability of information services, conduct searches for information, and provide full texts of all information in the file.

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Office of Communications
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NOTE:

A further important factor in the Health Resources Administration relating closely to Technology Transfer is the journal, *Public Health Reports,* published by HRA. This magazine publishes contributions from many sources of value to public health, health and medical care, and community medicine.

Public Health Reports is published six times per year.

Inquiries on editorial matters should be addressed to:

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5600 Fishers Lane
Rockville, Maryland 20852

Health Services Administration

Enabling Legislation and Mission

Although the Health Services Administration (HSA) of the Department of Health, Education, and Welfare was established under Part 3 of the Reorganization Order effective July 1, 1973, the Division of Hospitals and Clinics of its Bureau of Medical Services traces its history back to 1798 when Congress passed an "Act for the Relief of Sick and Disabled Seamen."

The Health Services Administration provides a national focus for programs and health services for all people of the United States with emphasis on achieving the integration of service delivery and public and private financing systems to assure their respon-

NATIONAL CENTER FOR HEALTH STATISTICS

Enabling Legislation and Mission

The National Center for Health Statistics is the only Federal agency established specifically to collect and disseminate data on health in the United States. The Center designs and maintains national data collection systems, conducts research in statistical and survey methodology, and cooperates with other agencies in the United States and in foreign countries in activities to increase the availability and usefulness of health data. Among the latter activities is the development of the Cooperative Health Statistics System, involving State, Federal, and local agencies in the collection and sharing of the health data needed at all levels of government.

Authority is from P.L. 93-353, Health Services Research, Health Statistics, and Medical Libraries Act of 1974.

Research Base

The Center conducts a program of basic measurement research and long-range applied research in statistical methodology. Under the Cooperative Health Statistics System (CHSS) the Center is supporting projects to examine alternatives to the content, structure, and methods of the System. These projects involve a number of statistical components of the System, but with emphasis on long-term care, hospital care, ambulatory care, and health manpower components. Data utilization is highlighted in many of these efforts.

Technology Transfer Policy and Objectives

The Center seeks the widest possible use of the findings of its various data collection systems, which include continuing health interview and examination surveys of national samples of the U.S. population, the national vital registration system for births, deaths, marriages, and divorces, and inventories of health facilities.

Findings are made available in several forms:

- *Publications:* About 45 reports are published annually in the *Vital and Health Statistics Series.* Current, provisional vital statistics data are published in the *Monthly Vital Statistics Report,* with final, official data for each year in the annual volumes of *Vital Statistics of the United States.*
- *Data Tapes:* Standardized tapes of aggregated data from the various survey systems and the vital registration system may be purchased. Format and content of the tapes, as well as ordering information, are given in Standardized Micro-Data Tapes of the National Center for Health Statistics (DHEW Publication No. HRA 74-1213).
- Special and unpublished tabulations.

Developments in the Cooperative Health Statistics System are reported in the periodical *News of the Cooperative Health Statistics System.* A series of regional meetings is being held during FY 1975 to provide for an exchange of information between Center staff and users and producers of health data.

The organizations responsible for technology transfer information are the Division of the Cooperative Health Statistics System and the Scientific and Technical Information Branch, Division of Operations, National Center for Health Statistics.

Implementation

The Cooperative Health Statistics System will provide for the collection of any particular data element by that level of government best equipped to collect it, and the information then will be shared with other levels. As now envisioned, the System will include seven components in the area of vital and

Included in its results are hemodialysis equipment of many kinds, including, most recently, a new generation of "hollow fiber" dialyzers now being produced commercially. Another development is a semiportable artificial kidney machine, capable of detoxification of uremic patients without connection to a water supply or drain. Flat-plate dialyzers, single-needle (rather than double-needle) systems for access to the bloodstream, peritoneal dialysis systems utilizing indwelling silicone rubber catheters, and other instruments have been developed and improvements are sought under a large annual contract program.

All the above examples are indicative of formal, continuing activity that results in development of materials or procedures for technology utilization. There are numerous additional efforts that result in technology transfer as a byproduct of more general research.

For example, in 1974, as a result of cooperative efforts by scientists of the *National Institute of Neurological Diseases and Stroke,* the Food and Drug Administration and a pharmaceutical company, the drug carbamazepine (Tegretol) won approval by the Food and Drug Administration for general use in long-term treatment of epilepsy. This was the first new antiepileptic drug to be introduced in 14 years and is expected to provide valuable alternative medication for control of seizures in a substantial number of patients. Another drug, clonazepam (Clonopin), is now under consideration for similar approval, and several others are under active clinical investigation by instramural and grant-supported scientists seeking better means of epilepsy control.

Similar studies supported by this Institute are directed to at least six other drugs, new formulations, or combination therapies for epilepsy control. If results warrant, additional new medications will become available in private medical practice as a direct result of treatment research.

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Health Resources Administration

NATIONAL CENTER FOR HEALTH SERVICES RESEARCH

Enabling Legislation and Mission

The National Center for Health Services Research was created by passage in the 93d Congress of the Health Services Research, Health Statistics, and Medical Libraries Act of 1974. It supersedes the Bureau of Health Services Research which has been a part of the Health Resources Administration since July 1973 when that Administration was formed in a reorganization of the various agencies of the U.S. Public Health Service.

The mission of the National Center is to conduct, support, and stimulate a national program of research, development, demonstration, evaluation, and health service research training. It serves as lead agency in design and support of research and development projects which are prototypes for health service programs and providers of health services.

Public information materials. All components of NIH, and the Office of the Director, regularly issue a variety of publications, audiovisual materials, educational videotapes, tapes and films for publication and broadcast, and other materials to explain research findings through mass communications media, and to practicing physicians through the professional press, closed-circuit television lectures and other devices.

Support of technological development. As an important aspect of its research activity, all NIH components participate in development, utilization, and dissemination within the private sector of technological materials, devices, and techniques as a specific aspect of programs in support of their missions. Examples include:

The National Institute of General Medical Sciences annually expends approximately $21 million in support of biomedical engineering, to increase effective introduction of engineering into fundamental and applied biomedical research.

This program supports research through regular research grants and special center grants. Contracts are utilized for the support of applied research and development. A number of individuals in clinical chemistry, biomedical engineering, and diagnostic radiology have been and are currently being supported through fellowships and training grants.

This program was supported by a total of 206 research grants, centers, fellowships, training grants, and seven contracts in 1973. Research includes the development of systems for rapid data acquisition and display, involving new types of transducers and integrated electronic circuitry. Emphasis will continue on instruments for positive patient/sample identification, for automated laboratory procedures, and newer techniques in diagnostic radiology. A new training program for postdoctoral candidates will be initiated in 1975.

The Division of Research Resources annually expends some $11.5 million on biotechnology research.

The program awards grants and contracts for the development and use of sophisticated health-related technologies. Emphasis is placed on digital computation, mass spectroscopy, nuclear magnetic resonance spectroscopy, and electron microscopy, although other technologies also are included in a limited degree. The main thrust of this program is the furtherance of biomedical research through creation of centers of technological excellence which in turn provide the grantees and contractors of NIH's categorical programs with investigative opportunities they otherwise would not have.

The nature and scope of the various biotechnology resources over the years have been closely associated with major technological advances and research opportunities. Beginning from almost pure research activities 10 years ago, the program has evolved to the point where, in addition to furnishing research services, each resource now in its own specific area of technology enters into close collaborative activities with its user community; engages in core research to further develop the technology as a tool in biomedical research; and conducts formal and informal training to acquire new skills for its own staff and to disseminate the benefits of its technology to the user community. Incorporating all of these activities within a resource makes the resource more responsive to the needs of the medical scientific community.

The Division also supports more than 80 clinical research centers in medical institutions throughout the country in which application of research findings to patient care is emphasized. It funds a number of

The budget for FY 1975 was approximately $2 billion, of which approximately 80 percent was allotted to support of extramural research and development.

Research Utilization Policy and Objectives

The NIH technology utilization mandate is implicit in several legislative sources. The Public Health Service Act, as amended (Sec. 301, 42 U.S.C. 241), states:

> "The Surgeon General shall conduct in the Service, and encourage, cooperate with and render assistance to other appropriate public authorities, scientific institutions and scientists in the conduct of, and promote the coordination of, research, investigations, experiments, demonstrations, and studies relating to the causes, diagnosis, treatment, control and prevention of physical and mental diseases and impairments of man . . ."

To carry out the foregoing, the same act, in Sec. 301(a), authorizes the Surgeon General to:

> "Collect, and make available through publications and other appropriate means, information as to, and the practical application of, such research and other activities."

The congressional directives and interest have continued through the years. For example, the National Cancer Act of 1971 (P.L. 92-218) authorizes the Director of the National Cancer Institute to:

> "Collect, analyze and disseminate all data useful in the prevention, diagnosis, and treatment of cancer, including the establishment of an international cancer research data bank to collect, catalog, store and disseminate insofar as feasible the results of cancer research undertaken in any country for the use of any person involved in cancer research in any country." (Sec. 407(b)(4).)

Because of the extent and variety of the legislative changes, the decentralized structure of NIH and the broad array of research and developmental activities undertaken and supported by its several components, there has been no single organizational entity with prime responsibility for technology utilization activity. Despite heavy emphasis on basic research and traditional and preponderant reliance on use of the grant mechanism, rather than contracts for support of extramural research, NIH nevertheless has had many specific and active technology utilization activities. Some of these have involved coordination and collaboration with the Atomic Energy Commission, the National Aeronautics and Space Administration, Oak Ridge National Laboratory (now Holifield National Laboratory), and other Federal and private organizations. Numerous internal programs have been undertaken and maintained such as the biomedical engineering effort of the National Institute of General Medical Sciences, biomaterials development by the National Institute of Dental Research, and others.

Research Utilization Responsibility

Heretofore there has been no central office with responsibility for research utilization. Directors of the various institutes have limited responsibility in this area, and have been active in assuring technological utilization. As of March 1975 a proposal to establish an Office for Dissemination of Research Results within the Office of the Director, NIH, was under consideration.

Implementation

The National Institutes of Health has consistently maintained a policy of making the

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24 other Federal buildings now under construction and older buildings are being examined on a case-by-case basis, and their firefighting safety techniques are being upgraded.

Construction and Financing for Office Buildings

Construction Management/Project Management. GSA developed a new management technique in 1972 that utilizes a construction manager working directly with the owner; he hires or subcontracts the labor and jobs that need to be done; he is responsible for the complete task from inception to the final turn of the key. The Project Manager, GSA's man responsible for one major project, has the authority at the highest levels. Today, there are 15 construction management projects valued at $469 million.

Purchase Contract Program. This program consists of a technique creating a beneficial partnership between Government and the private sector and uses private financing to complete a project. A contractor constructs a building to Federal specifications and sells it to the Government over a period of 30 years. The major advantages of this program are: the building stays on local tax rolls; it will boost the GNP by as much as $1.5 billion; it provides 88,000 new construction jobs over the life of the program; and adds approximately $22 million in property taxes to local governments. There are 37 projects currently using the purchase contract method.

Federal Buildings Fund. In this system, the Federal Government pays rent to the Federal Government! It started on July 1, 1974. Some of the major aspects of the system are listed below:

a. For the first time in history, agencies will pay rent for space and are assessed a charge per square foot equivalent to commercial rates.

b. Agencies will include the rentals in their FY 1975 budgets.

c. Agencies will have incentives for more efficient use of space, and their budgets will better reflect their total program costs.

d. Better short- and long-term planning is provided.

e. Future funds can be anticipated with a degree of accuracy never before possible.

f. The fund allows GSA new flexibility in the acquisition, alteration, maintenance, operation, and protection of public buildings.

Life-Cycle Costing. A major system being explored is entitled "Life Cycle Planning Budgeting Model," which is designed as one of the most advanced life-cycle cost management tools for efficient allocation of resources in managing the provision of Federal space. The ability to develop major planning strategies for new construction, leasing, maintenance, alteration, and obsolescence alternatives will be the product of this effort. Life-cycle costing is being utilized in several equipment procurement areas, such as room air conditioners, refrigerators, freezers, domestic water heaters, cooking ranges and high-speed printer ribbons, as trial efforts to encourage the development and transfer of new product technology.

Automated Data and Telecommunications Management. New techniques are being developed and implemented to manage the rapidly increasing use of the technologies of telecommunications and computers by the Federal Government.

Archives and Records. Records storage and management systems developed and used by GSA are among the most extensive in the world.

Environment. The construction of an environmental "demonstration" office building, and the development of improved

seminated as technical reports through NTIS and through the NBS publication "Energy Conservation Guide for Industry and Commerce" which is partially funded by FEA. It is expected that as a result of the mobile home research, an energy conservation addendum will be prepared for the ANSI standard on mobile homes.

Programs in industrial energy conservation include the development of specific products which can be put to use by plant management and engineers. In-depth analyses of conservation potential in important industries are underway.

Technology Transfer Responsibility

There is no clearly identifiable technology transfer organization within FEA. It should be recognized, however, that many of FEA's research activities are undertaken cooperatively with other Federal agencies that do have formal technology transfer programs. It is apparent from the language of the Energy Reorganization Act of 1974 that FEA will be cooperating closely with the Energy Research and Development Administration in future technology transfer activities.

Implementation

Responsibility for the successful application of the results of FEA's Conservation and Environment Program rests with the individual program managers. In addition, one staff member is assigned to coordinate these activities and represent the program in an across-the-board sense.

In addition to the activities within Conservation and Environment, FEA has established the National Energy Information Center (NEIC) to serve as a clearinghouse for State and Federal Government officials and the public. The NEIC supplies information on Federal energy programs and statistics that clarify energy supply, usage, shortage, and the impact of shortage.

NEIC has two activities underway aimed at promotion of a smooth flow of information from source to user. Briefings for State and local government officials are being held at each of the 10 FEA Regional Offices. The purpose of these meetings is to create understanding on both sides of the availability and the needs for information. NEIC is also working with the Information Industry Association and representatives of key energy information processing and disseminating organizations to improve cooperation and efficiency. A working group has been established to create a blueprint for cooperative activities.

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(Wash., Oreg., Idaho, Alaska)

Infiltration Inflow
Suspended Solids Removal
Cold Weather Treatment
Land Treatment

Field trips are included with the seminar program when appropriate sites are available. Seminar attendees have visited such facilities as the 233 MGD Boston Metropolitan District Commission Combined Sewer Overflow Detention and Chlorination Station and the 20 MGD Pure Oxygen Aeration Project at the Newton Creek Wastewater Treatment Plant, New York City.

Seminar publications covering detailed information presented at the seminars are published and broadly disseminated to the engineering and industrial community. Publications to date include:

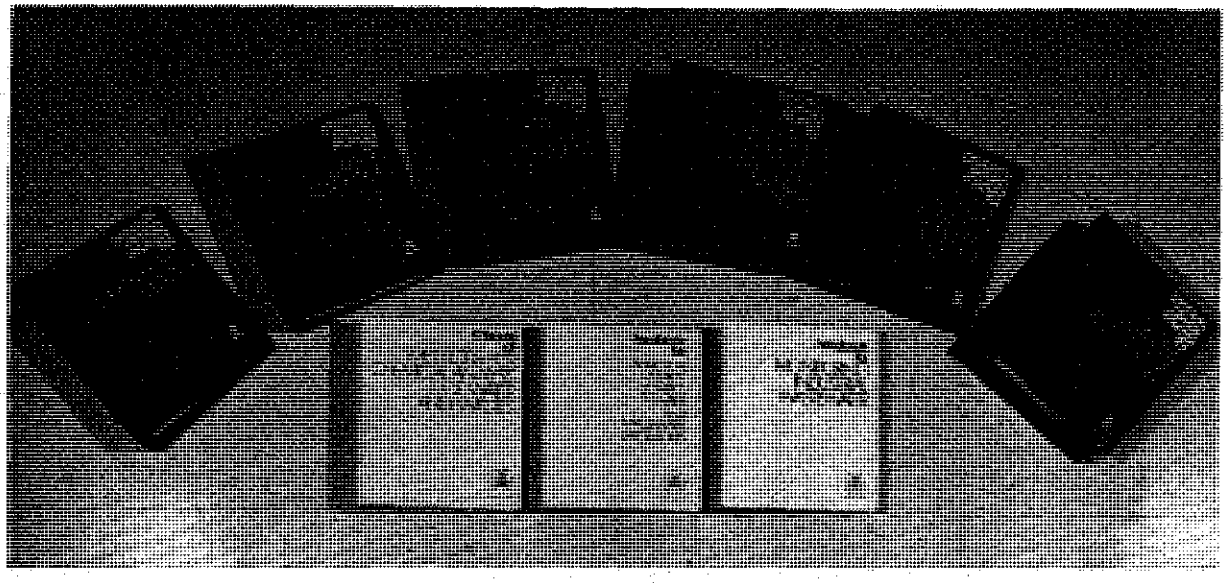
Municipal Seminar Publications
- Upgrading Lagoons
- Physical-Chemical Treatment
- Oxygen Activated Sludge
- Nitrification/Denitrification
- Upgrading Existing Wastewater Treatment Facilities—Case Histories
- Flow Equalization
- Wastewater Filtration
- Physical-Chemical Nitrogen Removal

Industrial Seminar Publications
- Upgrading Poultry Processing Facilities to Reduce Pollution (3 Vols.)
- Upgrading Metal Finishing Facilities to Reduce Pollution (2 Vols.)
- Upgrading Meat Packing Facilities to Reduce Pollution (3 Vols.)
- Upgrading Textile Operations to Reduce Pollution (2 Vols.)

Audiovisual material utilized by Technology Transfer includes motion pictures, closed-circuit television, and graphic presentations. Technology Transfer produces fast-paced, human-centered motion pictures depicting successful full-scale application of new technology. Interviews with key individuals involved in the particular projects are included, producing authentic voices of the design engineer, the municipal or industrial decisionmaker, the plant operators, etc. The purpose of these motion pictures is to encourage the use of new technology by showing that it has already been used successfully and is therefore a proven technique. These films are suitable for showing to conversation



Audience at Technology Transfer Monitoring Seminar held in Atlanta, Georgia.



Process Design Manuals and Handbooks

Upgrading Existing Wastewater Treatment Plants
Sulfide Control in Sanitary Sewerage Systems
Sludge Treatment and Disposal

Handbooks for
Analytical Quality Control in Water and Wastewater Laboratories
Monitoring Industrial Wastewater

Manual of Methods for Chemical Analysis of Water and Wastes

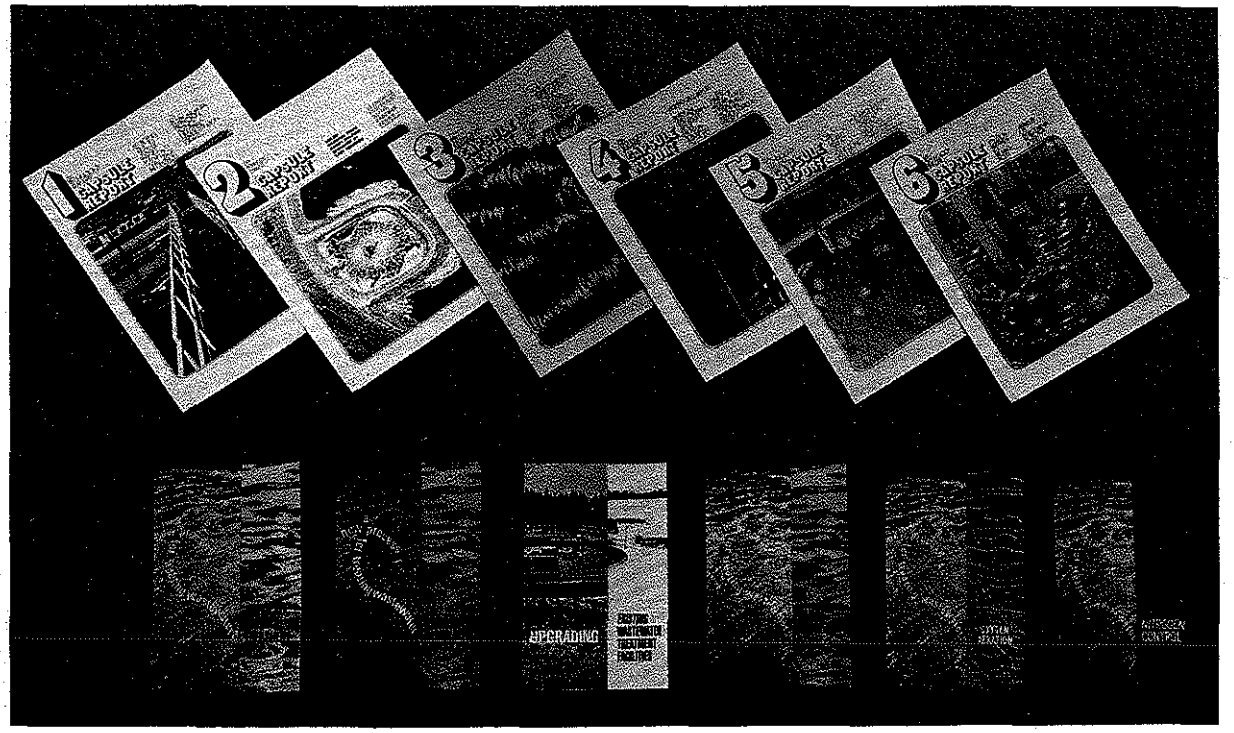
Through 1974, 150,000 copies of the Process Design Manuals, 50,000 copies of the Handbooks, and 25,000 copies of the Chemical Methods Manual have been distributed. Each of these publications reflects the usable results of EPA in-house and funded research and development as well as that performed by other Government agencies and industry and are updated regularly. Technical publications under preparation include:

Process Design Manuals for
Nitrogen Control
Design of Treatment Facilities for Small Municipalities

Industrial Pollution Control Manuals for
Power Industry
Pulp and Paper Industry
Textile Industry

To communicate new technologies concerning in-plant control and treatment methods available for industrial waste control, Technical Capsule reports are being prepared. The Technical Capsule reports are concise technical documents, usually comprising six to eight pages, and describing successful pollution abatement projects proved reliable in demonstration or full-scale operation.

Capsule reports already distributed include: recycling zinc in viscose rayon plants by two-stage precipitation, dry caustic peeling of peaches, aerated lagoon treatment of sulfite pulping effluents, color removal from kraft pulping effluent by lime addition, process changes for waste abatement in brass wire mills, and pollution abatement in a brewing facility. Additional Capsule reports are scheduled for completion during 1975.



Capsule Reports on top—Process Brochures on bottom.

program's initial goal was to make an impact on the construction of municipal wastewater treatment facilities. The need was recognized because applications for construction grants were not including new technologies. Thus, the need for a special technology transfer effort was mounted to overcome traditional conservatism in the pollution control field in order to prevent a major investment in obsolete treatment and control facilities and to enable municipalities to meet increasingly stringent pollution standards. In addition to the municipal pollution control area, Technology Transfer now has programs in industrial pollution control, nonpoint sources pollution control, and water supply (drinking water).

Technology Transfer's objective is to effectively impact the construction, installation, and operation of pollution control and abatement facilities, to ensure that the latest viable technologies are transferred to potential users, and eliminate the possible large investment in obsolete facilities. The program's primary function is to bridge the gap between research and full-scale use by evaluating and transferring newly developed, successful technologies to consulting engineering firms; municipal, industrial, and State design engineers; city managers; conservation groups; and others exerting influence over the design and construction of all pollution control and abatement facilities. A further goal is to firmly establish the newly emerging technologies as practical and feasible alternatives on a national basis, to be routinely considered and evaluated in the planning of these facilities.

Technology Transfer Responsibility

The Environmental Protection Agency Technology Transfer Office has a head-

The IC Bulletins, which are distributed each year to over 1,000 recipients, have prompted a large number of requests for additional and more detailed information. A recent study of this bulletin program, after 106 technology items had been publicized, indicated a high rate of resulting technology transfer. In the short time the program has been in effect, seven different technologies have been completely implemented by nine different companies, and three other technologies are being considered for future implementation.

Highest in industry interest are the bulletins which describe environmental monitoring and pollution control items. Technologies described include a surface debris and oil removal system for stream purification, and a method for determining organic molecules in sewage effluents. Next in interest was the category of machine tools. Examples include a pneumatic chip-breaking cutting tool, an optical method for measuring surface finishes, and a portable electro-polishing device.

In addition to the horizontal transfer of existing technology, the AEC has a larger role in the direct transfer and commercialization of the new R&D accomplishments which were an integral part of its mission goals. Three such program-related areas have been: nuclear power plant development; peaceful uses of nuclear explosives; and the application of radioisotopes for medical and industrial purposes. However, the principal beneficiary of the program R&D mission of the Commission is the nuclear industry. The Atomic Energy Act of 1954, in establishing the AEC as a research and development agency, directed the Commission to encourage and promote industrial participation in the exploitation of peaceful uses of atomic and other energy. The AEC has, therefore, viewed the transfer and commercialization of the technology it has developed as part of its mission. Essentially the entire nuclear industry has been built upon AEC-developed technologies and expertise.

The AEC began its experimental power reactor program during the late 1940's. One outgrowth of this program was the Experimental Breeder Reactor-I at the National Reactor Testing Station in Idaho, which produced the world's first electricity from nuclear energy in 1951.

The AEC embarked on its first cooperative arrangement with industry to construct a full-scale nuclear power plant in 1954 when it entered into a contract with Duquesne Light Company for the Shippingport Atomic Power Station. Under this arrangement, Duquesne undertook certain costs while the AEC undertook to construct the nuclear portion of the plant, to provide the fuel, and to bear certain operational costs of the plant. Since its initial operation in December 1957, the Shippingport plant has provided information contributing to the demonstration and improvement of pressurized light-water power reactors.

Since this initial experiment, there have been four rounds of reactor development with cooperative arrangements between the AEC and private industry. The most significant result to date has been the transfer to industry of the light-water-pressurized nuclear reactor technology, and its use by industry in commercial nuclear power plants to generate electricity. A recent program, begun in 1969, has been the development of liquid-metal, fast-breeder reactor demonstration plants.

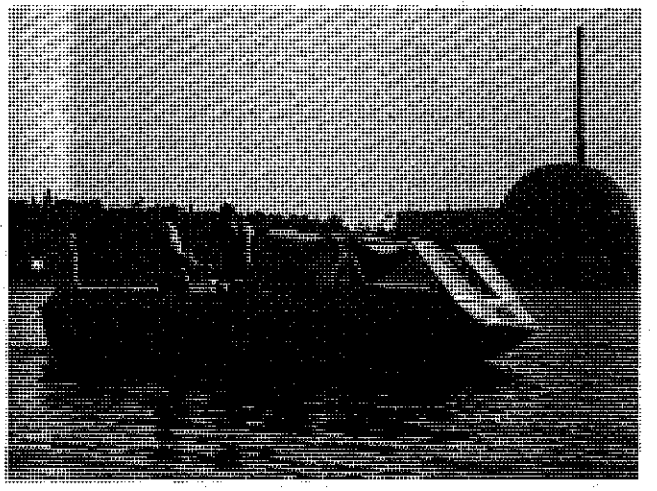
Project Plowshare program is a recent example of civilian use of defense technology. Project Rio Blanco, involving the detonation of three nuclear explosive devices 1 mile beneath the Colorado's western slope to release trapped natural gas in May 1973, was apparently a success. By using three separate atomic devices, stacked one on top of the other, a long cylindrical chamber was created, cutting through a dozen or so pockets of gas-bearing sandstone. Gas is expected to seep into the 850- by 140-foot chimney for several decades, producing around 20 billion

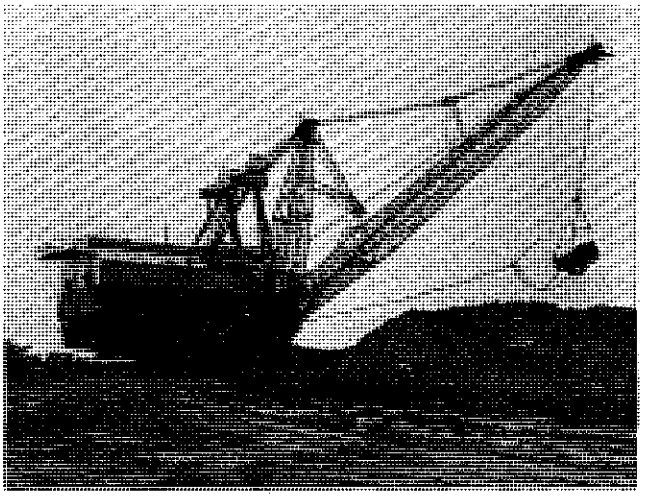


For several years the Energy and Environmental Systems Division at the Argonne National Laboratory has provided management support to the State of Illinois by helping the State to solve some difficult environment problems.

The Rock River basin was the subject of the first phase of the Division's investigation, with the objective of enabling Illinois to comply with Federal water quality standards.

A limnological research team is currently investigating the economic impact from power plants situated on the shores of the Great Lakes. Here, an instrumented Argonne research boat gathers data on currents, temperature fields, chemical species, and aquatic life near a central station power plant for use in mathematical and physical scale models to simulate thermal discharges.





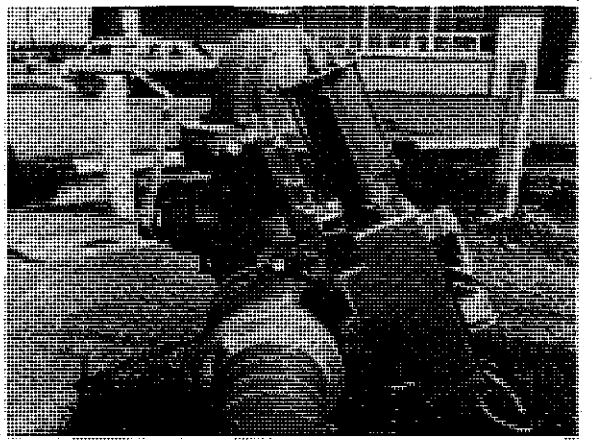
Also under Illinois government sponsorship at Argonne National Laboratory, another research team is currently investigating alternative technologies for the reclamation of strip-mined land in Illinois. Included are theoretical studies, small-scale demonstration experiments, and a major demonstration project at a representative site to explore the economics of different alternative long-range reclamation programs.

The programs include: supply of uranium concentrates and other raw materials, and production and management of fissionable materials; development, manufacture, and testing of nuclear weapons and related ordnance devices and systems; development of nuclear reactors for civilian, military, and space use, including the conduct of safety research programs, the development of the Nation's first liquid metal fast breeder reactor, fusion reactors, and nonnuclear energy technologies; basic and applied research and development in biological, medical, physical, environmental, and engineering sciences; development and application of systems to detect and prevent the loss or diversion of nuclear materials; dissemination of information related to atomic energy; development and administration of arrangements for international cooperation in peaceful uses of atomic energy; and sponsorship of special-purpose training in the interest of development of atomic energy uses.

The policy development and program coordination functions are performed primarily by the Headquarters divisions. The operations are carried out largely by industrial concerns and private and public institutions under contracts administered by the 11 ERDA field offices. Under a typical arrangement the ERDA owns the physical plant and equipment and pays the cost of the operations.

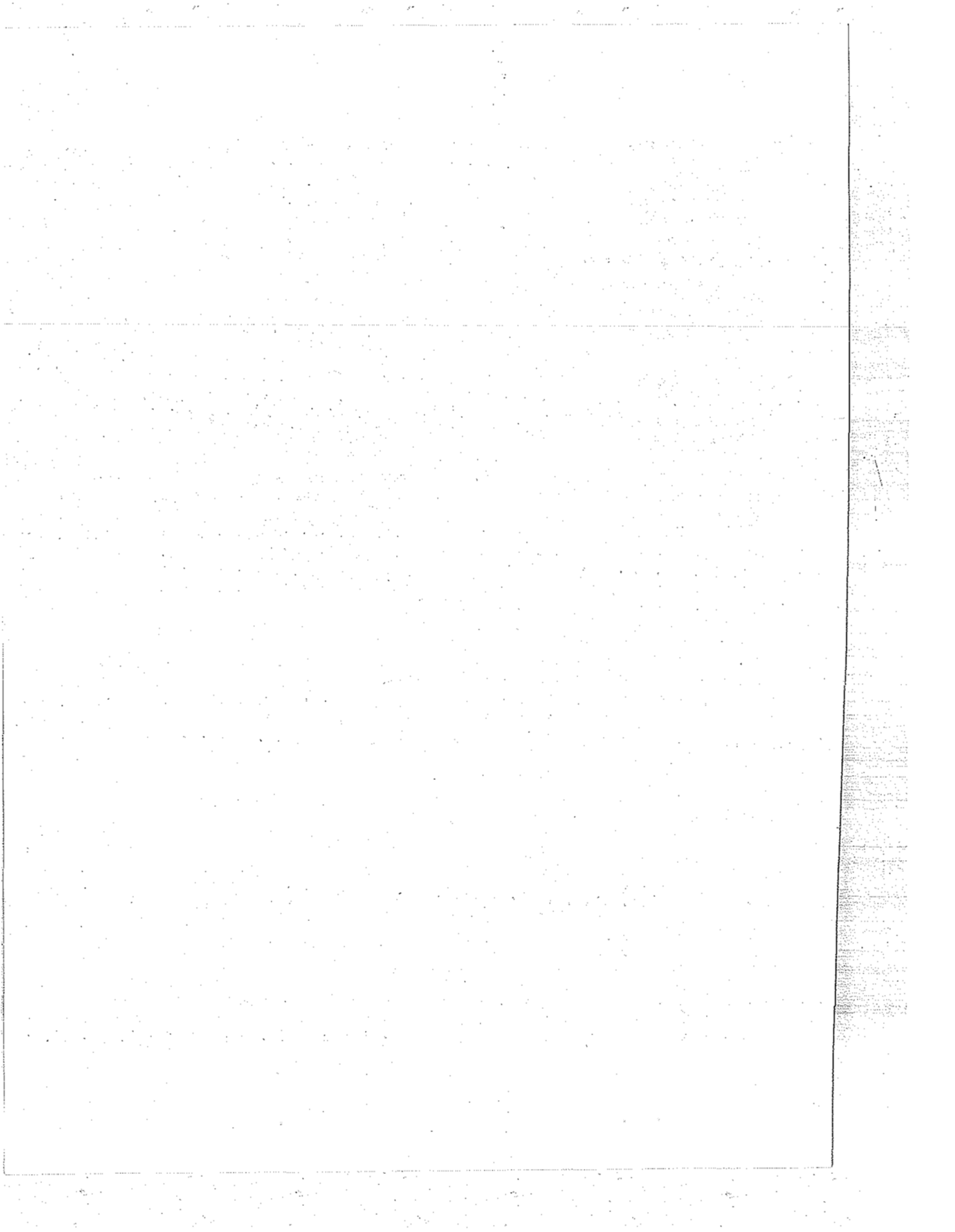
Regulatory Functions[2]

The Director of Regulation is responsible for discharging the ERDA statutory functions of assuring that the civilian uses of nuclear materials and facilities are accomplished without endangering public health and safety, environmental quality, or national security, and are consistent with the antitrust laws. This involves a system of licensing and regulation which includes, among other things: evaluation of applications for the construction and operation of nuclear reactors and other nuclear facilities and for the possession, use, and disposal of atomic energy materials; regulation of licensed activities including assurance that measures are taken for the physical protection of facilities and materials; development and implementation of standards, criteria, rules and regulations governing licensed nuclear activities; conduct of an inspection and enforcement program to determine that licensees are complying with ERDA rules and regulations and the conditions of their licenses; and the development of effective working relationships with the States as well as foreign governments regarding the regulation of atomic energy, including the assurance that adequate regulatory programs are maintained by those States which exercise, by agreement with the Administration, regulatory control over certain nuclear materials activities within their respective borders.



A valve to provide radio-controlled remote operation of a fire hydrant was demonstrated in Tacoma, Washington. City of Tacoma personnel had earlier established the need for such a valve. Battelle's Pacific Northwest Laboratory personnel assembled the unit using mostly off-the-shelf components. The valve is being considered for commercial development.

[2] These activities are now performed by the Nuclear Regulatory Commission (NRC).



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Foundation, and the Georgia Science and Technology Commission, the California Science and Technology project, and the Alabama Innovation Group.

- Federal civil agencies have been cooperative in sharing their program plans with the DOD laboratories in order that intelligent assessments of relevant DOD technology and facilities can be made.

Some examples of specific transfer mechanisms employed by the DOD Consortium are:

- Seminar/workshops have been conducted with the general theme of "domestic applications for military technology" at several naval laboratories and centers throughout the country. These expositions of laboratory capability potentially applicable to the solution of domestic problems were attended by Federal, State, and local government officials, university staff members, and representatives from private industry. A number of new technical partnerships were formed and projects initiated as a result of the meetings held at the Naval Underwater Systems Center, Newport, Rhode Island, the Naval Ship Research and Development Center, Maryland, and the Naval Electronics Laboratory, San Diego, California. Each seminar was opened with remarks by local Congressmen: Senator Ribicoff, Senator Bob Wilson, and Congresswoman Marjorie Holt.

- Colloquium on Technology Transfer, September 5-7, 1973. This Colloquium was sponsored by the Navy, the American University, and the Department of Commerce, with the cooperation of the National Science Foundation. The purpose of the Colloquium was to provide a forum wherein representatives from the agencies that are sources of technology could interact in a direct, personal way with technology interfacing agents and selected spokesmen from user organizations, so as to bring various perspectives of the technology transfer process into sharper focus and to help promote closer cooperative efforts. Approximately 135 persons participated in the Colloquium. The proceedings of the Colloquium are available from NTIS, including a list of attendees in the proceedings.

- A workshop between the DOD laboratories' representatives and the program element managers of the Federal Highway Administration. This was preceded by several weeks of homework by the laboratories in studying the priority needs of the Federal Highway Administration.

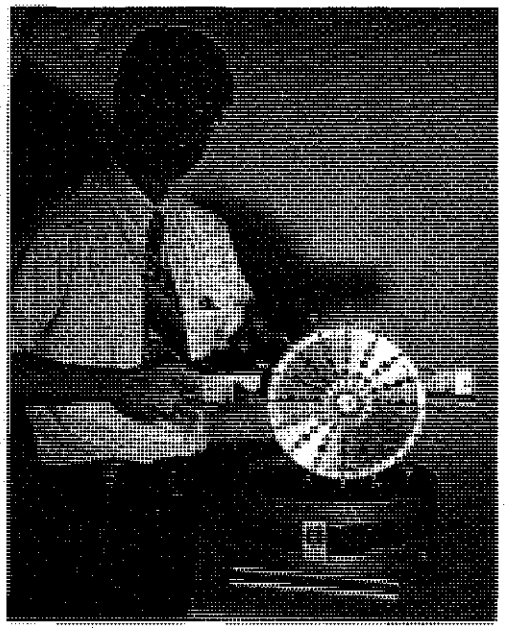
- A joint seminar on Program Management and Control Systems between selected DOD laboratories and one of the National Environmental Research Centers. This resulted in EPA applying a new management system to some of their programs.

- Exhibiting DOD biomedical devices at the Massachusetts Science and Technology Exchange Workshop. This resulted in a new business venture for the Navy inventor of a cardiovascular assist device.

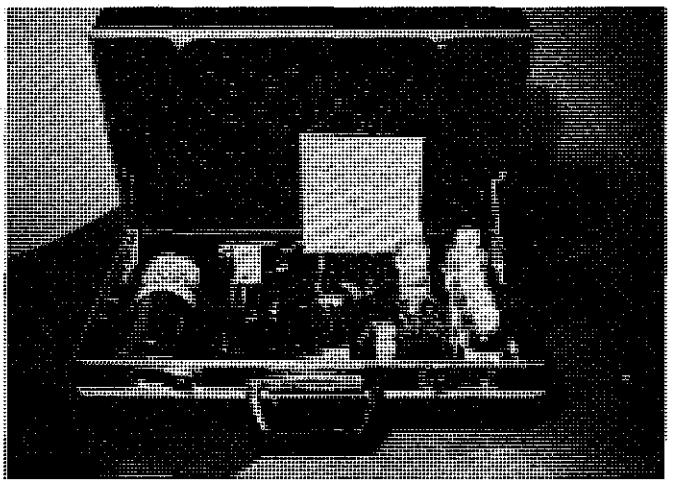
- Interagency agreement between the Naval Surface Weapons Center, White Oak, Maryland, and the Environmental Research Center, Research Triangle Park, North Carolina, to transfer DOD technology to EPA in the area of air pollution control.

Since 1971 over 200 projects have been carried out by the Consortium utilizing existing DOD technology to meet requirements of other agencies. The projects covered a wide range of problems relating to fire and safety, the environment, health and medicine, law enforcement and crime prevention, transportation, analysis and testing, and instrumentation.

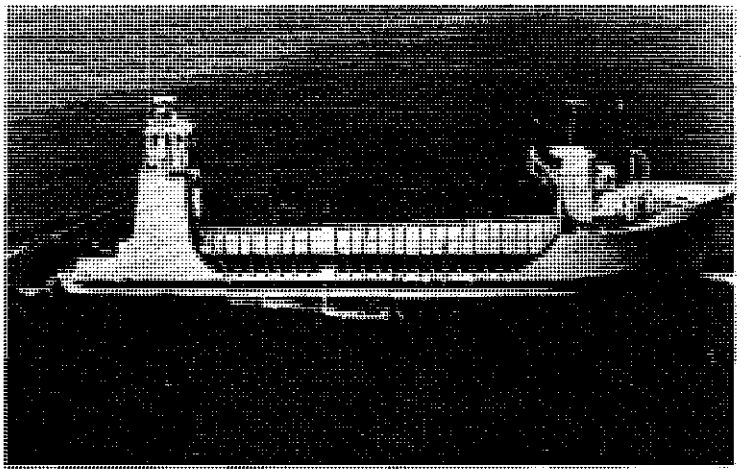
Most of the projects mentioned above were in support of other Federal agencies. However, transfers are now in progress with State and local governments.



An engine operating on heat energy and employing the NITINOL alloy for energy conversion is displayed by Dr. Sherman Gee, Technology Transfer Officer at the Naval Surface Weapons Center, White Oak, Maryland.



The Civil Engineering Laboratory, Port Hueneme, California developed this compact Kit for identification of weathered paints by field personnel. The Kit is now commercially available.





The Naval Undersea Center, San Diego, California is spearheading a new project to demonstrate the feasibility of ocean farming. The Kelp crop will produce various foods, fuels and products such as waxes and lubricants and may be an important supplement to our national resources.

The objectives of the DOD Technology Transfer Programs are:

- To derive the maximum benefit from the investment of R&D funds by the Department of Defense
- To facilitate the transfer of existing military technology and research products to the solution of critical domestic problems.
- To utilize Government-owned R&D facilities more efficiently in the national interest.

Implementation

The approach to program implementation within the Air Force, Army, and Navy varies, but each service places heavy emphasis on the importance of person-to-person communications in the technology transfer process.

Air Force

The Air Force cooperates with and responds to the initiative of civil agencies of Government and can point to a significant number of important transfers. The most important example is the broad Air Force contribution to the U.S. commercial aviation industry. This is documented in a recent DOD-NASA-DOT study, entitled *Research and Development Contributions to Aviation* (RADCAP).

Army

The Army's implementing policy has been drafted and is under review. This policy statement contains essentially the same guidelines as the current DOD policy, and specifies that performance of work for the civilian sector will be contingent upon the workload and priorities of the performing activities. The Army's Technology Transfer program is based on cooperation and response to the initiative of civil agencies.

Navy

A few naval laboratories experimented with technology transfer in the late sixties and early seventies. In July 1971, at the suggestion of the Special Assistant to the Deputy Director (Research and Advanced Technology), representatives from 11 DOD laboratories met at the Naval Weapons Center and formed the nucleus of an informal consortium to further their cooperative efforts in the transfer of military based technology to national problems in the civilian sector. There are now 31 member laboratories (Army, Navy, and Air Force) in the consortium. Each laboratory has designed a primary contact for technology transfer activity within the laboratory, and the program relies heavily upon the person-to-person approach in the technology transfer process.

DOD Information Systems

Although information systems by themselves are not completely adequate transfer mechanisms, a well-organized R&D information data base is a vital component of any transfer process. The Defense Documentation Center is the primary R&D data source for military R&D.

The Defense Documentation Center (DDC) makes available scientific and technical reports produced each year by U.S. military organizations and their contractors. The Center also operates computer-based data banks of management and technical information concerning R&D projects. Although originally created to serve the military, DDC services have been extended to all Federal Government agencies and their contractors, subcontractors, and grantees.

DDC does not serve the general public directly, but the scientific and industrial community has access to reports having no security or other distribution restrictions. Such reports are sent to the National Technical Information Service (NTIS) of the Department of Commerce where they are made available

3) perform high technology engineering for Federal agencies, publishing widely for transferral to both industry and State and local governments.

OT, because of its range of activities from research, development, application, policy analysis, and implementation, is in a good position to practice technology transfer. Its internal government contracting work for other Government agencies such as DOD, FAA, and DOT provides the background and experience to apply the high technology developed for these clients to problems of emergency health care delivery, electronic mail, community information, automobile collision avoidance, international trade, and many other social and economic needs.

To meet these goals, OT publishes extensively in both internal and technical journals. At present, it is moving to enlarge its readership by programing secondary publication of its work in trade and professional journals to gain the prompt notice of larger numbers of professionals in telecommunications, navigation, and related fields.

Technology Transfer Responsibility

This responsibility, throughout the organization and subject only to restraints of its sponsors, is a major management function for action in the conduct of all technical work. Policy guidance is given in both standing orders on readership, patenting and program execution, and in program planning and selection of work for its technology transfer potential, as a value judgment by managers.

Implementation

OT's technology transfer occurs in several modes:

- *Transfer incidental to engineering support on major Federal systems,* in which OT specifications for large Federal procurements "steer" the supply industry to capitalize upon systems analyses that optimize design factors for Federal as well as commercial telecommunications systems. Examples: microwave developments, LORAN navigation system improvements, and triservice analysis of field mobile radio procurement;
- *Technology-for-transfer,* such as basic research and development to improve prediction services, and for innovation in areas not commercially attractive to private research, have an important place in OT programing. Examples: survey and assessment of broadband cable technical requirements, analysis of domestic satellite technical and tariff requirements, and feasibility studies for exploitation of optical communications techniques;
- *Information exchange,* both vigorous publication of the work, and support for annual conferences of State and local officials in the telecommunications functions of their governments. Examples are: 1972 Conference of State Directors of Telecommunications, Annual symposia on "Telecommunications for Government" attended by Federal and State leadership, and demonstrations in cooperation with local governments and Federal agencies under the planned OT program on Telecommunications Applications.

It is OT policy to publish, and index, all of its work not specifically restricted for security or policy sensitivity. This is presently accomplished through placement of this work in Federal Depository Libraries (GPO) and NTIS listing of its publications. Also, NTIS has under development a special telecommunications catalog title, to place before the largest possible telecommunications community the internally published work of the Office.

Future Program Emphasis

To the long-established traditions of publication, dissemination and free consultation with the interested public, OT is currently

tion concerning the classification of patents. There are keyboard-controlled microfilm viewer terminals in the public search room. The microfilm is controlled by a minicomputer which serves as a number of terminals. The viewer displays the class and subclass location within a few seconds after a patent number is entered on the keyboard. The same information and lists of all the patents contained in each subclass are available on microfilm which is for sale through the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22151.

Paper copies of the U.S. classification manual, class definitions, and the classification index are available for purchase directly from the Patent and Trademark Office.

Technology Assessment and Forecast

This program, which is administered by the Office of Technology Assessment and Forecast (OTAF), was started in an effort to use patent data to pinpoint the most active areas of technology. The basic premise upon which the program is founded is that patent activity represents a highly significant measure of technological activity. That is, if the number of U.S. patents in a given area is growing rapidly, the assumption may be made that technological advance in that area is being actively pursued.

The patent activity data used in the program was compiled from the Patent and Trademark Office's file of over 11 million U.S. patent documents. Each year approximately 250,000 new U.S. patent documents are added to this file which is continuously scrutinized and restructured to accommodate the advent of new technologies and changes in existing ones.

The data contained in the vast patent file presently serve as the base for the technology assessments and forecasts prepared by the OTAF. It is recognized, however, that a better picture of the technological-economic interface can be obtained by supplementing patent data with other pertinent materials.

Consequently, the program's data base has been designed for maximum flexibility in order to accommodate the planned addition in the future of various types of economic information, such as distribution of R&D expenditures and export-import figures. With such additional data it then should be possible to study more fully the interdependencies of patents, technology, and the economy.

The Patent and Trademark Office has released four general distribution OTAF reports on technological activity in specific areas. Recent efforts have been focused on activity in such areas as coal gasification, oil shale technology, and other energy-related subjects. These analyses of trends in technological activity based on patent files will be of substantial benefit to people engaged in making decisions on research, development, and commercialization of new products.

OTAF publications, listed below, may be obtained from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22151.

Initial Publication; COM 73-10767; Price $3.00

Early Warning Report; COM 74-10150; Price $6.75

Third Report; COM 74-11383; Price $5.50

Fourth Report; COM 75-10050; Price $5.75

In addition to its general distribution publications OTAF prepares specialized or

Low Leaching Antifouling Organometallic Polymeric Materials.

- Licensing application.
- List of seminar attendees.

NTIS has already taken initial steps to foreign file on this invention in several countries to afford protection to the United States on this new technology.

NTIS will continue to work with Federal laboratories in identifying the most promising technologies for commercialization or for application in the public sector. The marketing resources available within NTIS are then used to bring this information to the attention of individuals and organizations in the private sector as well as State and local governments who are potential users of these technologies.

For additional information contact:

George K. Kudravetz: (703) 321-8530
National Technical Information Service
Springfield, Va. 22151

Patent and Trademark Office

Enabling Legislation and Mission

The granting of patents is authorized by Congress in accordance with Article I, Section 8, of the Constitution which provides:

> "The Congress shall have the power . . . to promote the progress of science and the useful arts, by securing for a limited time to authors and inventors the exclusive right to their respective writings and discoveries."

The first law was enacted in 1790 with revisions in 1836 and 1870. The Act of July 19, 1952 (Title 35, United States Code) revised and codified all patent laws. The administration of the patent laws as they relate to the granting of letters patent for inventions is the responsibility of the Patent and Trademark Office which also administers the laws pertaining to the grant of trademarks.

Implementation

A patent is a grant issued by the U.S. Government giving an inventor the right to exclude all others from making, using, or selling his invention within the United States for a specified number of years. In return for this grant, the inventor discloses his invention so that anyone may study it, gain ideas for improving it, or even devise a wholly different solution to the problem. Thus through the patent system the latest innovations in technology are made known to the public.

The chief activity of the Patent and Trademark Office is the examination of patent applications and the granting of patents for inventions which satisfy the statutory criteria. In addition, the Patent and Trademark Office publishes and disseminates patent information; maintains search files of U.S. foreign patents; maintains a scientific library and a public search room; supplies copies of patents and related official documents to the public; and periodically publishes technology assessment and forecast reports.

One of the important reasons for having a patent system is to inform the public of inventions which might not otherwise be disclosed. For the system to be effective as a source of technical information, it must be possible for

Another way NTIS brings Federal technology to the attention of a vast audience in the private and public sectors is by leasing the NTIS Bibliographic Date File, which now contains the records of more than 400,000 Federal research reports. At present, NTIS has lease agreements with approximately 30 Federal and State agencies, institutions, and private companies operating nationwide information networks.

For the past 2 years, NTIS has been developing a program responsive to the need for a governmental mechanism for the exploitation of national patents for the expansion of the domestic economy. Patent experts have long realized the gold mine of Government-developed technology which could be spun off into commercial products and processes. For example, an antifogging compound developed by the National Aeronautics and Space Administration has been licensed to 61 firms, and several small companies have been formed expressly to market the compound. However, of the more than 23,000 patents in the Government portfolio, only 5 percent are licensed and 3 percent utilized by licensees.

The low utilization of these technologies, weighed against the R&D investment (one-half of the Nation's R&D work), led to Presidential directives in 1963 and 1971 calling for more aggressive exploitation of Government inventions.

Government-owned inventions are available to interested parties on a nonexclusive, royalty-free basis; licenses are usually granted with a minimum of evaluation of the licensee and intended use of the invention. Some agencies make provisions for limited exclusive licenses when it appears that such licenses are a necessary incentive for the investment of risk capital.

Currently, NTIS serves as the focal point for processing and publishing information on new Government inventions. NTIS acquires copies of recently issued Government patents and recently filed applications. The inventions are cataloged, indexed, and announced as available for licensing. Through NTIS, lists of new Government inventions are announced by title in each Wednesday's edition of the *Federal Register* and in each weekly issue of the *Official Gazette* of the U.S. Patent Office. These announcements give the title of invention and the patent or patent application serial number.

A more comprehensive announcement service, which includes an abstract of invention and usually an illustration, is available directly from NTIS. *Government Inventions for Licensing* is a weekly bulletin which provides the single most comprehensive and timely access to all new Government inventions. An annual subscription is available to this weekly bulletin for $165.

In addition to announcing the new inventions, NTIS also provides copies of pending patent applications (copies of issued patents are available from the Patent Office). The applications are publicly available in either paper copy or microfiche form. Claims are deleted from application copies sold to the public to avoid premature disclosure in the event of an interference before the Patent Office. Claims and other technical data can usually be made available to serious prospective licensees.

More than 100 representatives from chemical and maritime industries attended a seminar at the Naval Ship Research and Development Center in Annapolis, Maryland, to hear Navy inventors describe their new antifouling organometallic polymeric coating. The seminar was sponsored by NTIS and the U.S. Navy.

The Navy inventors believe their coating should provide protection to ships' hulls, pilings, buoys, cooling towers, and the like from fouling for more than 5 years. Coatings currently in use last only 18 months to 2

concerned with the analysis and communication of highly specialized technologies. Some, however, concentrate on the evaluation of cultural, educational, and socioeconomic data. Making the resources of centers available to industry is intended to generate additional public applications from the original Federal fundings.

IAC's generally provide the following three production services:

- **Technical Inquiry Services:** The custom searching of a data base for information relevant to specific queries; combined, by some of the IAC's, with analytical research and evaluation.
- **Data Books and Research Reports:** Often the state-of-the-art reports, that is, the best information available on a subject. Also published in this category are annotated bibliographies, technical guides, and directories of terms and processes.
- **Current Awareness Bulletins:** Reflecting the latest technical achievements in brief as they are observed and recorded for subsequent detailed evaluation; usually available on a subscription basis.

NTIS is the national marketing coordinator for the following Information Analysis Centers: Chemical Propulsion Information Agency; Cryogenic Data Center; Explosives Laboratory, Feltman Research Laboratories; Infrared Information and Analysis Center; Machinability Data Center; Mechanical Properties Data Center; Metals and Ceramic Information Center; Non-Destructive Testing Information Analysis Center; Nuclear Safety Information Center; Plastics Technical Evaluation Center; Reliability Analysis Center; Standard Reference Data Center; Technology Application Center; Thermophysical and Electronic Properties Information Analysis Center; and Toxicology Information Response Center.

It should also be noted here that NTIS recently signed an agreement with the Engineering Sciences Data Unit (ESDU) which gives industry, research organizations, universities, Government laboratories, and individual scientists in the United States easy access to preeminent engineering design data.

ESDU is operated by the Royal Aeronautical Society in association with the Institutions of Chemical, Mechanical, and Structural Engineers.

ESDU is a group of qualified engineers working with acknowledged experts in various fields to provide working design and physical data for use in aeronautical, chemical, mechanical and structural engineering.

The basic ESDU product is a Data Item—a set of loose-leaf sheets devoted to a single topic and containing graphical data, equations, and tables, together with definitions and terminology, explanatory matter and worked examples. Subscribers to one or more of the 15 sub-series that make up the four series mentioned above become Associates of ESDU. Associates not only pay less for the Data Items, but they receive new Data Items in their sub-series automatically and they are entitled to consult with the ESDU staff by mail, telephone, or Telex on any matter concerning the sub-series.

A new NTIS product is the Directory of Computerized Data Files and Related Software—a unique guide to machine-readable data files, data bases and related software available to the public from 60 Federal agencies. More than 500 data fields and bases are listed and described. The Directory required 2 years to compile and is the first of its kind. It will be revised annually and gradually expanded to cover all Federal agencies. The Directory is a bibliographic reference tool offering direct mail-order service for items available from NTIS. Other items may be ordered directly from the generating agencies.

semination of scientific, technical, and engineering information.

This mission was reiterated in the President's 1972 Science and Technology Message in which NTIS was designated as the focal point for transferring the results of Government research and development activities to wider use in the private sector.

Implementation

The National Technical Information Service has become the central source for the public sale of Government-sponsored research and development reports and other related analyses prepared by Federal agencies or their contractors.

Through agreements with Government organizations, NTIS receives over 60,000 new technical reports annually, covering subjects from Agriculture to Space Technology. These include all of the unclassified technical reports resulting from research funded by AEC, NASA, and DOD as well as the research reports and studies of the Department of Housing and Urban Development, the Department of Transportation, the Environmental Protection Agency, the Federal Energy Administration, and many other agencies. NTIS is the only central source of research reports and other analyses from the vast Federal network of departments, bureaus, and agencies. All of these reports are indexed, abstracted, and announced to the public through a variety of publications including a comprehensive, biweekly abstract bulletin.

In addition to published bulletins and announcements, descriptions of the reports are stored in a computer data base, which can be searched to retrieve all of the reports on a given subject or by a given author. This search service, known as NTISearch, provides users with ready access to more than 400,000 federally sponsored documents published since 1964.

NTISearch users also have access to the Smithsonian Science Information Exchange's (SSIE) current research information file. The SSIE file of 180,000 ongoing and recently terminated research projects describes who supports each project, who does the work, where and when the research is performed, and it includes a technical summary. It covers basic and applied research in life, physical, social, behavioral, and engineering sciences. This combination allows NTISearch users to have one point of contact for their review of both completed research reports and ongoing research project information.

NTIS ships 11,500 information products daily as one of the world's leading processors of specialty information, and supplies its customers with about 4 million documents and microforms annually. The NTIS information collection exceeds 850,000 titles, all available for sale. About 100,000 titles are in current shelf stock. Current lists of special interest reports describe those most in demand.

A standing order microfiche service (SRIM) is also available which automatically provides subscribers with the full texts of research reports selected to satisfy individual requirements.

NTIS is required by statute to price its products and services for cost recovery. The distribution of its products and services is self-sustaining. Less than 20 percent of NTIS funding is from direct appropriations. Annual gross sales income is $11.2 million, the bulk of which is from the sale of copies of technical reports, although the sale of announcement products and search services also contributes to sales income. The NTIS central staff consists of some 400 people.

The basic NTIS announcement vehicle is a series of bulletins known as the *Weekly Government Abstracts*. They reach nearly 25,000 subscribers with new Government technical reports and new Government in-

program operates 20 data centers throughout the world to critically evaluate data in specialized technical fields.

The Experimental Technology Incentives Program (ETIP), proposed by the President in his fiscal 1973 budget, seeks to increase the Nation's application of technological invention and innovation to such questions as productivity, unemployment, pollution, energy conservation, and unfavorable trade balances. The experiments conducted under the program will systematically explore how the Federal Government may change its policies, procedures, or practices so as to encourage technological change. ETIP activities will involve various elements of the industrial community, professional and trade organizations, educational institutions, agencies of Federal, State, and local governments, and individuals.



Since 1910 NBS has provided a large variety of Standard Reference Materials (SRMs) whose chemical composition and properties have been accurately determined and certified. These standards are used throughout industry and the scientific community to calibrate and evaluate measurement instruments and test methods. Over 850 different SRMs are currently available.

Technology Transfer Accomplishments

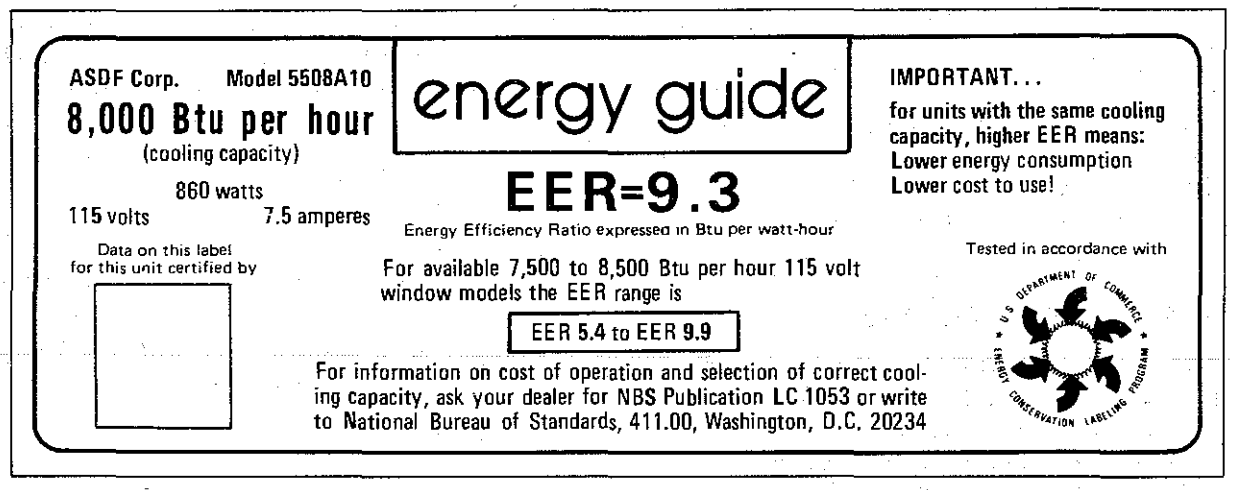
Some specific examples of technology transfer by NBS follow.

- In 1973, the President directed the Department of Commerce to develop a system of labeling to provide consumers with information on the energy consumption and efficiency of home appliances. Industry support was vigorous. NBS was assigned to work on the project with other Federal and State agencies, consumers and retailers. The first type of appliance labeled under the energy conservation program was room air conditioners, during the summer of 1974. Other appliances in the program include refrigerators, home freezers, clothes washers and dryers, ranges and water heaters. The key items that appear on labels are: energy consumption, energy efficiency, and range of energy efficiency available in similar products.

- In one of several projects to disseminate information on energy conservation, NBS has issued an energy program management kit for small and intermediate-size firms. The first edition of 5,000 has been distributed. Following receipt of comments and possible revisions, distribution of an additional 50,000 copies is planned for 1975.

- The development of a sulfur dioxide fluorescence monitor for use in air pollution control evolved from a research program on molecular fluorescence in the NBS Photochemistry Section and can be used to measure either ambient air pollutant concentrations or source emissions. A commercial version of the NBS device is being manufactured by two U.S. companies.

- The NBS Time and Frequency Division broadcasts, round the clock, accurate time and frequency information which serves as the basis time reference of scientific



The energy guide for air conditioners gives consumers conservation data to aid buying decisions. Specifications for the label were drafted, with industrial cooperation, by NBS.

The Associate Director for Information Programs

The Associate Director for Information Programs promotes optimum dissemination and accessibility of scientific information generated within NBS and other agencies of the Federal Government; [and] promotes development of the National Standard Reference Data System and a system of information analysis centers dealing with the broader aspects of the National Measurement System.

To fulfill these obligations, NBS employs a staff of 3,100 full-time employees in major laboratories at Gaithersburg, Maryland, and at Boulder, Colorado. The FY 1974 NBS obligations for research and technical services supported by appropriated funds was $60 million. An additional $40 million of reimbursements was received for technical services rendered primarily in support of other Federal agencies.

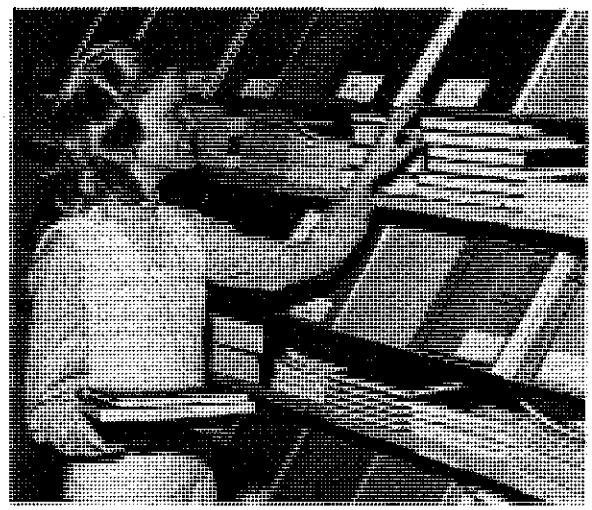
Implementation

The application of NBS research is accomplished through a variety of means including cooperative arrangements with user organizations, such as trade organizations in manufacturing and commerce, professional societies and associations, various State conferences and local government groups, and specially constituted organizations with a common technology interest. Direct contractual arrangements are undertaken with Federal agencies requiring NBS expertise in measurement or other technical areas. Technical consultative services are available to other agencies and institutions and to the public.

Accuracy, precision, and compatibility throughout the U.S. National Measurement System are achieved and maintained by reimbursable calibrations of such measuring devices as gage blocks, flowmeters, thermocouples, standard lamps, and voltmeters; by the annual sale of about 30,000 standard reference materials, of over 850 different kinds, which are used in checking instrument performance and in evaluating test procedures; and by Bureau-sponsored cooperative programs to assist user laboratories in assessing their entire measurement operation—procedures, instrumentation, environmental factors and personnel. These include Measurement

ment, and a comprehensive range of activities in engineering and the physical sciences to meet the technical needs of Government agencies, scientific institutions, and industrial enterprises. Specific legislative responsibilities have been assigned to NBS for flammable fabrics research, research and advisory services related to automatic data processing technology, the development of a standard reference data program, and for carrying out a national metric system study.

The Bureau is directed by this legislation to exercise its functions for "the Government of the United States: for any State or municipal government within the United States; or for any scientific society, educational institution, firm, corporation, or individual within the United States engaged in manufacturing or other pursuits requiring the use of standards or standard measuring instruments."



To promote the availability of reliable information, the National Standard Reference Data program collects, processes, interprets, analyzes, and disseminates technical data for use by the entire community of scientists and engineers. The scope of the program is the entire field of physical and chemical properties of substances.

Research Base

An essential ingredient of technology utilization is measurement capability, and the development of technology on a national and international scale requires the existence of an accurate and compatible physical measurement system. NBS is the point of reference for all physical measurement standards in the United States, thereby ensuring general confidence in measurement reliability. This role implies responsibility in developing new measurement capabilities and standards as required by scientific and technical advances.

In order to meet these responsibilities effectively, the Bureau conducts fundamental and applied research spanning an extremely broad variety of fields in the physical sciences. Research in measurement science includes the application of scientific discoveries to improved accuracy and precision of the national standards of measurement, the evaluation of new developments in measurement instrumentation, and the generation and evaluation of new calibration procedures. NBS laboratories also do research on the physical and chemical properties of technologically important materials required in manufacturing processes, health care, electronics, and energy generation. Bureau units respond to special research needs in such areas as computer software, building technology, consumer product safety, crime prevention technology, and fire prevention.

The staff maintains an active involvement with the academic and industrial communities through its industrial research associate program, postdoctoral research associateships, guest worker programs, and joint research undertakings. The objective of these interactions is to assure prompt, continuous dissemination of scientific and technical developments within the NBS laboratories and to NBS clientele.

Technology Transfer Responsibility

EDA does not maintain continuing technology transfer programs but conducts efforts only in response to specific project requests. Within EDA the limited number of such projects has been sponsored by the Office of Technical Assistance.

Implementation

An EDA project is not undertaken unless a specific implementation strategy is developed in the formulative stages of the proposal. Most of the implementation is accomplished by governmental user agencies at the State and local levels and by the private sector. Project participation by these groups during the lifetime of the project through periodic conferences as well as a shared local financial commitment are the primary mechanisms used in implementation.

Technology Transfer Accomplishments

The Office of Technical Assistance is continuing a grant through December 31, 1974, with Public Technology, Inc., for the Development of a Local-State Procurement Method and Manual for Non-Standard Items of Equipment. This project, initiated in June 1972, was aimed at helping State and local governments to more effectively obtain one-time, technologically oriented and usually expensive items of equipment. Examples of such purchases include environmental monitoring and treatment devices, municipal information systems, and computers and computer software. A draft manual is presently being tested in six cities. The project was completed in December 1974.

The Office of Technical Assistance is also continuing support of the Connecticut Product Development Corporation through April 30, 1975, to employ underutilized scientists and engineers in transferring high technology into smaller, innovative companies, thereby increasing local employment opportunities. The project involves the identification of new products which show promise of success in the marketplace and the provision of risk capital jointly with the private sector for such promising ventures. The program has responded to over 300 inquiries, screened 127 formal requests, and supported 15 product development situations including such items as a surgical zipper, new wrench, general utility hydrostatic spindle, hospital food heating system, and electrostatic deposition.

Future Program Emphasis

A limited number of technology transfer efforts may be considered for EDA support but such projects *must* show near-term economic impacts by stimulating the creation of new jobs and new industries in economically distressed areas.

For additional information contact:

Mr. I. M. Baill, Director
Office of Technical Assistance, EDA
14th Street and Constitution Avenue, N.W.
Washington, D.C. 20230
Telephone: (202) 967-2116

Office of Product Standards

Enabling Legislation and Mission

The Office of Product Standards, a constituent operating unit of the Department of Commerce within the Office of Science and Technology, was established by Commerce Department Order 16 on July 25, 1969.

Its primary mission is policy guidance with respect to types of standards needed and to

being automated to make them as efficient as possible. The program includes development of better fabrication equipment, automated design procedures, improved shipbuilding regulations, and a better trained work force. So far this project has identified 177 areas where ship costs would be reduced without sacrificing safety or efficiency. It has also introduced the Autokon, a computerized system for production and control, into several shipyards. Technology transfer results automatically as the very developers of the technology are also the users who, through a consortium of shipyards, share their findings with each other.

Nuclear technology is being used to develop a standardized, nuclear-powered steam generator for marine use. A 120,000-shaft-horsepower (SHP) system, well along in its development, can be utilized in a variety of ships requiring high power propulsion, i.e., large high-speed container ships, arctic ice breakers, very large surface tankers, submarine tankers, and LNG carriers. This new engine represents a second-generation development of the nuclear power plant of the N.S. *Savannah* at the 20,000-SHP level. Besides the technical development of the engine itself, problems of the economics of the above ships, their safety and environmental impact, their licensing and indemnification, their crew training, and port entry problems are being pursued simultaneously.

Satellite communication is being used to modernize maritime communications. Shipboard equipment is under development, and coordination with NASA has provided use of satellites to conduct test and evaluation of the early systems. Eventually, maritime satellites will be provided for the express purpose of ship-to-shore and ship-to-ship instantaneous communications and to provide revolutionary improvements in time involved in sending messages and data, and to provide an advance tool for global fleet management of the ships of the future.

In the main, MarAd's emphasis is R&D on "development" rather than "research." Its principal projects attempt to apply existing technologies to marine use. The reason for this is twofold. First, the maritime industry has been able to exist primarily because of government ship construction and ship operations subsidies and has not been able to generate resources to conduct R&D. Secondly, the Government has not applied funds to maritime research and development anywhere near the magnitudes it has applied to other areas such as military, space, transportation, etc. Until FY 1971, less than $5 million was applied to MarAd R&D. In the period FY 71-75, a level of $20-$25 million has been applied over a wider spectrum of development programs. As described in the text above, technologies from other fields have been utilized to develop a more productive maritime industry. In addition, the financial provisions of the Merchant Marine Act of 1970 have created opportunities for all shipyards to fill their ship construction schedules and employ thousands of workers.

The technology developed by MarAd R&D and, in fact, by the entire maritime community is well documented in the MRIS bulletins to which local governments can subscribe through the National Academy of Sciences. The NTIS is another source of the results of MarAd R&D. Finally, the Annual Report of the Maritime Administration issued for each fiscal year contains a list of all the R&D work contracted in that year.

MarAd R&D work which can be specifically related to local governments have been in the fields of pollution abatement, e.g., oil/water separation facilities for shoreside and shipboard use and oil/water monitors; port operations, including advanced cargo handling systems, hurricane damage and fire prevention, harbor safety and accident prevention, regional port studies to determine future needs of groups of ports in given geographical areas, e.g., the San Francisco Bay area studies by the Northern California

volvement and cost-sharing by the maritime industry which augments Government funds by approximately 50 percent. The aim of the program is not only better shipping systems but a maritime industry more innovative and self-sufficient.

Technology is being applied to develop a more competitive United States maritime industry through four major categories of improvements:

- Shipyard Productivity: To reduce the capital cost of ships;
- Ship Operating Efficiency and Economy: To increase cargo throughput at lower cost;
- Ship Safety: To reduce the loss of ship, cargo, personnel and the attendant time and financial losses to operators, shippers, insurance companies, etc.;
- Specialized Cargo Transport: To handle the unusual cargoes such as liquefied natural gas (LNG), very large amounts of oil, neo-bulk cargo, etc.

Research Utilization Responsibility

The carrying out of MarAd research and development programs and the utilization of their output is the responsibility of the Assistant Administrator for Commercial Development. This is accomplished through cost-shared contracts, incentive funding, and dissemination of findings through program reviews and its Maritime Research Information Service described below.

Implementation

MarAd research and development is conducted and its products implemented by three suboffices of the Office of Commercial Development, namely, Office of Advanced Ship Development, Office of Advanced Ship Operations, Office of Maritime Technology. There are also two National Maritime Research Centers which carry out analytical and experimental projects in support of the key MarAd R&D programs. The Office of Commercial Development, in addition to the R&D activities noted above, also carries out promotional responsibilities through market development and promotion of U.S. ports.

The advanced ship development effort includes shipbuilding improvement projects directed toward improving shipyard operations, thus reducing the capital cost of ships and thereby reducing construction subsidies paid by the Federal Government. Advanced ship development projects also include design of very large crude oil carriers and deepwater terminals for receiving them as well as liquefied natural gas ships which will help relieve the energy crisis. Second-generation nuclear merchant ships will power more economically the high-powered, high-speed, and/or large ships of the coming decade and beyond; changing the form of the commodity itself and designing ships to load and carry the cargo (e.g., coal or ore in slurry form) will take advantage of unique United States geographic situations and trade requirements to gain large cargo-carrying advantages over foreign-flag ships.

Ship operations improvement projects include advanced navigation/communications, automated ship control and cargo handling, and management which are aimed at increasing the safety and efficiency of ocean transportation; large oceangoing tug-barge systems will bring the inherent economics of this mode of cargo carrying in our domestic waterways to the international sector.

Supporting maritime technology is directed toward developing new hull forms and structures, new propulsion systems, and shipboard pollution-prevention systems to reduce or eliminate ship-generated pollution to legal levels. This activity also involves the development of systems and procedures for the con-

The Office of the Associate Administrator for Environmental Monitoring and Prediction maintains cognizance over and establishes policy for NOAA's environmental satellite, meteorological, hydrologic, marine environmental services, climatological, upper atmospheric and space programs which entail monitoring and prediction of the environment.

The assessment of advanced technology includes environmental remote sensing utilizing sensor platforms such as satellites, buoys, ships-of-opportunity, ships, aircraft, constant level balloons, and other conceptual systems for accelerating transition from research to operational application. This Office also focuses on the development of demonstration projects utilizing a variety of NOAA environmental monitoring capabilities to meet emerging national needs.

For additional information contact:

John W. Townsend, Jr.
Associate Administrator
National Oceanic and Atmospheric Administration
Rockville, Maryland 20852

Office of Minority Business Enterprise

Enabling Legislation and Mission

The Office of Minority Business Enterprise (OMBE), established in 1969 and presently acting under the authority of Executive Order 11625, is responsible for facilitating the strengthening and expansion of minority business enterprise.

Implementation

The Office of Minority Business Enterprise is coordinating the development of a technology program designed to bring additional resources to the development and growth of minority business.

In conjunction with the National Aeronautics and Space Administration (NASA), OMBE is sponsoring a series of regional seminars during calendar year 1975. The seminars are designed to familiarize minority businessmen with the technology and technological data available through the NASA system, which may have a potential for commercialization. The objective is the identification of a match of available technology with the talents and capabilities of minority firms able and available to translate such technology into commercial products.

Additionally, OMBE is developing a pilot program to provide a variety of specialized resources to minority business firms when a viable match with available technology is made. The resources are being developed, primarily, in the private sector. Included in the developing integrated processes are components for product identification, market appraisal, product modification, business management, and technical assistance and financing. The Federal role will be one of coordination and support. Included in this business process are several major national corporations. It is anticipated that the pilot program will become operational during calendar 1975.

For additional information contact:

Theodore Lettes
National Coordinator, Technology Utilization
Office of Minority Business Enterprise
Department of Commerce
Washington, D.C. 20230

engineering advances to industry through several methods:

- Publication in several publications including the NMFS Division of Statistical and Market News and the Commercial Fisheries Review.
- When particularly worthwhile results are achieved or to maintain contact with industry, workshops or seminars are held by Service personnel. The seminars are often held during the winter or the off-season to achieve more industry participation.
- Invitation of industry and press observers aboard research vessels or charter vessels to view new gear operations.

The principal objective of NMFS in fishery products technology is to provide information and assistance to the fishing industry in the form of basic and applied research results and direct technical assistance. The basic program areas are: (1) Development of underutilized resources; (2) new process and handling methods; (3) microconstituents: (4) pollution control technology; (5) aquaculture nutrition and technology; (6) fishery products nutrition; and (7) inspection support and product safety.

An example is the development and demonstration of new or improved methods of handling and preserving fish aboard vessels, including a mechanized one-man operated vacuum eviscerator and a modified refrigerated seawater storage system which will greatly expand its applicability and effectiveness in preserving fish at sea. Based upon these developments, commercial units have been designed and built and are now in use by industry, resulting in a more efficient operation and less waste of harvested resources due to spoilage.

The NMFS has ongoing research programs dealing directly with the development of technology for the commercial cultivation of species such as shrimp and salmon. In addition to programs directly related to aquaculture, NMFS laboratories are conducting studies on the physiology, behavior, and life histories of marine organisms. The data derived are fundamental building blocks essential to the development of any aquaculture system.

The following is an example of how NMFS transfers aquaculture technology to users: Technology of the artificial propagation of shrimp developed at the Galveston laboratory has been widely disseminated through NMFS publications and in other media. As a result, a number of private firms are experimenting with shrimp culture. The Office of Marine Ecosystems Analysis (MESA) conducts investigations to understand and monitor the various processes of specific marine environmental systems, determining the impact of natural phenomena and manmade alterations on the marine environment, and providing specialized information for effective management of marine areas and the rational use of their resources. In this program, the New York Bight Project is the first in-depth marine ecosystem investigation. In addition to the New York Bight Project, a baseline study of the Northeastern Gulf of Alaska is being conducted under a contract from the Department of the Interior's Bureau of Land Management. Ecosystem projects are planned for Puget Sound in Washington State and Prince William Sound in Alaska.

The MESA projects provide information to Federal, State, regional, and local organizations which must make decisions, establish policies or enforce decisions on matters associated with specific marine ecosystems such as the New York Bight Project. Project advisory committees and information user panels provide a means for collecting information on the needs and uses of marine ecosystem information for each project and for the flow of information to the users of the results as well as through research reports issued by the project.

taining, and improving all aspects of the environment.

The FY 1973 National Oceanic and Atmospheric Administration R&D budget was $121 million.

Research Utilization Policy and Objectives

NOAA describes its technology transfer program as fitting into the following three categories:

1. Formal Technology Transfer: Information, publication, extension, advisory and related programs by which technology is transferred to business and industry after being developed by category 2 or 3 programs. A substantial amount of technology transfer to business and industry is also effectively accomplished by cooperative, consultative, information-exchange and related aspects which are often included, to differing extents, in technology development activities in categories 2 and 3.

2. Technology Development Specifically for Transfer: Programs such as fishing gear development, development of underutilized resources, and aquaculture development, for which NOAA has no intention of implementing the developed technology in its own operational programs, but which are conducted specifically for the purpose of transferring the technology, through category 1 activities, to related industries in order to enhance the contribution of those industries to the national well-being.

3. Technology Development Incidentally for Transfer: Programs motivated by the needs of NOAA's operational programs, but whose developed technologies are applicable in business and industry and are likely to, or may, be transferred thereto through category 1 activities. Examples are weather forecasting techniques which NOAA develops for its own operational meteorological programs, but which are also transferable to private meteorologists.

It is NOAA policy to make available, subject to the interests of national security, the results of its research and development programs to the general scientific and technology community, including the business and industry sectors of the U.S. economy. In technological areas where NOAA undertakes development programs specifically for transferring the developed technology to business and industry, the transfer process is promoted through appropriate advisory and extension services. More broadly, all technology developed by NOAA, whether primarily for transfer or for use in NOAA's operational programs, is made available for transfer through NOAA publications or publications of related professional societies. NOAA also participates in cooperative technological information exchange programs, such as the Smithsonian Information Exchange which is generally accessible to the appropriate professional public. Beyond these regular technology transfer mechanisms, NOAA utilizes special mechanisms such as demonstrations, displays, and public media presentations. A substantial amount of technology transfer to business and industry is also effectively accomplished by cooperative, consultative, information exchange, and related aspects which are often included, to differing extents, in NOAA's technology development activities.

Technology Transfer Responsibility

Components of NOAA concerned with technology transfer include the Office of Sea Grant, National Marine Fisheries Service, Office of Marine Ecosystems Analysis, Office of Marine Technology, Environmental Data Service, and Office of the Associate Administrator for Environmental Monitoring and Prediction.

continued or deemphasized; they are expected to focus their attention primarily on more effective use of existing resources.

The USDA cites significant decreases in the proportion of disposable income spent for food, increases in crop production per acre, and increases in output per man-hour in farm production as indicative of the results achieved through this program.

For additional information contact:

E. L. Kirby: (202) 447-3377
Administrator, Extension Service
Department of Agriculture
Room 5039, South Building
Washington, D.C. 20250

prove soil, water, and wildlife resources to assure efficient agriculture and a healthy and attractive environment.

Forest Service

The Forest Service is assigned national leadership in forest and forest range resource protection, management, and utilization. Forestry research is directed at ways to improve the management of forest and related lands and processing and utilization of forest products. The Forest Service manages 154 national forests and 19 national grasslands, containing 187 million acres. Working in cooperation with State forestry agencies, private landowners, and others, the Forest Service provides technical assistance for the protection and management of 480 million acres of State and private forest lands and technical assistance to loggers and processors of forest products.

Farmer Cooperative Service (FCS)

The Farmer Cooperative Service (FCS) supports the efforts of farmers who elect to use cooperatives as a method of marketing farm products, purchasing production supplies, or performing business services related to farming operations. There are two dimensions of agency activity that relate to the transfer of technology to the agricultural sector: the technical assistance program, and the applied research program.

Technical assistance is provided by FCS on organizing new cooperatives, the economic potentials and disadvantages involved in consolidation of cooperative activity, on changes in structure to more effectively address both the food and input markets, on long-term investment and growth decisions, and a variety of similar topics related to the maintenance of cooperatives as viable and competitive agribusiness organizations.

Applied research is conducted to provide farmers relevant basic information pertaining to cooperative organization and operations. Research studies of the agency concentrate on financial, organizational, legal, social, and economic aspects of cooperative activity in U.S. agriculture.

The Farmer Cooperative Service emphasizes rapid and meaningful response to the emerging informational and technical assistance needs of cooperatives with the goal of making these organizations fully responsive and competitive in the changing economic environment of agriculture.

The information generated by agricultural research is made available by the National Agricultural Library.

The Assistant Secretary for Conservation, Research, and Education has administrative responsibility for ARS, CSRS, the Extension Service, SCS, Forest Service, and the National Agricultural Library. He is responsible for the coordination of all the research and educational programs of the agencies.

Cooperative Extension Service

The Cooperative Extension Service has primary responsibility for the transfer of technology in agriculture, home economics, 4-H Youth, and community resource development. The Cooperative Extension Service or "Agricultural Extension Service" is active at each of the land-grant universities and has staffs in nearly all of the U.S. counties. The name "Cooperative Extension" derives from financial and administrative arrangements involving three levels of government—Federal, State, and county.

Currently, about 42 percent of extension funds are used for agricultural production and marketing and 58 percent for people and their communities. Of the overall sources of funds, 45 percent is Federal; 37 percent, State; and 16 percent, county; and 2 percent from other sources. Most extension staff is located in State and land-grant universities or in county and multi-county offices. The Cooperative Extension Service utilizes its

- The Extension Service has been designated to have primary responsibility for the transfer of agricultural technology and management information for the entire agricultural system.
- Each State is an integral part of the Extension Service. Each land-grant institution recognizes this function. It is organized to carry out this work by having competent and fully accepted staff.
- The Extension Service staff possesses a range of competencies and skills which are flexible. They are supported by highly trained technical and scientific personnel.
- Since agricultural scientists and other scientists work with the Extension Service, the problems of the clientele are appreciated and understood; thus research work is influenced. Certain scientists who conduct extremely high-risk or theoretical research are protected.
- Consumer information and transfer of technology in human nutrition and related subjects are major areas of concern.
- There is growing interest in developing the use of new information transmission techniques. Remote terminals are being located in county or multicounty offices. Programs are being written for information retrieval or problem solving. A national network is in the early stages of formation.
- Program management information systems and other feedback evaluations continue to receive attention.

Implementation

Since its inception the USDA has worked with State governments, universities, and with business units to perfect a technology transfer and utilization system. Research supported by USDA produced results which have been disseminated by Extension Services located in every State and practically all counties of the Nation.

Extension Service

The Extension Service utilizes about 16,000 professional workers, 8,000 support staff, 8,000 program aides and more than 1 million volunteers. Funds from Federal, State, local and private sources exceed $440 million annually.

Other major USDA activities, described here because of their relationship to the Extension Service, include the Agricultural Research Service, Cooperative State Research Service, Economic Research Service, Statistical Reporting Service, Soil Conservation Service, Forest Service, Farmer Cooperative Service, and the National Agricultural Library.

Agricultural Research Service (ARS)

The Agricultural Research Service (ARS) conducts fundamental, applied, and developmental research in the production, marketing, and utilization of agricultural products; food safety and human nutrition; environmental quality; and ornamental vegetation and turf. The staff of ARS includes about 3,000 research scientists with a $216 million budget. About 80 percent of the ARS scientists are located at or adjacent to university campuses where work is performed cooperatively with State experiment stations. Research is conducted under the direction of four regional program managers in separate laboratories, stations, and work sites. Also, there is a central laboratory complex in Beltsville, Maryland, and large labs on utilization research in each of the regions. Most research is performed internally with only about 3 percent of the research work contracted extramurally.

Recent examples of research include the development of a commercially adapted vaccine for Marek's disease. It preceded full implementation by less than 3 years. Flame-resistant treatment of all children's

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the operations and and performance of State and local governments. The response has been an increased emphasis within the agencies, with the establishments of focal points and an active outreaching approach. More recently at the Federal coordinating level, the Federal Council for Science and Technology established a Committee on Domestic Technology Transfer. The Committee functions to provide improved coordination and information exchange among Federal agencies and with users at all levels. This report is one output of this Committee's activities.

As can be seen from the material in this report, the policies and programs for technology generation, transfer, and use may vary among the various Federal agencies. Each has attempted to design its program to best fit its particular mission, skills, and users. The list of evolving mechanisms, new activities, and specific projects in the overall program to bring technology and knowledge to bear on public problems grows. Technology transfer is receiving increasing attention in government, business, and the university; its importance is now more actively recognized locally, nationally, and internationally. The Federal Government encourages all users to be aware—and make use—of the capabilities and output offered by each of the Federal agencies. The total effort is real and is critical to achieving economic well-being and improved quality of life for our society.

Acknowledgments

This directory is the result of the combined efforts of the members of the Committee on Domestic Technology Transfer (CDTT) of the Federal Council for Science and Technology (FCST) and the agencies they represent. Each agency provided the basic data describing its programs, resources and contact mechanisms.

The scope and content of the directory was planned by a group consisting of Al B. Linhares, Chairman of the CDTT; Richard L. Stone, Executive Secretary; Dr. Howard Davis of HEW; and Todd Anuskiewicz, Consultant to the National Science Foundation.

The implementation of this project to include detailed preparation, integration and review of the text and layout was accomplished by Mr. Anuskiewicz under the direction of Mr. Stone.

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