

## Section III

# PROGRAM DESCRIPTIONS AND ACTIVITIES

OTA assessments are programmatically structured in eight principal areas: energy, food, health, materials, national research and development policies and priorities, oceans, technology and world trade, and transportation. The program areas were established by the OTA Board as a means for organizing congressional requests for assessments. The Technology and World Trade Program is the most recent addition to the scope of OTA activities.

During the report year, more than 40 projects were in progress. Reports on 10 major completed assessments were delivered to the requesting committees of Congress. Forty-three requests for OTA assessments were received from Senate and House committees, bringing to 118 the number the Office has received since its inception.

## Section III

### PROGRAM DESCRIPTIONS AND ACTIVITIES

#### Energy Assessment Program

Requests from Congress for OTA assessments of energy-related issues have been organized by the Energy Program into four principal subject areas: energy conservation, fossil fuels, nuclear power issues, and renewable energy sources. OTA projects across these areas comprise a comprehensive program to provide information to assist Congress in selecting among energy options directed toward assuring both adequate supplies and more appropriate uses of energy.

In 1976, the OTA Energy Program completed analyses of the research and development plans and priorities of both the Energy Research and Development Administration (ERDA) and the Environmental Protection Agency (EPA). The Energy Program also undertook a number of projects addressing issues and options concerning both sides of the energy equation—supply and demand.

On the supply side, efforts were initiated to assess the impacts of and constraints on the development of solar energy, direct coal utilization, and improved methods of recovering oil and gas resources. A fourth project is examining the potential for proliferation of nuclear material capable of being used in weapons, as well as the safeguards designed to prevent proliferation. In the demand sector, attention was focused on residential energy conservation, and on an analysis of the policy options for accelerating the realization of its potential.

The Energy Program is working closely with the other OTA program areas on projects of overlapping interest. Accordingly, in the assessment of slurry pipelines to transport coal, the Energy Program is providing support to the Transportation Program. These two program staffs are also cooperating on those projects concerned with the energy demands for transportation. Similarly, the Energy Program is cooperating with the Oceans Program

in work examining priorities for energy development on and under the oceans. Further, an interactive relationship has been established with the Food Program on bioconversion projects.

#### *Comparative Analysis of the 1976 ERDA Plan and Program*

In this third report on the energy research and development activities of ERDA, OTA responded to a congressional request to determine the effectiveness of ERDA's plans and programs in meeting the goals established in its enabling legislation. In this project, OTA examined ERDA's updated plan and program and assessed the changes made since the earlier OTA analyses. (Excerpts from this report may be found in section II.)

The report provided Congress with substantial background data and analysis for its authorization, appropriations, and oversight functions. Prior to markup of the ERDA authorization bill, OTA briefed the staffs of the Senate Committee on Commerce and House Committee on Science and Technology. Material prepared during the assessment became the basis for recommendations made by the Energy, Research, and Development Subcommittee of the House Committee on Science and Technology on the solar and conservation sections of the authorization bill.

#### *A Review of the U.S. Environmental Protection Agency's Environmental Outlook, FY 1976-80*

EPA presented its 5-year research plan to Congress in February 1976. Concerned that its long-term research program may have been unduly influenced by the Agency's regulatory activities, Congress asked OTA to assess



Air pollution: industrial gases belching from a steel plant.

EPA—Documerica Photo.

EPA's ability to anticipate and research emerging environmental problems. To assist in this review and analysis, OTA assembled three panels totaling more than 50 members representing a wide range of disciplines and points of view. One panel addressed EPA's research plans for control and abatement technology, while the second considered research plans for environmental effects and technologies. The third panel reviewed the plan as a whole and examined crosscutting issues. (Excerpts from this report may be found in section 11.)

The report gave Congress a tool with which to analyze the role of research and development within EPA. Following an OTA briefing of the Subcommittee on the Environment and Atmosphere of the House Committee on Science and Technology, the Subcommittee cited the OTA assessment in a report on the organization and management of EPA's Office of Research and Development. In addition, the EPA Assistant Administrator for Research and Development acknowledged that the OTA analyses made a positive contribution to EPA's efforts to revise and improve its program.

## *Solar Electric Energy*

Nearing completion during the report year, this project, requested by the Senate Committee on Aeronautical and Space Sciences, addresses the feasibility and potential of onsite solar energy systems for generating electricity, heating, and cooling. Two methods of generating electricity by solar means are under study: using solar-heated fluids to drive conventional generators, and converting the sun's energy to electricity in photovoltaic cells. Both methods also produce waste heat which can be used directly for heating and cooling.

One of OTA's major assessments, this work is directed toward analyzing the costs and operations of conventional heating and cooling systems, several modes and levels of various solar technologies, and how solar technologies might be incorporated with existing systems. The examination covers nine types of solar collectors, two types of photovoltaic systems, and associated control, heat transfer, and storage mechanisms. The levels of use being analyzed range from single-family dwellings, through clusters of buildings and multiunit structures, to small communities. The assessment also is examining the economic, institutional, and environmental impacts of solar energy systems.

The assessment is being performed by OTA staff with the assistance of contractors, consultants, and a citizen's advisory panel. Early drafts of the technical sections of the report were extensively revised and expanded by OTA staff in 1976. In addition, OTA developed independent analytical programs to evaluate technical and economic aspects of each system, both in and of themselves and in comparison with existing or potentially competing energy systems. The project was scheduled for completion in early 1977.

## *Enhanced Recovery of Oil and Gas*

Some of the controversy with regard to energy stems from a lack of complete or reliable information on the extent to which energy resources exist within the United States. An important question underlying this determination is the amount of oil and gas potentially available from known reservoirs

through the use of enhanced recovery techniques. Accordingly, OTA is examining data sources about oil and gas and identifying the prospects for their recovery by secondary and tertiary methods, as well as those factors which may encourage or hinder implementation of such methods.

OTA staff and contractors reviewed, analyzed, and correlated the findings of recent reports from a variety of Government and private sources on enhanced oil recovery. This work served as the basis for developing an expanded data base covering about 50 percent of the known oil reserves in the United States. This effort was assisted by an advisory team of specialists from the University of Kansas assembled by OTA to gather technical data for an analysis of reserve sources.

This assessment, proposed by Senator Ted Stevens of the OTA Board, responds to requests from the Senate Committees on Commerce and on Interior and Insular Affairs, and the House Committee on Science and Technology. A report was expected in early 1977.

## *Residential Energy Conservation*

Several technologies in use or under development can save significant amounts of energy in the heating and cooling of residential buildings. In this project, OTA is evaluating the potential for such conservation over the next 15 years and identifying the impacts of and constraints on achieving that potential. The principal objective of the study is to analyze the policy options that Congress might pursue to accelerate conservation measures.

Undertaken at the request of the Senate Committee on Commerce, the assessment was scheduled for completion in the spring of 1977.

## *Coal Utilization*

As the prices of oil and gas have increased, and as their availability has become increasingly dependent on uncertain foreign sources, Congress has returned attention to coal as an abundant resource. In doing so, Congress faces questions arising from the conflicting

requirements in using coal to meet energy demands while maintaining appropriate environmental standards.

This project is evaluating and comparing the impacts of different methods, available or under development, for burning coal directly (i.e., in contrast to converting it to gas or liquids). An important part of the assessment is focusing on methods, either available or being developed, to increase the burning efficiency of coal, thereby reducing pollutants and other undesirable byproducts.

A second part of the project is examining the technologies for, and environmental and other impacts of, converting coal to gas or liquid forms for combustion. The assessment, undertaken at the request of the Senate Committee on Public Works, is being performed by OTA staff with the assistance of contractors and an advisory panel. It was scheduled for completion in early 1977.

### *Nuclear Proliferation and Safeguards*

Long an international issue, the spectre of a nuclear holocaust has been intensified by the

recent spread of nuclear material generated by the growth in nuclear energy development around the world. This proliferation has heightened concern that nuclear material and know-how, provided both by the United States and other countries, could be used to build nuclear weapons by those nations that do not now possess them.

To assist Congress in determining how this trend can be retarded and the potential disaster minimized, OTA is analyzing the problems attendant to proliferation of nuclear materials and the safeguards in use or that might be used to prevent diversion to weapons production. This, in turn, will provide information for the assessment's evaluation of the possibilities for, and the potential of, developing safeguards to prevent the spread of nuclear weapons.

The project is being performed by OTA staff, contractors, and an advisory panel. Efforts on this analysis were forwarded by a workshop held to formulate a work plan, followed by a succession of four panel meetings to review and assist the work of OTA staff. The assessment, requested by the Senate Committee on Government Operations, was expected to be completed in early 1977.

## **Food Program**

In 1972-73, shortages of foods, fuels, and fertilizers disrupted U.S. and world markets and altered public perceptions of availability of these items. Since that time, improvements in the world food outlook have occurred. Instead of shortages, world cereal production in 1976 exceeded that of 1975 by 9 percent, and world carryover stocks (surpluses over that needed immediately) were expected to be the largest in 5 years. In the United States alone, carryover wheat stocks should be the largest since 1963.

At the same time different concerns arose, particularly in the United States. Large sections of the country west of the Mississippi River were experiencing their worst drought in years. Accidents or careless handling of nonbiodegradable chemicals, as well as chemical additives to foods, posed hazards for both

livestock and human food sources. State and Federal regulations affecting food production, processing, and marketing have increased sharply in recent years. New regulations may be required to protect the environment and consumers' health; yet some regulations appear excessively burdensome to the food industry in relation to the protection they provide for society.

To assist Congress with these and other related issues, the OTA Food Assessment Program embraces a wide range of issues concerning agriculture, food, and nutrition. Food Program activities are divided into three functional areas: (1) production, from input to the farm gate; (2) marketing, consisting of processing, wholesaling, and retailing; and (3) consumption and nutrition. These activities

address two primary congressional concerns: better management and use of technologies and resources, and the impact of U.S. food policies on the nutrition and health of consumers at home and abroad.

The need to anticipate changes that affect the U.S. and world food systems has been examined thoroughly in OTA's assessment of food information systems, published during the report year. The study has been used to help apprise Congress of the need and some of the means available for obtaining as much advance notice as possible of national and international food crises.

Yet another project dealing with the overall food situation initiated in 1976 is assessing alternatives in U.S. food policy. This project is intended to provide information and public policy options for Congress to consider in legislating a national food policy.

In the food production area, OTA is examining alternative methods for funding of high-priority U.S. agricultural research. Basic research in the biological sciences that underpin livestock and crop production technology in the United States has been curtailed in recent years. This deficiency, unless corrected in the near future, may limit potential improvements in food production technology in the coming decades. A second project is evaluating the consequences of increasing U.S. support for agricultural research in developing countries.

In the marketing area, OTA projects are addressing issues concerning the transfer of food processing technology to developing countries and the impact of Federal regulation and food grading standards on consumer choices.

In a nutrition-related activity, OTA surveyed so persons knowledgeable in the food and nutrition fields. Analysis of survey results identified five issues of concern: (1) public health problems affected by nutrition, (2) monitoring U.S. and international food consumption and nutrition status, (3) assessing Federal food and nutrition programs, (4) public awareness of nutrition, and (5) the quality, safety, and nutritional value of food. In that these issues correspond to congressional concerns, the survey results are expected to serve

as a resource for possible nutrition assessments.

In carrying out these projects, the OTA Food Program calls upon the information resources of several executive branch agencies. These include the Department of Agriculture (USDA), the Agency for International Development, the Federal Trade Commission, and the Food and Drug Administration.

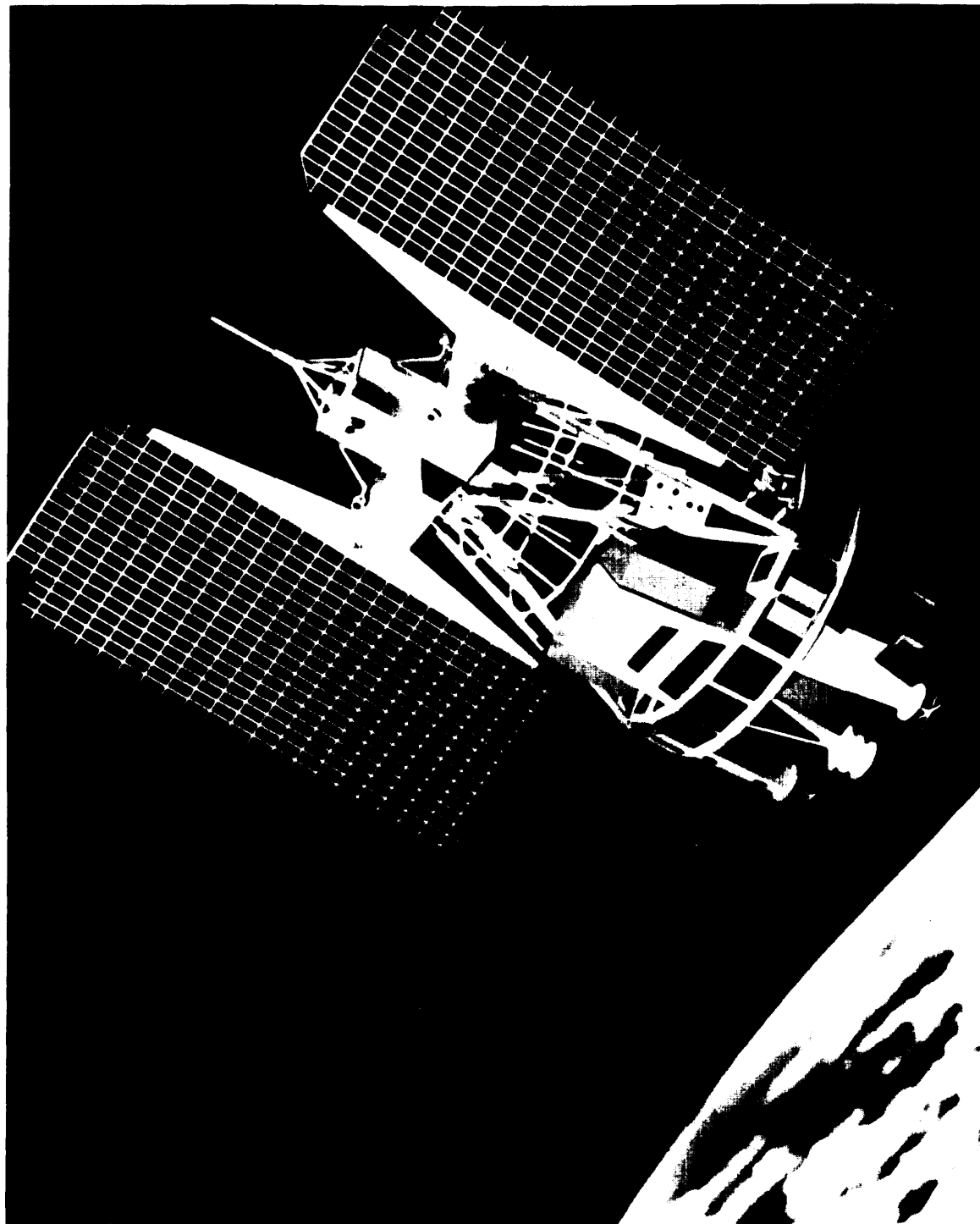
Two Food Program assessments under way during the report year complement projects in other OTA program areas. The assessment of needs and alternatives for implementing research and development in agriculture is related to the OTA Research and Development Program, while the project concerning the transfer of food processing technology to developing countries has themes common to those being developed in OTA's Technology and World Trade Program. In addition, such marketing issues overlap with concerns of OTA's Transportation Program, while nutrition issues correlate with similar issues that are the subjects of OTA Health Program analyses.

### *Food Information Systems*

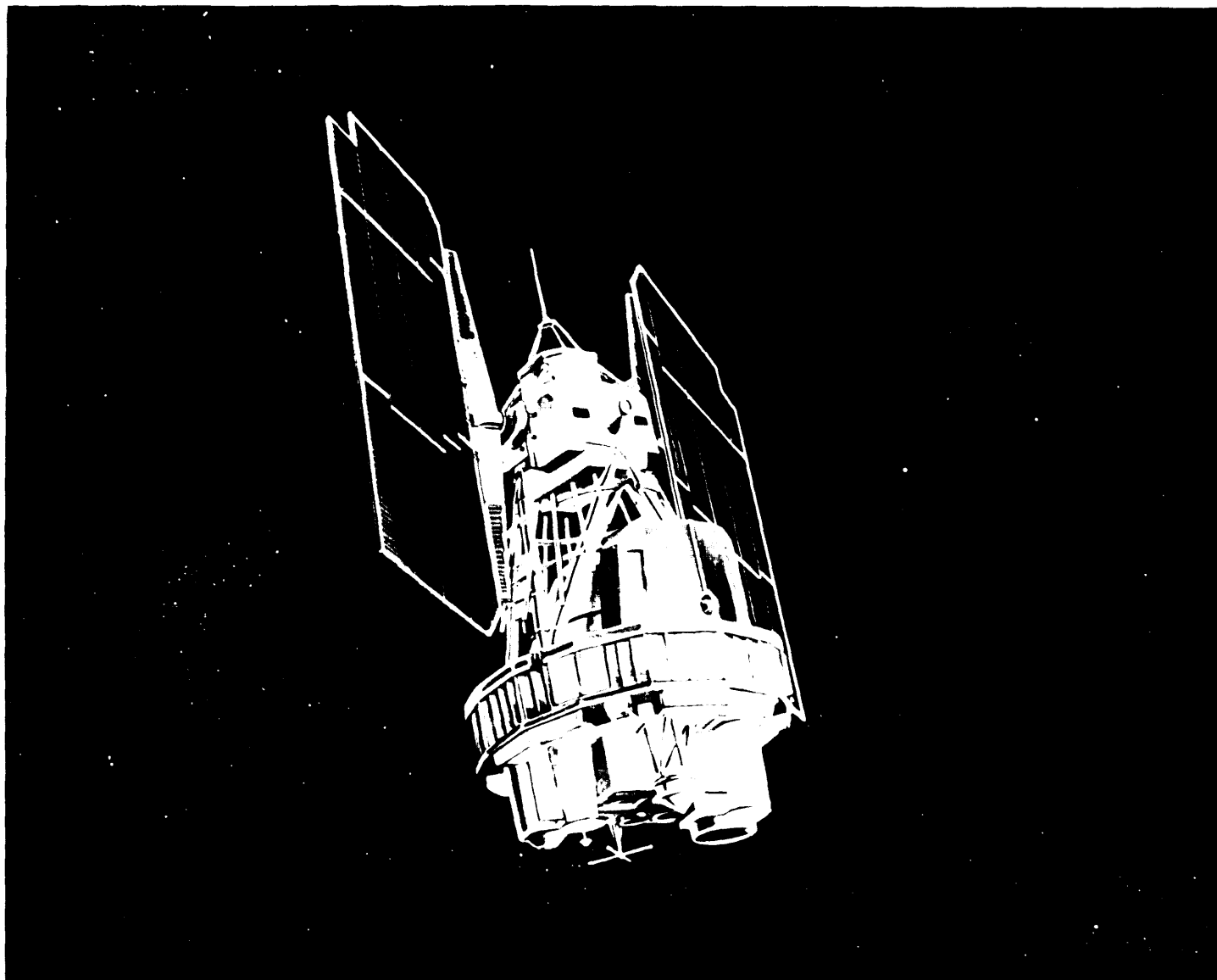
This report, published in August 1976, consists of two volumes. The first records four days of public hearings on food information systems held by the OTA Board on September 24 and 25, 1975; December 10, 1975; and February 4, 1976. The second volume summarizes and analyzes testimony elicited at the hearings and other material submitted by witnesses, OTA staff, and Board members. (Excerpts from this report may be found in section II.)

Requested by the Senate Committee on Agriculture and Forestry, the assessment provided material for four congressional hearings: two were held by the Subcommittee on Foreign Agriculture Policy of the Senate Committee on Agriculture and Forestry, and one each by the Subcommittee on Census and Population of the House Committee on Post Office and Civil Service and the Senate Select Committee on Nutrition and Human Needs. A bill requiring USDA to conduct an agricul~ur-

Art's concept of the Earth Resources Technology Satellite A ERTS now LANDSAT  
For the U.S. space devoted exclusively to the study of the earth's natural resources



**Artist's concept of LANDSAT-2. LANDSAT-2 was launched on January 22, 1975, in a circular polar orbit at a distance of 568 miles. The Multispectral Scanner System provides images of the earth in four spectral bands.**



NASA Photo.



al census every 5 years was based on material prepared for the OTA hearings.

### *Agricultural Research and Development*

Initiated during the report year, this assessment consists of two separate but related parts: an evaluation of the alternatives for supporting high-priority agricultural research in the United States, and an analysis of the implications which could result from possible increases in U.S. support of agricultural research in developing countries.

Preliminary findings obtained in 1976 aided the staffs of two subcommittees of the House Committee on Science and Technology in hearing preparations, and material developed by OTA was expected to be used in hearings scheduled for early 1977 by the Foreign Assistance Subcommittee of the Senate Committee on Foreign Relations. Requested by the Joint Economic Committee and the House Committee on Science and Technology, a report was expected early in 1977.

### *Transfer of Food Processing Technology to Developing Countries*

The growth in population experienced by many developing countries, in combination with continued drought, has made widespread hunger a grim reality in many parts of the world. Recent uncertainties about U.S. agricultural output have reinforced the argument advanced by many observers that long-range solutions lie in developing nations becoming self-sufficient in food production.

Toward that end, OTA is evaluating the alternatives for and consequences of exporting U.S. food processing technology to such developing countries. As part of this, the project is identifying the quality and range of foods available to such nations, as well as those technologies which would be likely to increase their total food supply, improve its nutritive value, and/or lower the cost of high-quality food.

In addition, OTA is analyzing the effectiveness of institutional channels for, the methods of, and constraints to such transfers. The

options available to Congress for stimulating such transfer are also being examined.

Requested by the Joint Economic Committee, the Senate Select Committee on Nutrition and Human Needs, and the House Committee on Agriculture, this assessment was scheduled for completion in early 1978.

### *Food Grading*

Present Federal food grades impart little information to the consumer, whose demands for more information have led Congress to consider changing the standards for U.S. food grades. Current grading criteria are based on sensory characteristics such as taste, flavor, color, or exterior appearance. A more uniform terminology, increased nutritional information, and standardized systems for grading might be of great benefit to consumers.

At the request of the Senate Committee on Agriculture and Forestry and the Senate Select Committee on Nutrition and Human Needs, OTA is examining current standards for food grading to determine if and how changing them will affect consumers. Specifically, the project is evaluating changing the present producer-oriented grading system to a more retail- or consumer-oriented one.

The assessment identifies and analyzes three major issues: (1) changing the criteria or sorting rules used for food grades; (2) changing the present optional Federal grading system to a mandatory system; and (3) determining the adequacy of present grading terminology for consumers. These issues are being evaluated for grading fresh red meat, fresh fruits and vegetables, and processed foods.

The first part of the project was expected to be completed in early 1977.

### *Alternatives in U.S. Food Policy*

This project integrates results from several different assessments being undertaken by the Food Program. It is assessing technological issues and problems relating to U.S. food policy in the production, marketing, consumption, and nutrition areas.

The OTA Food Program and its Food Advisory Committee have established three objectives for the assessments of alternatives in U.S. food policy. First, a statement was being prepared on the components needed to formulate a national food policy. Second, public policy and technological issues of concern to Congress are being identified and analyzed. Third, emerging issues in the food area are being identified and analyzed.

OTA examined the policies and programs affecting each element of the system, how

they relate to one another, and the tradeoffs which result from trying to resolve conflicts that arise between competing goals (such as low prices for consumers and higher incomes for farmers).

The assessment was requested by Senator Hubert Humphrey of the OTA Board, the Senate Committee on Agriculture and Forestry, the Senate Select Committee on Nutrition and Human Needs, and the House Committee on Agriculture. A report was scheduled for completion in early 1978.

## Health Program

The purpose of the OTA Health Program is to conduct technology-related research studies on health policy for the committees of Congress. The Health Program has concentrated its initial efforts on issues related to medical technologies, rather than broadening its scope to include other fundamental issues such as behavioral, environmental, and occupational health.

Medical technologies are defined as the set of drugs, devices, and procedures used by medical professionals in delivering medical care to individuals and the organizational systems within which such care is delivered. These applications of scientific knowledge in the health field address a wide range of medical purposes: disease prevention, diagnosis, therapy, rehabilitation, organizational support, and patient care. Such technologies take the form of both hardware (devices and facilities) and software (methods and skills).

Congressional committees are concerned with Federal policies that bear upon many activities in the development and use of medical technologies: determination of need, research and development, validation of research findings, diffusion, use, financing, and measurement of outcome. Throughout all these activities, issues concerning quality, cost control (efficiency), and equity arise.

One assessment completed in 1976 examined the potential benefits to be derived from

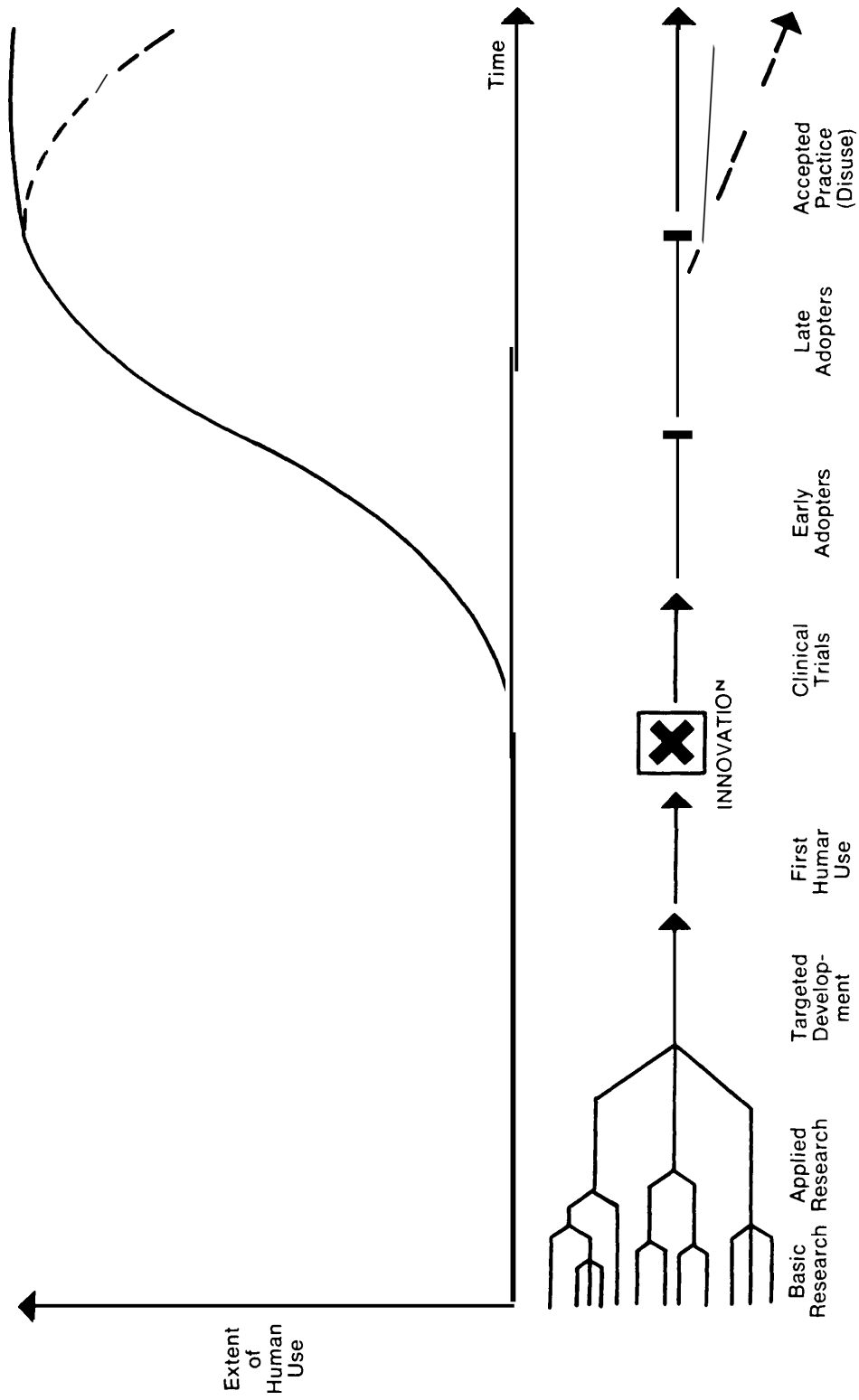
more fully analyzing new medical technologies with respect to their impact on the patient, the patient's family, the medical care system, and on the legal, social, and political structures in society. A detailed examination of the policy implications of one new technology, the computed tomography (or CT) scanner, is the subject of a study initiated during the year.

In another assessment undertaken during the year, OTA is examining policies for determining the efficacy and safety of new medical technologies before they are placed into widespread use. In yet another study, OTA is evaluating the benefits and limitations of medical information systems that use computers to process both administrative and medical data. Special emphasis is being given to activities related to clinical medical care. The OTA Health Program is also completing an analysis of alternative policies that might improve the use of prescription drugs.

Policy studies in the Health Program are conducted by OTA staff with the assistance of expert advisory panels, consultants, and, for some specific tasks, outside organizations on contract to OTA. The Health Program Advisory Committee assists in the development of research plans for studies, including definition of issues, scope, and methodology.

In planning and carrying out studies, Health Program staff work closely with congressional committee staff as well as with other legisla-

ω scheme for development and diffusion of medical technologies



tive and executive branch agencies, such as the Congressional Research Service, General Accounting Office, Congressional Budget Office, and the Department of Health, Education, and Welfare.

#### *Development of Medical Technology: Opportunities for Assessment*

The OTA report examined the need to assess the social impacts of new medical technologies while they are being developed, the kinds of questions that might be asked in such assessments, by whom, and at what point in the development process assessments could most effectively be conducted. The report presented the case histories of nine technologies to illustrate medical technologies, how they are developed, and why assessing their social impacts might be helpful. (Excerpts from this report may be found in the preceding section.)

Requested by the Senate Committee on Labor and Public Welfare, the report was published in August. At year's end, its findings were being used by the committee staff to prepare for hearings planned for spring 1977 concerning the possibility of requiring assessments of new medical technologies developed with the aid of Federal funds.

#### *Policy Implications of Computed Tomography Scanners*

The computed tomography (CT) scanner, a new radiological device which combines an online computer with sophisticated X-ray equipment to produce a cross section image, is used to diagnose a wide variety of diseases. Rapidly and enthusiastically accepted by the medical community, CT scanning in the United States is already costing more than \$200 million per year, and is growing rapidly. The Federal Government, through private insurance companies and individual patients, is faced with the problem of paying these bills. The combination of the revolutionary nature of CT technology, the rapidity of its accept-

ance, and its expense have created many major problems for the medical system.

Because many of these problems are common to a number of new medical technologies, CT scanners provide a case study that highlights several important issues for health policy. These issues include: Federal policy regarding safety and efficacy, the effect of health planning and regulatory policies on diffusion, the relationship between efficacy and patterns of use, and the impact of reimbursement policies on expenditures. The assessment, requested by the Senate Committee on Finance, was expected to be completed in late 1977.

#### *Achieving Safer, More Effective, and Less Costly Use of Therapeutic Drugs*

Although Americans spend more than \$10 billion annually on drugs, numerous questions concerning the cost, use, and effects of therapeutic drugs remain unanswered. Alleged problems include: errors in administration of drugs, noncompliance by patients, inadequate professional and consumer education, and under- and over-utilization of drugs. Inordinate or inappropriate use of drugs can lead to protracted illness or needless injury, as well as increased costs.

In this study, OTA is analyzing a broad range of factors that limit safer, more effective, and more economical use of drugs. The problem of adverse drug effects is being given particular attention. In addition, a number of strategies designed to improve drug use are being evaluated. The alternatives fall into several categories: information provided to health professionals, review of behavior of health professionals, administration and management of drug use, education and training of health professionals, regulation and control of procedures used by health professionals, and information provided to patients. Systems to monitor adverse drug effects are also being reviewed.

This assessment, which was requested by the House Committee on Ways and Means, is limited to prescription drugs. Completion was expected in late 1977.

Issues of efficacy arise when a new technology is introduced, when a widely used technology is later questioned, or when alternative therapies are compared. Various laws have been enacted to regulate the safety and efficacy of drugs and medical devices.

Determination of safety and efficacy of procedures, however, is widely considered to be a professional responsibility, although some testing is being conducted by various Federal agencies and private groups. However, such widely used technologies as tonsillectomy, appendectomy, and fetal monitoring have not been completely assessed for efficacy and safety. Other widely used procedures, such as mammography, are now being reexamined.

In this study, OTA is using 16 short case studies to illustrate the diverse nature of medical technologies, the difficulties in determining efficacy and safety, and Federal involvement in assessing efficacy before technologies come into widespread use. The OTA Health Program is examining the need for assessing efficacy and safety, the methods and procedures available for such assessment, the types of assessment presently being supported by the Federal Government, and ways to improve existing policies.

The report was undertaken at the request of the Senate Committee on Labor and Public Welfare. Completion was expected in late 1977.

Almost 90 percent of all hospitals in the United States use some form of electronic data processing. For the most part, hospitals have automated only business and administrative functions; few health care facilities presently use computers for activities related to clinical care. Computer systems that process both administrative and medical data, known as medical information systems, have recently been developed and are now being marketed.

This assessment analyzes the benefits and limitations of such systems. Three representative systems are being examined: one designed for use in an acute-care hospital, one designed for ambulatory care, and one that can be used in either setting.

The study is directed toward an examination of the impact of such systems on patient care, the quality of care, medical education, professional roles, research, planning, malpractice litigation, and the confidentiality of patient records. The Health Program is identifying factors, such as cost, transferability, and acceptability, that will influence the implementation and use of medical information systems. Alternative Federal policies are being analyzed regarding more widespread use of such systems.

The assessment was requested by the Senate Committee on Labor and Public Welfare. It was expected to be completed in late 1977.

## Materials Program

The processing and use of materials\* account for almost 50 percent of the U.S. gross national product. About 45 percent of the full-time work force, some 34 million workers, were employed in the materials sectors of the economy in 1973. Until the 1973 oil embargo, however, the importance of raw and processed materials, and the fact that some were in short supply and/or controlled by foreign sources, was not generally appreciated.

In its requests for OTA assessments, Congress has reflected a concern over the future availability of adequate quantities of materials to maintain current standards of living. Congress is also concerned about whether supplies will be assured by the normal actions of the economic marketplace, or whether some Government action is required.

To meet these concerns, the OTA Materials Program is built around the total materials cycle, from exploration and extraction through production to use, reuse, and eventual disposal. This approach emphasizes the linkages between issues at one phase of the cycle with those at another. The individual projects address both the supply and demand sides of the materials equation.

During the report year, OTA published two reports addressing separate but related issues involving materials. The first, released in October 1976, examined the possible use of a national stockpile of critical materials for broader purposes than national security in order to avoid future economic dislocations. The second, published in December, analyzed existing and possible institutional means for improving the capabilities of the Federal Government to acquire information on materials needed to support policy decisions.

Work progressed in 1976 on five assessments. One project is examining the issues relating to resource recovery from and the management of municipal solid wastes. Two

assessments deal with issues and problems related to access to minerals. The first is examining laws, policies, and practices that affect the exploration for and production of minerals from Federal lands. The second is looking at the effects of Federal land management and ownership on mineral exploration and development on non-Federal lands.

Another project deals with alternative technological approaches for conserving materials in both their manufacture and use. Finally, OTA is assessing the value of past and future mining activity on existing Federal coal leases.

A number of related problems or issues are being looked at by OTA from different angles by several program areas. Coal, for instance, is being assessed by three separate projects in three program areas: (1) the Materials Program is evaluating Federal coal leases; (2) the Energy Program is studying coal utilization; and (3) the Transportation Program is examining the use of slurry pipelines to transport coal.

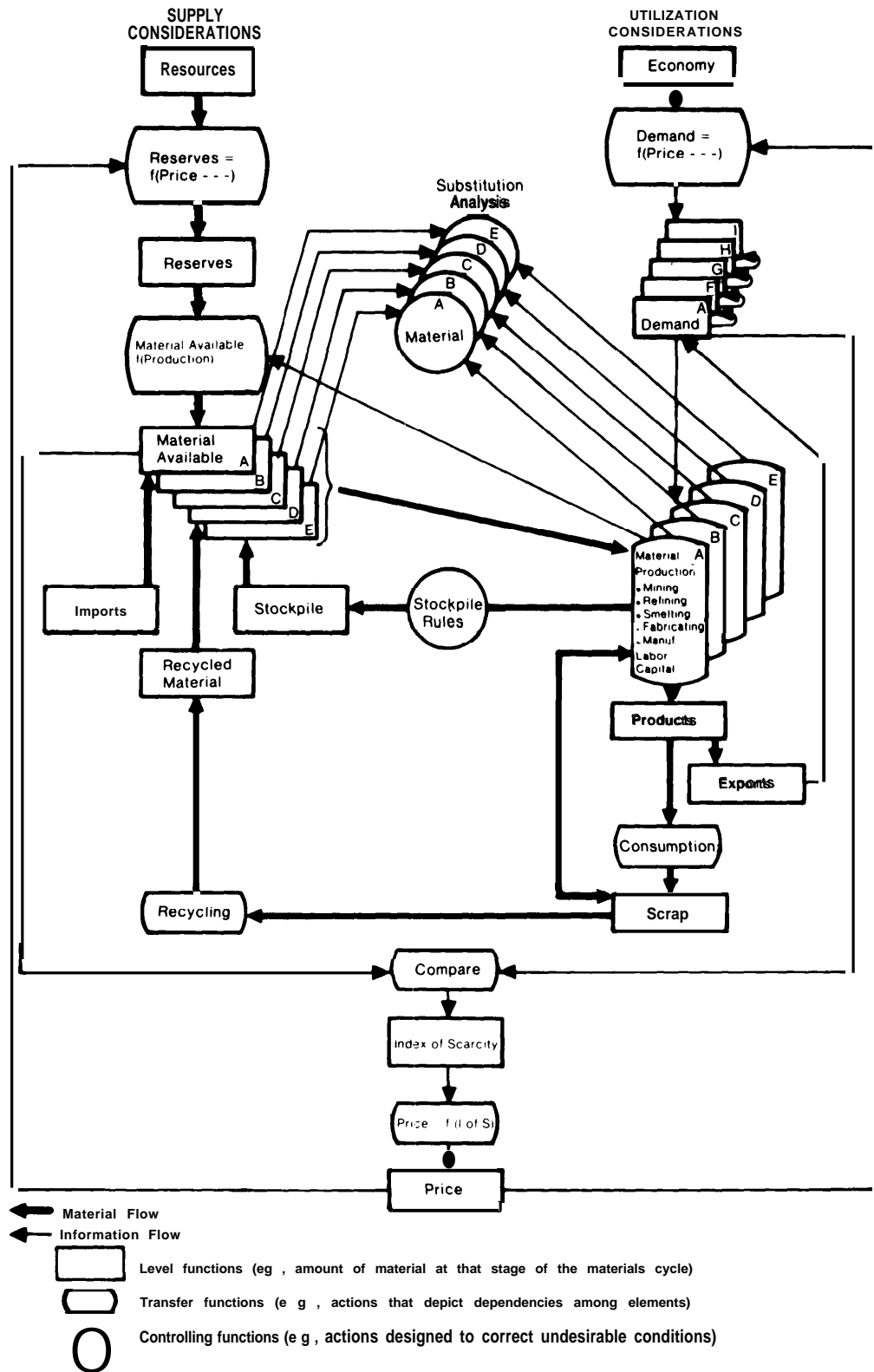
### *Alternative Economic Stockpiling Policies*

Undertaken for the House Committee on Science and Technology, the findings of the report have been widely used by Congress and other organizations. OTA briefed the staffs of the Senate Committee on Commerce, the Department of Defense Materials Shortages Steering Committee, the Federal Preparedness Agency, and the Materials Division of the Department of Commerce. In addition, OTA assisted the Subcommittee on Materials Availability of the Joint Committee on Defense Production in preparations for hearings on economic stockpiling held June 8 and 9, 1976. Finally, the National Commission on Supplies and Shortages used the findings to help prepare for its report to the President and to Congress issued in December 1976. (Excerpts from this report may be found in section II.),

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\* "Materials" has been defined in *Science Policy - A Working Glossary* (1976 edition) as "stuff that things are made of or with, or could be."

## Basic informational framework applied to materials substitution



## *Materials Information Systems*

This report addresses the alternative methods by which policy makers in Congress and elsewhere would receive adequate and timely information about supplies and potential shortages of materials which are critical to the U.S. economy. The project assessed the needs, character, institutional structure, and effects of information systems on the supply, processing, and use of materials. (Excerpts from this report may be found in section II.)

The assessment was requested by the House Committee on Science and Technology. The staffs of four separate congressional committees were briefed at various stages of the project and given copies of the interim report. In 1976, as in 1975, OTA staff testified at hearings conducted by the Senate Committees on Commerce and Interior and Insular Affairs on proposals to establish, among other things, a national energy information system.

Also, the National Commission on Supplies and Shortages has been closely involved with this and other Materials Program projects. OTA briefed the Commission staff in preparation for a conference held April 19 to 23, 1976, and for the Engineering Foundation Conference at Henniker, N. H., held on August 8 to 13, 1976. The OTA Director submitted the major findings of the assessment for insertion into the record of public hearings held by the Commission on October 13, 1976.

### *Resource Recovery, Recycling, and Reuse*

The generation and management of municipal solid wastes present substantial problems for local, State, and Federal governments. Wastes are not only costly to collect, but also need to be disposed of in an economical and environmentally acceptable manner. In addition, the generation of wastes results in a more rapid consumption of natural resources. Accordingly, OTA is studying the potential for, and barriers to, recycling and reusing resources recovered from the waste stream. OTA's purpose is to identify and analyze both

the policy options for the resolution of these problems, and the likely impacts of implementing those options.

The project includes several parts: an evaluation of markets for such recovered goods as paper, aluminum, ferrous metals, glass, and energy; an analysis of the impacts of freight rates on the movement and sale of recovered goods; a study of the economic and technological feasibility of centralized facilities for resource recovery; and an analysis of the implications of mandatory deposits on beverage containers.

The assessment, being performed by OTA staff with the assistance of a subcommittee of the OTA Materials Advisory Committee, was requested by the Senate Committee on Commerce and the House Committee on Science and Technology. OTA worked with congressional staff during deliberations leading to the Resource Conservation and Recovery Act, enacted on October 21, 1976.

In addition, OTA staff briefed the Subcommittee on Environment and Atmosphere of the House Committee on Science and Technology. Background material on recycling materials was prepared for the staffs of the Senate Committees on Public Works and Finance. OTA staff also participated as panel members at a symposium held on April 7, 1976, on resource conservation and recovery sponsored by the Subcommittee on Transportation and Commerce of the House Committee on Interstate and Foreign Commerce.

The final report was expected to be completed late in 1977.

### *Minerals Accessibility on Federal Lands*

OTA is assessing the effects of modifying or restructuring State and Federal laws, policies, and practices that significantly affect the exploration for and production of minerals located on Federal lands. The objective of the assessment is to provide alternative approaches to facilitating mineral development in ways that are environmentally acceptable and take nonmineral land uses into account.



The assessment is divided into two parts. The first involves a compilation and analysis of information on the effects of current Federal and State laws, policies, and practices relating to mineral development on Federal lands. The second is analyzing possible adjustments in the existing system for managing the exploitation of minerals on Federal lands, as well as the impacts of those adjustments.

The assessment was requested by Senator Ted Stevens of the OTA Board and the Senate Committee on Interior and Insular Affairs. One report was expected in the fall of 1977, another by the end of 1977.

An interim report was distributed to the Senate and the House Committees on Interior and Insular Affairs and many individual members of those committees, to other interested committees and Members of Congress, to executive agencies, and to the public.

In addition, OTA sponsored an assessment workshop in July that enabled congressional staff to question representatives of executive agencies, private industry, and interest groups on various issues relating to minerals and Federal land management.

#### *Minerals Accessibility on Non-Federal Lands*

This project is assessing the various aspects of Federal land management and ownership that influence the exploration for and development of minerals on non-Federal lands, or on Federal lands where the surface and subsurface property rights are severed. The assessment is focusing on situations where the Federal Government owns only the surface land or only the minerals, as well as on access across Federal lands to minerals located on non-Federal lands.

This assessment, which evolved from the minerals accessibility on Federal lands project, was requested by Senator Ted Stevens of the OTA Board. The assessment was expected to produce two reports by the end of 1977.

#### *Conservation Through Reduced Wastage*

Since in the manufacture and use of products a large amount of materials might be saved, OTA is analyzing alternative technological approaches to conserving materials. To provide an appropriate focus for a potentially wide-ranging effort, the scope of this assessment is limited to primary metals (chromium, nickel, copper, aluminum, and iron) and certain key products, such as autos and railroad rolling stock, appliances, and military and construction equipment.

The assessment is directed toward the study of the flow of materials from their source to end-use products, examining the cycle to determine the reasons for wastage, and identifying and evaluating alternative approaches to the design and manufacture as well as the conservation of materials. The project is divided into two parts: an engineering analysis to define the state of the technology for conservation, and a public policy analysis of the options for Congress in considering the impacts of the technology.

Requested by the Senate Committee on Commerce, the project was expected to be completed by mid-1978.

#### *Existing Federal Coal Development*

OTA is analyzing Federal coal leases, permits, and preference-right lease applications with respect to current and future plans for the development of coal reserves. Mandated by Congress in Section 10 of the Federal Coal Leasing Amendments Act of 1975, the assessment is analyzing all mining activities, determining the revenues from those leases, and evaluating the feasibility of using deep mining technology in the leased areas.

This assessment was to be completed by the end of 1977.

## Oceans Program

Recent years have brought an increased awareness of the impact of the oceans on the well-being of man—the oceans' potential as a source of food, fuel, and hard minerals; their use as avenues of world commerce and communications; and their role in man's research for knowledge about his resources and environment. At the same time, the oceans are increasingly recognized as a finite resource, one to be managed in a way that will strike a balance between immediate use and longer-term viability,

To assist Congress in its deliberations of such matters, the OTA Oceans Program focuses on a broad range of issues involving the use and quality of the oceans and the systems deployed on or in the oceans and along their shores. The program is particularly concerned with examining possible future uses of the oceans.

Early studies by the Oceans Program centered on the potential for, and impacts of, using the oceans to help meet the energy needs of the Nation. In December 1976, OTA published a report on the impacts of three proposed offshore energy systems on the coastal areas of New Jersey and Delaware. A related project was underway on the implications of various proposed technologies for harnessing the ocean itself as a source of energy. Another project examines the public decisionmaking process for, and the effects of, locating energy facilities in coastal areas. Some aspects of these assessments involve work by other OTA programs, especially the Energy Program.

Work continued on an assessment of technologies for carrying out provisions of the new 200-mile fisheries zone created by Congress. A planning study was initiated to aid Congress in its evaluation of Federal expenditures for marine science and technology.

### *Coastal Effects of Offshore Energy Systems*

The report on the effects three proposed offshore energy systems might have on the coastal areas of New Jersey and Delaware culminated a 3-year, multifaceted effort by

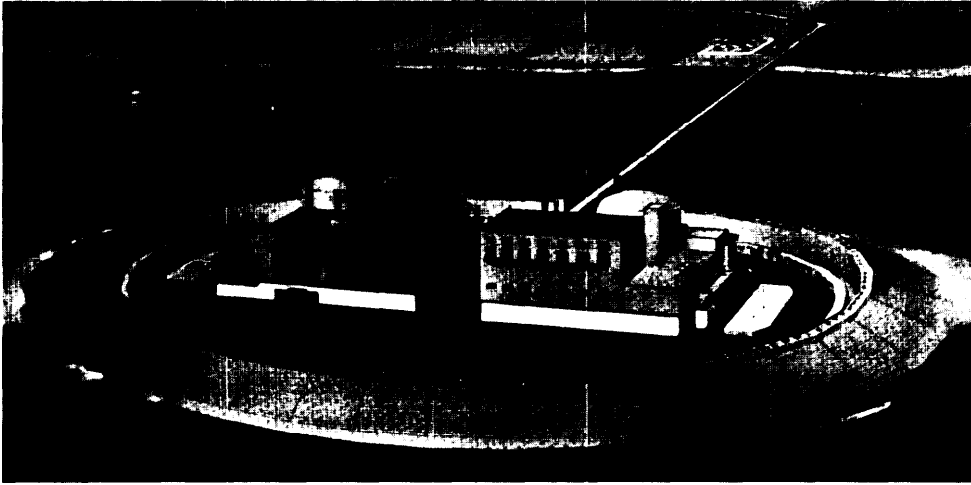
OTA. The three systems are: the exploration for and development of offshore oil and gas, use of deepwater ports for large oil tankers, and generation of electricity by floating nuclear powerplants. (Excerpts from this report may be found in section II.)

As part of this assessment, OTA completed a public participation program which involved more than 15,000 people through workshops, public meetings, interviews, citizen advisory panels, and distribution of questionnaires and brochures. The program was intended to contribute to the public understanding of the technologies being assessed and to insure that the final report reflected the views and concerns of the people who would be affected by the technologies,

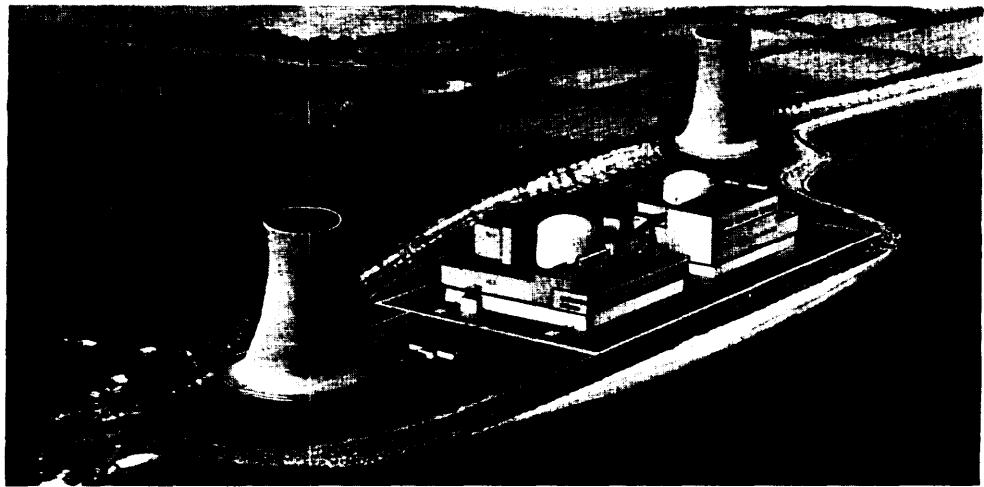
Throughout the year, various sections of the report were used by numerous committees of jurisdiction in both the House of Representatives and the Senate in preparation of legislation dealing with tanker safety, oil spill liability, coastal zone management, and offshore oil and gas leasing. The report served as a resource for public debate centering on the potential licensing of a floating nuclear powerplant off Atlantic City. It was used by both Congress and the Administration in planning reorganization of the U.S. Department of the Interior. The report was expected to continue to serve as a working paper for upcoming OCS legislation throughout the 95th Congress.

Late in 1976, in response to a series of tanker grounding and oil spills, the Oceans Program restated the findings of a 1975 analysis of "Oil Transportation by Tankers." Updated statistics were provided on oil spills, foreign tanker registration, and the status of technology for marine safety and pollution control. This emergency response assisted congressional committees in their inquiries into the tanker accidents, provided support for Senator Edward M. Kennedy at hearings in Boston on December 22, 1976, relative to the *Argo Merchant* spill, and was to support further hearings on tanker safety scheduled early in 1977 by the Senate Committee on Commerce.

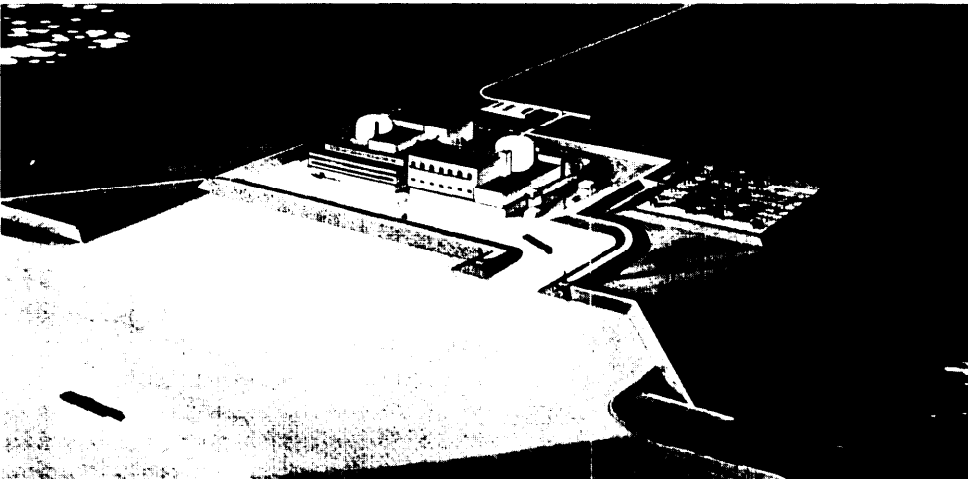
## Three siting alternatives for floating nuclear plants



1. Nearshore siting-open-cycle cooling



2. Inshore siting-cooling towers



3. Riverine siting-open-cycle cooling

Source Offshore Power Systems, Inc.

In addition, work proceeded on the following projects:

### Fisheries Technology

In April 1976, Congress established a 200-mile offshore fisheries zone, giving the Nation jurisdiction to limit fishing by foreign nations and to establish regulations which would preserve fish stocks and encourage the U.S. fishing industry to grow and develop new commercial and recreational fisheries. To assist Congress in assessing the impacts of this law, the Oceans Program is studying techniques to be used in enforcing fisheries regulations, management practices to be used in regulating the fisheries, and opportunities which may be created by implementation of the law. The study is identifying changes which are desirable in the Federal structure dealing with fisheries and is analyzing new electronics surveillance systems which may be useful in enforcing regulations.

A report on this assessment, which was requested by the Senate Committee on Commerce and the House Committee on Merchant Marine and Fisheries, was expected to be released in the spring of 1977.

### *Renewable Energy From the Oceans*

A number of technologies have been proposed to harness the energy of the oceans themselves. These include conversion systems for geothermal energy, tidal and ocean thermal powerplants, salinity gradient and ocean farming systems, and mechanisms to extract wind, wave, and current energy.

The Oceans Program is analyzing each system's potential for meeting energy needs and the adequacy and effectiveness of Federal support and regulatory mechanisms for the systems. A report was expected in spring 1977 for the Senate National Ocean Policy Study.

### *Marine Science and Technology*

The Federal Government has invested large sums of money during the past two decades in

research projects involving the oceans and coastal areas. In a planning study directed toward evaluating the progress that has or has not been made as a result of these expenditures, OTA is examining possible alternatives for organizing such Federal research efforts, as well as legislation which may be needed.

During this project, a set of questions was submitted to a wide range of marine specialists in such areas as transportation, fishing, energy, hard minerals, ocean research and engineering, and meteorology. Responses from these specialists were used to outline the status of technology and the research needs in each area.

The planning study, requested by the Senate National Ocean Policy Study, was due to be completed in spring 1977.

### *Siting of Energy Facilities*

Meeting the demand for energy requires new facilities, which, in turn, raises questions and possible conflicts regarding their location. This is particularly the case in the coastal areas where population density is high and industrial, residential, transportation, and recreational users compete for land. In addition, energy facilities are viewed by many as threats to the ecological and environmental balance of the coastal areas.

These factors are all being considered in an OTA project examining the effects of the public decisionmaking process on the geographical location of powerplants, oil refineries, and other energy facilities. The study is analyzing the extent to which Federal laws and policies, such as those regulating air and water quality, influence the location of energy facilities. It also is assessing the long-range impacts of energy facilities on population distribution and economic growth.

A report on this study, requested by the House Committee on Interior and Insular Affairs and the Senate Committee on Commerce, is due in late 1977.

## National Research and Development

### Policies and Priorities Program

Research and development activities are vital to the economic, social, and technological well being of any country. The significance of research and development goes beyond the dollars involved—\$26.3 billion in the Federal budget for fiscal year 1978, plus about another \$20 billion in the private sector. R&D expenditures can induce rippling effects by stimulating technological innovation and economic activity, and may, in fact, be a prerequisite to innovation.

The Federal Government provides nearly 70 percent of the support for basic research in the United States. In an era of limited resources, Congress often must resolve the conflicting claims for support from advocates of basic versus applied research. However, applied research is often grounded in the discoveries of basic research. The problem is to determine what basic research to support and how best to allocate finite resources among competing demands.

Congress, its committees, and individual Members and their staffs are faced with discerning the effects of Federal R&D priorities, and examining legislative options for getting the most out of federally sponsored R&D. Seven different congressional units—the Senate and House Committees on the Budget, the Congressional Budget Office, the Joint Economic Committee, the Senate Committees on Commerce and on Aeronautical and Space Sciences, and the House Committee on Science and Technology—plus several members of the OTA Board requested or expressed an interest in assessments relating to the R&D activities of the Federal Government.

As a result, the OTA Board, on the recommendation of the Advisory Council, established the National Research and Development Policies and Priorities Assessment Program in 1975. The R&D Program examines a variety of issues and factors relating to scientific and technological research, as well as the role of Congress regarding decisions on

R&D and applications of science and technology. This includes consideration of the institutions and methods for establishing R&D policies and priorities, as well as for evaluating their substantive content. The Advisory Council has created a steering committee, including some of its own members, to guide the OTA R&D activities.

The R&D Program is directed toward fulfilling, in part, the congressional mandate, as expressed in the Technology Assessment Act of 1972, for OTA to provide early warnings of the impacts of technology. It is intended to assist the Congress in moving toward a capability for long-range planning.

In addition, the Program serves as a diverse and important resource for other OTA program areas. The Energy and Food Programs, in particular, have projects under way examining the role of the Federal Government in sponsoring R&D.

With continuing guidance from and oversight by the Advisory Council, the R&D Program has identified three areas for detailed study:

- The health of the scientific and technological enterprise.
- The application of science and technology.
- The decisionmaking process for establishing R&D policies and priorities.

The projects in each of these areas are quite diverse, yet closely interrelated. They are intended to be of a continuing or long-term nature. The projects form a comprehensive analysis of the policies and programs of the Federal Government in sponsoring R&D.

Beginning in 1975, advisory panels were selected and assembled for each of the three areas. As with the areas and the projects in each, the work of the panels is closely interrelated. The 50 persons on these three panels represent a broad array of interests and expertise. The panels met three times each during 1976 to define the issues, suggest specific

projects for study, and approve agendas and plans for action in 1977.

The three panels and their projects are:

### *Health of the Scientific and Technological Enterprise*

Many observers argue that the state of scientific and technical research in the United States has declined in recent years, leading to possibly harmful consequences for the U.S. economy and world trade position. This panel is studying scientific and technological research as a system and is seeking means to define and assess, as well as options to maintain, its health. It is examining recent developments affecting R&D, including the leveling off of funding and the aging of research programs at universities and research institutions. Emphasis is being given to the impact of different means of coupling research and education in science and engineering.

Four major projects are underway in this area. They are: (1) the formulation of definition of the scientific and technical enterprise and criteria for assessing its health; (2) an assessment of the status of basic research and advanced training in science and engineering associated with our academic institutions; (3) an examination of the role of women and minorities in science and engineering and the relationship of this issue to the health of the scientific and technical enterprise; and (4) an evaluation of how to determine the relative emphasis that might be given to various scientific fields, how to facilitate the emergence of significant new fields, and how to assure the quality of effort.

This panel is concerned with maximizing the accessible talent in scientific fields. Another topic which the panel is focusing on is the relationship between Government, university, industrial, and national research laboratories and the distinctive roles of each in the scientific and technical enterprise.

Because of the broad nature of these projects, the other two areas of the R&D Program are expected to rely heavily on this panel's conceptualization of the scientific and technical enterprise.

### *Applications of Science and Technology*

The end result of much research consists of products, mechanisms, or procedures that help to generate innovation. The applications panel is studying the process by which the results of research become applied to national or social needs or goals. This panel is pursuing work on three projects: the role of the Federal Government in affecting an innovation process, the international transfer of technology, and the mobilization of scientific and technological resources to solve national needs.

The first project involves issues regarding the appropriate role for the Federal Government and the mechanisms by which it pursues, stimulates, and regulates technological innovation. In particular, the factors that can influence the innovative process are being examined. One aspect of the project is comparing governmental activities in the United States with those of other countries in terms of their effects on all aspects of technological innovation, including R&D. Key laws and Government practices that can affect innovation are being identified.

Second, the issues relating to technology and mechanisms by which it is transferred in the international economic marketplace are being evaluated. Particular attention is being given to issues concerning the role of the Government in assisting the transfer of technology to developing countries.

Finally, insofar as scientific and technological resources—both individual and institutional—can be mobilized to meet national goals and needs, this panel is examining how science and technology have or have not been effectively used in the past. In addition, the range of mechanisms for directing technological resources toward national goals are being analyzed.

### *Decisionmaking on R&D Policies & Priorities*

The decisionmaking panel is evaluating both the process by which the Federal Government sets R&D policies and priorities and the social and economic impacts of R&D. It is compiling

existing knowledge about the decisionmaking process, identifying gaps, and appraising the need for further research. The peer review system is being evaluated as a decision mechanism with particular emphasis on its different roles in basic and applied research.

This panel began four projects in 1976. The first concerns the development of better guidelines for Congress in R&D budgeting.

The second project examines the various options by which Federal science and technology activities might be organized, with particular attention given to proposals to reorganize the departments and agencies of the Federal Government. In this work, the panel is being assisted by the Congressional Research Service of the Library of Congress, which is gathering information and cataloging proposals for reorganization.

A third project seeks to identify means by which improvements in methodology for fore-

sight in setting R&D policies and priorities might be accomplished. Finally, the fourth project is assessing methods for evaluating the social and economic impacts of R&D.

### *Projects for All Three Advisory Panels*

In addition, all three panels are engaged in three other projects that complement those listed above. One examines the role, management, and structure of the national research laboratories and centers, as well as their deployment, their possibilities, and problems. Another is evaluating the societal significance of choosing among alternative technologies which fit the needs of specific user groups. The third assesses current and possible roles of the public in the decisionmaking processes in science and technology as well as the impacts of science and technology on the development of public policy.

## **Technology and World Trade Assessment Program**

The relationship of technology to international trade on the one hand and the U.S. economy on the other has become a subject of increasing congressional interest. Many observers believe that the U.S. economy and balance of trade position have suffered from the export of technology, as well as from investment by U.S. companies in foreign industry.

Analyses are cited showing a declining trade surplus in recent years in such technology-intensive industries as chemicals, scientific instruments and controls, nonelectric machinery, and transportation. This decrease has been accompanied by a decline in the growth of both labor and capital productivity in the United States for the years **1965-73**.

A number of factors are said to have contributed to this decline in U.S. technological leadership in international trade. The factors include reduced expenditure on research and development in the United States, sale of licenses and transfer of manufacturing know-how to other countries, and Government

policies that are not conducive to industrial innovation or research and development.

Others, however, argue that the United States can remain economically healthy and competitive in the international market only through an open trade policy that encourages innovation and the continuous creation of new technology. This position holds that productivity figures do not show any precipitous decline—only cyclical swings. The adverse trade trends are attributed to price rather than any comparative decline in technological leadership, as evidenced by an increased trade balance for the same technology-intensive industries since 1973.

The critics of the assumption of declining technological competitiveness due to the export of U.S. technology argue that if technological innovation is successfully fostered in the United States, trade statistics will take care of themselves without Government intervention. In other words, the United States should stimulate technological innovation at home rather than attempt to control the export of

technology to prevent other nations from catching up.

To address such issues and to provide a factual base from which accurate evaluations can be made, OTA created the Technology and World Trade Assessment Program in 1976. This program focuses on key issues and assumptions relating to the technological relationships of the United States and its trading partners abroad. The assessments examine the relationship of technology to the competitive position of the United States in international markets and the related effects on the U.S. economy.

The nature of technology and the processes by which it is developed, introduced in the marketplace, and transferred or diffused depends on many factors that generally are poorly understood. These include: the size and sophistication of the market, economic conditions, quality and level of R&D, quality of the labor force, availability and cost of capital, and Government tax, patent, antitrust, and a host of other policies.

Given the uncertainties about the nature of technological development and its relationship to world trade, the lack of data in general, and the specific lack of data on the relationship of technology to trade, OTA is examining the U.S. trading position as reflected in analyses of trade, productivity, and related statistics. Among the factors being examined are the control of technological relations, trade with the Soviet Union, and the promotion of a more satisfactory means for technology transfer to developing nations.

OTA has consulted widely and is tapping the resources of other Federal executive agencies and private institutions with responsibility for or interest in technology and trade. These include the General Accounting Office, National Science Foundation, the Departments of State and Commerce, the Export-Import Bank, and the National Academies of Sciences and Engineering.

During 1976, the Technology and World Trade Program explored the background of

the problem, sorted out the issues, and adopted an initial strategy for action in 1977. The Technology and World Trade Advisory Committee met for the first time in December. Further, arrangements were made for adding a full-time program manager, a retired vice president of a major chemical company, early in 1977. The part-time manager for 1976, a former director for international scientific and technological affairs at the State Department, will become a consultant to the program in 1977.

One project is assessing the state of technology and trade trends in selected industries that are technology intensive and figure prominently in world trade. The chemical industry has been chosen as the target for first study by the Advisory Committee. One longstanding trend—the cross-licensing of technology to support both foreign subsidiary and domestic markets—is being examined to determine how repatriating funds affect the U.S. balance of trade. Using such data, OTA is analyzing the causes of growth and decline in exports. Later studies will be conducted on the steel and electronics industries,

In addition, five functional studies are underway: 1) a comparison of productivity and economic growth rates among leading member nations of the Organization for Economic Cooperation and Development (OECD); 2) an examination of current account trends in recent years, with special emphasis on trade figures for advance technology products; 3) a comparison of technological innovation in several different countries; 4) an evaluation of patterns of technology transfer among OECD countries; and 5) an analysis of R&D trends in different countries.

Finally, the Technology and World Trade Program is drawing on the resources of and developing joint areas of concern with the Food, Materials, and Research and Development Programs of OTA. As experience is gained and data gathered, these and other program areas are expected to make similar uses of the Technology and World Trade Program.



## Transportation Program

To assist Congress in its deliberations on transportation issues, the OTA Transportation Program examines the safety, economic, social, energy, and environmental implications of moving people and goods.

Following up the 1975 studies of the relationship of mass transit and automated guideway transit systems to energy and the economy, OTA completed two reports in 1976 on public transit in urban areas. The first concerned the role of the Federal Government in assisting and encouraging community planning for mass transit, while the second assessed various automatic control systems for rapid transit trains. The Transportation Program began a major assessment of potential short- and long-term changes in the characteristics and use of the automobile as a mode of personal transportation. Another planning study, begun late in 1976, looks at the research and demonstration methods for new urban transit vehicles.

Continuing a series of reports to Congress begun in 1975 on the status of U.S. railroads and proposals directed toward their reorganization and improved efficiency, OTA is assessing the effectiveness of various laws in increasing the safety of railroads. Another project is analyzing the possible use and potential effects of slurry pipelines to transport coal.

For most of 1976, the Transportation Program included a project examining telecommunications technologies for the movement of information. A preliminary report published in April 1976 examined the feasibility of applying communications technologies to provide community services in rural areas. During the summer, this project was transferred to OTA's Exploratory Activity. An OTA workshop was held in November to further explore the Federal executive role in the possible provision of telecommunications services.

Because several projects of the Transportation Program deal with concerns that are broader than transportation alone, there is a need for coordination with other

OTA program areas. For example, the recently completed assessment of community planning for mass transit and the current assessment of the automobile have involved cooperation with the OTA Energy Program. Similarly, the coal slurry pipelines project is being performed with the assistance of the Energy and Materials Programs.

### *Community Planning for Mass Transit*

This multivolume report, published in February 1976, was based on a study of mass transit planning in nine U.S. cities: Atlanta, Boston, Chicago, Denver, Los Angeles, Minneapolis-St. Paul, San Francisco, Seattle, and Washington, D.C. The report is made up of separate volumes—consisting of a summary, the nine case studies, and technical and bibliographical appendixes. (Excerpts from this report may be found in section II.)

Requested by the Senate Committee on Appropriations, the interim findings of the assessment were transmitted to the Transportation Subcommittee in 1975 to prepare for congressional hearings. They were used by the Transportation Subcommittee to critique the mass transit investment policy of the Department of Transportation. The report is being used on a continuing basis by the requesting and other committees with transportation oversight to evaluate mass transit planning and development programs.

### *Automatic Train Control*

The OTA report, published in May 1976, was requested by the Senate Committee on Appropriations on behalf of its Transportation Subcommittee. Used by the House Committee on the District of Columbia in 1975 as background for oversight hearings on the Washington METRO System, the report has been widely distributed to, and reprinted by, the transportation industry. (Excerpts from this report may be found in section 11.)

## *Broadband Communications in Rural Areas*

This report, published in April 1976, began as a preliminary effort to a more detailed study. The report was circulated by the Senate Committee on Agriculture and Forestry to the principal Federal agencies with responsibility for communications and/or rural areas. Many of these responded in favor of further examination of the potential of such systems. The chairman of the Federal Communication Commission, for instance, termed the report "a valuable service by encouraging a systematic and comprehensive look at rural broadband communications." (Excerpts from this report may be found in section II.)

## *Changes in Use and Characteristics of Automobiles*

The private automobile has become the most prevalent form of transportation in the United States. By 1970, 80 percent of American households owned at least one car, and more than 90 percent of the annual passenger miles traveled were by automobile. At the same time, serious questions have emerged regarding the future of the private auto. These include decline in the supply of petroleum, increased costs for materials and labor, rising environmental concerns, and widespread traffic congestion on highways and urban streets.

Consequently, OTA has undertaken a major assessment of potential changes in the use and characteristics of automobiles over the short term (next decade) and long term (into the next century). This assessment, initiated at the request of the Senate Committee on Commerce, was approved by the OTA Board in February 1976 after review of the results of a preliminary planning study carried out by the Transportation Program staff in late 1975. The project examines the auto and supporting industries, road building and management, consumer ownership and use of cars, and the role of the Federal Government.

Such factors as the future availability of fuels and materials, the need to reduce harmful pollutants and to improve the safety of

cars, and possible shifts in public attitudes are being analyzed in connection with public policy alternatives which might affect automobiles and their use. The experience of several foreign countries with their transportation systems is being examined for solutions that could possibly be applied to problems in the United States.

The assessment is being performed by the Transportation Program staff with assistance from the Energy and Materials Programs and the cooperation of the National Science Foundation. A preliminary report was expected in late 1977 and a final report in late 1978.

## *Coal Slurry Pipelines*

For many years, coal was replaced by other less expensive and cleaner fuels. With the increased price and uncertain availability of other fuels, however, coal is once again seen by many as an abundant and relatively cheap source of energy.

In view of this, and of alternative proposals for shipping large quantities of coal over long distances, OTA is assessing the use of slurry pipelines to transport coal from its source to where it can be used. In this project, particular emphasis is being given to two key elements of concern: the environmental effects of such pipelines and their impacts on other forms of transportation, especially railroads.

The assessment was requested by the Senate Committees on Commerce and Interior and Insular Affairs, and the House Committee on Interstate and Foreign Commerce. It was due to be completed in 1977.

## *Railway Safety*

The Federal Government has attempted, in recent years, to solve the financial, institutional, and operational problems of U.S. railroads. OTA examined the financial aspects of the reorganization of rail transportation in a series of reports published in 1975. In passing the Railroad Safety Authorization Act of 1976, Congress required OTA to evaluate the effec-

tiveness of the Railroad Safety Act of 1970 and other Federal laws aimed at improving the safety practices and performance of the railroads. This is one of OTA's two congression-

ally mandated assessments. The other mandated assessment concerns coal leasing on Federal lands. A report was expected in early 1978.