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and fish and wildlife conservation. These research priorities are subject to periodic review and revision by the commission.

Among the projects approved for funding in 1989 were:

1. A three year grant of \$66,000 and 56,610,000 zlotys awarded to the Central Laboratory for Radiological Protection (Warsaw) for a joint research project entitled "long-lived post-Chernobyl radioactivity and radiation protection criteria for risk reduction".

2. A three year grant in amount of \$43,000 and 22,900,000 zlotys to the Institute for Soil Science and Slant Cultivation (Pulawy) to conduct joint research project entitled "wheat rhizosphere microflora and its effect on plant nutrition and some pathogenesis fungi."

3. A three year grant to Jagiellonian University in amount of \$48,000 and 24,000,000 zlotys to conduct joint research project entitled "ion, electron and photon stimulated desorption of ionic crystals." The fund also supported a workshop on wetlands protection which took place in Gdansk and Mazurian Lake district in September, 1989, in collaboration with U.S. EPA, as well as a workshop on cultural landscapes preservation, jointly arranged by the Board of Historical Gardens and Palaces Conservation and the U.S. National Park Service.

SAUDI ARABIA

Oil still dominates U.S.-Saudi relations, but as Saudi Arabia diversifies its economy, cooperative science and technology efforts have increased in significance. While most S&T cooperation continues to be conducted through the U.S.-Saudi Joint Economic Commission (JECOR) and the U.S. Geological Survey (USGS), there are new areas of activity. Saudi intellectual property protection appears to be strengthening as a result of U.S. pressure and a fledgling Saudi intellectual property rights related to industries.

Exploratory bilateral alternative energy discussions took place in the U.S. and Saudi Arabia during 1989. The U.S. recently participated in a visible and successful regional conference on ozone depletion in Saudi Arabia. The Saudis have been active in global climate change activities. The U.S.-Saudi scientific/technological relationship is an extremely important, if low key, element in our overall relationship. S&T cooperation is fundamentally apolitical and continues at a steady pace despite the vagaries of regional political developments. This allows the U.S. to maintain an American presence inside some Saudi ministries, helping keep open channels of communications and underscoring our continuing commitment to enhance Saudi

Arabia's security in a quiet but persuasive manner.

Bilateral S&T Activities

The U.S. and Saudi Arabia cooperate widely in science and technology fields. Since the mid-seventies, bilateral S&T activities have been largely coordinated through the U.S. Embassy and the office of the U.S./Saudi Joint Economic Commission (JECOR). Significant JECOR projects include agriculture and water resources, support for the King Abdul Aziz City for Science and Technology (KACST), manpower training and development, desalination research and training, solar energy research and development, cooperation with King Faisal, King Saud and King Abdul Aziz Universities, emergency medical services, space research and technology, landsat earth sensing and meteorological systems development. The present JECOR agreement expires in February 1990, but both governments have agreed that this will be renewed for another five years. Two other major bilateral S&T projects are not administered through JECOR. One involves the CAAG (Civil Aviation Advisory Group) program of the U.S. Federal Aviation Administration (FAA) which has provided airmen certification and aircraft ratings for Saudia Airlines since 1982 under a bilateral agreement. The second pro-

gram is between the U.S. Geological Survey (USGS) and the Saudi Ministry of Petroleum and Minerals. The USGS program has made geological surveys of much of western Saudi Arabia, identified non-petroleum mineral and water resources, drawn Landsat image and other maps of the country and trained many Saudi geologists.

Environmental Topics

The Saudi Arabian Government was active in the Intergovernmental Panel on Climate Change (IPCC) during 1989. Dr. Abdulbar Al-gain, president of the Saudi Meteorology and Environmental Protection agency (MEPA), and other MEPA officials have regularly participated in IPCC response strategy working group meetings. Prince Fahd bin Abdullah, deputy to the Minister of Defense and Aviation, represented Saudi Arabia at the November 6-7 Ministerial Conference on Atmospheric Pollution and Climate Change in the Hague. In his speech, Prince Fahd applauded global efforts to combat global warming, which he characterized as "a life or death issue" for much of the earth. He proclaimed Saudi Arabia's total commitment to strengthening international legal instruments connected with climate change and said that the Saudi Arabian Government would participate in negotiations on a framework convention on climate.

The prince concluded that the world must move toward non-greenhouse emission energy production and consumption systems that are safe, affordable and efficient.

Intellectual Property

Saudi Arabia is one of 25 countries the U.S. administration is monitoring because of inadequate protection of intellectual property rights (IPR), particularly videotape, cassette tape, and computer software copyrights. At present, these intellectual property media have effectively no legal protection in Saudi Arabia.

Until recently the Saudis were inactive in protecting IPR, but they are beginning to realize that such protection safeguards their artists, software designers, and inventors as much as those of other countries. Saudis trying to compete in these markets, including Saudi sound recordings companies with authorized license arrangements with foreign producers, are lobbying the Saudi Arabian Government for a tougher copyright regime. Saudi software writers complain that widespread software piracy makes their efforts fruitless. Through contacts between U.S. and Saudi IPR experts, we have been working to educate Saudi officials about the growing importance of IPR protection. In September, 1989, a Saudi copyright offi-

cial from the Ministry of Information attended a copyright training seminar at the Library of Congress in Washington. We anticipate that Saudi responsiveness on IPR issues will grow as Saudi Arabian Government efforts to diversify the economy away from oil lead the Saudis into greater intellectual property production.

In January 1989, Saudi Arabia took a major step forward in IPR protection when King Fahd approved Saudi Arabia's first patent law. The new legislation, which went into effect in May, is generally comparable in scope and operation to patent laws in the U.S. and other developed nations.

Atomic Energy

On October 3, 1988, Saudi Arabia acceded to the Nuclear Non-proliferation Treaty (NPT), thus making it eligible to purchase a nuclear research reactor from the U.S. or other NPT signatories. Several western firms, subsequently approached the King Abdul Aziz City for Science and Technology (KACST) about the possible purchase of a low-powered research reactor for the study of medical isotopes and other basic research. This issue remains under study.

Alternative Energy Sources

At first glance, Saudi Arabia has no conceivable interest in alternative energy

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sources: it has 250 billion barrels of proven oil reserves. Still, there is growing Saudi interest in alternative energy for at least two reasons. First, the Saudis wish to stay abreast of new technologies to help them forecast future world demand for petroleum.

Moreover, the Saudis are concerned about supplying power to remote areas of their country. One third the size of the continental U.S., Saudi Arabia has roughly ten million people concentrated in three major metropolitan areas. Consequently the per capita cost of delivering power to outlying areas, "rural electrification," is much higher than in the U.S. This has prompted a desire to make remote villages energy self-sufficient. In late October 1989, a team of alternative energy experts from the U.S. Department of Energy, the Solar Energy Research Institute (SERI), and Sandia National Laboratories, visited KACST under the auspices of JECOR. KACST (and MEPA) oversee government-sponsored scientific research. The meetings were a continuation of DOE-KACST talks begun in March at SERI in Colorado to explore areas of mutual interest: (1) assessment of renewable energy resources in the kingdom; (2) application of renewable energy resource technologies in remote areas;

and (3) solar building technology research and development.

Participants discussed possible future cooperation, including parallel research activities, technical resources exchange, solar energy systems modelling, and wind and geothermal research. While both the U.S. and Saudi Arabia agree that cooperative efforts would be mutually beneficial, funding uncertainties limit the commitments of either side, at least for now. The DOE team concluded that, given such constraints, a realistic target date for establishing a cooperative project devoted to alternative energy research would be mid-1990 at the earliest.

UNITED KINGDOM

General S&T relations between the U.S. and the U.K. Remain extensive and close at all levels: governmental, institutional and individual. Interaction between scientific societies of both countries, frequent exchanges between governmental institutions, and fruitful industrial relationships are continual. While a number of topical or project-related memoranda of understanding have been concluded over the years between counterpart agencies of the governments, there has been no perceived need for an umbrella science and technology agreement.

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During Fiscal Year 1989, both nations have continued to focus on competitiveness as national objectives. For its part, the U.K. has increased its efforts to foster cooperation among government institutions, universities and industry on technologies which are commercially promising. The Advisory Committee on Science and Technology (ACOST), chaired by the chairman of Rolls Royce, Sir Francis Tombs, continues to advise the government on S&T priorities, assisted by the Center for Exploitation of Science and Technology (CEST). To date, Her Majesty's Government has established seventeen interdisciplinary research centers for specific technologies, most of which are housed at various universities. The goal is to establish some 40 such centers over the next few years. The U.K. has also established a series of so-called "link" programs. The link initiative provides a mechanism by which the public sector in the form of research councils and government departments join with private-sector companies to pursue agreed research programs. While the majority of future fields are likely to be in engineering, a significant number will be in areas of science.

Nuclear and missile technology cooperation and coordination on nuclear and missile nonproliferation continue to be extremely close. Annual bilateral con-

sultations on these issues, which include sharing information on sensitive transactions, are reinforced by almost daily interactions by our respective embassies on a wide range of nuclear and missile topics. The U.K. has embarked on a program to construct a number of pressurized water reactors based on U.S. design. This will strengthen the ties between the nuclear industries of both countries.

Health

In health matters, the U.K. continues to regard cooperation with the U.S. as essential in the international fight against AIDS. U.K. health officials welcome opportunities to coordinate research and public education programs with the U.S., and several joint projects are underway involving government and private funds.

Environment

Prime Minister Thatcher's speech before the Royal Society late in 1988 signalled a heightened U.K. concern about environmental issues. As a consequence, international collaboration in environmental research has taken on growing importance, hence, the government's decision to spend an extra million British Pounds Sterling (BPS) on environmental research, much of which will be devoted to international projects.

Particular mention should be made of the key role the U.K. is playing in the Intergovernmental Panel on Climate Change. With respect to deforestation. The major development over the past year was the conclusion of a U.K.-Brazil agreement to cooperate on rain forest conservation. The two nations will work together on projects concerned with the management and steady renewal of tropical rain forests.

Biotechnology

While the U.K. government and public were relative latecomers to developments in biotechnology, industry and universities were not; indeed the U.K.'s relative strength in biotechnology stems from these two sectors. The U.K.'s intellectual achievements in the disciplines most closely allied to biotechnology are formidable. Of all the European countries, the intellectual climate in the U.K. approaches most closely that of the U.S., with the main emphasis of academic research being at the high-technology end of genetic engineering. In the past, relatively less attention was paid to fermentation technology, bioreactors, and chemical engineering. However, these important areas of biotechnology research have recently been given priority status by new government directives. Following the explosion of interest in biotechnology, the U.K. has

increased its emphasis on biotechnology research during the past few years. Funding for such research in universities is mainly by allocation from the research councils. The major expenditure is from the Medical Research Council (MRC). The Science and Engineering Research Council (SERC) has its own biotechnology directorate which has a separate budget. The SERC biotechnology directorate was set up in 1981 to develop and implement a policy for the support of research and training in biotechnology in U.K. universities and polytechnics. The directorate maintains close association with the biotechnology unit of the Department of Trade and Industry (DTI). The DTI uses its funds for biotechnology mainly, but not exclusively, as a pump-primer for specific projects within industry itself to the point where revenues can be generated and the process becomes self-financing. The DTI also has a significant program of R&D support for public sector laboratories. The aim is to encourage precompetitive research in collaboration with companies.

U.S. MISSION TO THE EUROPEAN COMMUNITIES

Two major evolutions have led to an intensified U.S.-EC science and environment relationship. The first is the EC's

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accelerated push towards a unified market by the end of 1992 and the significant legislative and psychological effect of that effort within the EC. The second is the recognition of the state of the global environment and the common desire of the EC and the U.S. Government to face the challenge of improving and protecting that environment.

The intensified relationship has fostered greater dialogue and debate. In environment, the U.S. and the EC cooperate in various multilateral forums, notably in the Intergovernmental Panel on Climate Change (IPCC) and in the G-24 regarding initiatives with eastern Europe. Bilaterally, we worked together very closely on the African elephant problem, the shipment and treatment of hazardous waste, and other issues. In R&D, bilateral discussions and cooperation continue in the High-Tech Working Group and other fora, and through the ten bilateral S&T agreements. The issues of biotechnology and intellectual property rights have been prominent and addressed extensively, due to significant developments in the state of the art and the need for harmonized regulation of the former and the importance of ensuring equity in the latter.

However, the importance of the bilateral U.S.-EC science and environment relationship goes beyond in-

dividual issues. In a relationship historically marked by public disputes over trade issues, science and environment offers an opportunity to foster and broaden the cooperative aspects of the relationship. And, with a changing Europe, it is vital that the united states be well-informed and ready to take advantage of strengthened European competitiveness.

Environment

Global Climate Change: The U.S. and the EC have held various communications on global climate change and the related issue of tropical forests. U.S. Government and EC officials have met and exchanged ideas at various international conferences over the past year, including those held in London, the Hague, and Noordvik. Both are very active within the Intergovernmental Panel on Climate Change (IPCC).

Montreal Protocol: The EC and the U.S. Government worked together to ensure that the Montreal Protocol on the Ozone Layer was ratified and regulations for implementation developed. Both the U.S. Government and the EC called for a total phase-out of harmful CFCs by the end of the century. The U.S. Government and the Commission of the European Communities continue to discuss ways to involve further the less-developed countries in the protocol.

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Both also are very active in the subgroups working on the scientific and other aspects of the protocol.

Eastern Europe: Environment issues in eastern Europe have gained prominence during the last year. Major events, in which the U.S. and the EC worked together, include the Sofia CSCE Conference and the environment group of the G-24 initiative with Poland and Hungary.

OECD: The U.S. and the EC continue to work together in the Environment Committee of the OECD. Although a number of issues are included in the committee's work, U.S.-EC collaboration on chemicals issues has been particularly beneficial.

Basel Convention: Both the U.S. and the EC attended the meetings leading to the Basel Convention on the Transshipment and Treatment of Hazardous Waste.

African Elephants: The USG and the Commission worked together closely in a successful effort to press the Government of Japan to halt trade in ivory and to add the African elephant to appendix I of the Convention on International Trade in Endangered Species (CITES).

US-EC ministerial environment issues were included for the first time in the agenda of the annual U.S.-EC Ministerial Consultations. EPA Ad-

ministrator William Reilly joined Secretary Baker, who chaired the meeting, and three other cabinet officials in discussions with Commission President Delors and other EC commissioners.

US-EC Environment Bilaterals: The annual US-EC environment bilaterals were held in July. Agenda items included a full range of environment issues. Of note, both sides agreed to expand the discussions to include two ad hoc working groups, on precious metal waste and chemicals, which met in the fall of 1989.

High-Tech Working Group: One of the agenda items discussed in 1989 included clean technologies. Specific issues discussed included CFC substitutes and waste policies.

Research And Development (R&D)

High-Tech Working Group: The U.S.-EC High Technology Group met twice during Fiscal Year 1989. The discussions, in which a number of USG agencies participate, are in-depth exchanges of views and information. The agenda included access to publicly-funded research and development, clean technologies, and biotechnology. The group has held extensive discussions on specific issues related to biotechnology, including longer-term perspectives for biotechnol-

ogy, intellectual property rights in biotechnology.

Food And Pharmaceutical Regulation: The first of a new series of twice-yearly meetings to discuss possible S&T cooperation between the U.S. Food and Drug Administration and the Commission was initiated. Specific topics included food, human and veterinary medicines, human biologics, and medical devices.

Bilateral S&T Agreements: The U.S. and the EC continue to adhere to and foster approximately ten major bilateral S&T cooperation agreements or exchanges of letters. These cover the following areas: a) peaceful uses of atomic energy; b) management of radioactive wastes; c) nuclear safety; d) nuclear safeguards; e) renewable energy sources; f) health and environmental effects of radiation; g) environmental matters; h) mineral technology; i) controlled thermonuclear fusion; and j) remote sensing biotechnology.

U.S.-EC Environment Bilateral Consultations: This past year, the general consultations were preceded by a one-day technical working session on biotechnology; various issues were discussed, including procedures for evaluating field trials of genetically-modified organisms, methods of exchanging and evaluating data, risk evaluation, and the state of knowledge on genetic transfers.

Possible Cooperation with NSF: Preliminary discussions on possible cooperation in biotechnology issues between the National Science Foundation (NSF) and the EC Commission's Directorate-general for Science, Research and Development were held this fall. Seminars and/or workshops may be organized during the next year.

Intellectual Property Rights (IPR)

GATT: The U.S. And the EC hold similar interests in bringing intellectual property rights within the general agreement on tariffs and trade (GATT). Discussions continue as part of the Uruguay Round.

High Tech Group: (noted above) Fact-finding discussions on access to publicly-funded r&d were included in this year's agenda. The exchange of information concentrated on participation by individual researchers in U.S. and EC research programs, contract terms for participation, and selection criteria and procedures.

UNION OF SOVIET SOCIALIST REPUBLICS

Interaction and cooperation between Soviets and Americans, in both official and unofficial forms, has expanded rapidly over the past year. The impetus for this growth comes from both the top

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political levels (i.e., the Malta scientific, technical and environmental initiatives) and from those involved in the exchanges on the working level, particularly on the Soviet side. These exchanges are mutually beneficial and have the potential to be even more so, particularly in terms of opening doors for long-term cooperation across the broad range of scientific, technological, ecological, and techno-industrial interests and needs in this nation attempting to transmogrify into a more efficient productive system.

Just as the overall U.S.-Soviet bilateral relationship has grown not only in depth in old areas, but has spread to new arenas and created new forms, the science and technology relationship has maintained a position at the "leading edge" of such rapid evolution.

In the new or renewed areas of science and technology cooperation, the Soviets, confronted with very real problems in their efforts at total system reform, are increasing their efforts to establish real "joint work" programs and eschewing the traditional "information exchange" formats of cooperation which have predominated to date.

Areas now undergoing expansion or under active consideration for major expansion include environment, space research, oceanography, basic sciences, energy and atomic energy. Details of

agreements are described below. The implications for these expansions go beyond the direct value of the specific cooperation programs into key information on directions and priorities of the Soviet reform efforts in crucial areas of Soviet development.

The principal U.S.-Soviet bilateral science and technology cooperation is covered within the framework of nine cooperation agreements. The Soviets perceive them as very useful, a convenient umbrella under which a variety of exchanges can take place. Currently, the environmental area is very active, with the Soviets interested in almost anything the U.S. can provide in terms of information and expertise. Joint projects under the U.S.-USSR Environmental Cooperation Agreement are expanding accordingly. In the multilateral area, the Soviets have cooperated with the U.S. in the U.N. and elsewhere on questions of climate change in the Intergovernmental Panel on Climate Change (IPCC) and other environmental and ecological concerns. The following are areas of cooperation which were active in Fiscal Year 1989:

- Cooperation in the Field of Peaceful Uses of Atomic Energy: The agreement was extended in June 1989 to permit time to complete review of a new agreement,

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including an annex for protection of intellectual property rights, in time for signature at the summit in the summer of 1990. Activities under the five-year Memorandum of Cooperation in Civilian Nuclear Reactor Safety continued. A meeting of the Joint Commission on Nuclear Reactor Safety was held in May, 1989.

- Cooperation in the Field of Environmental Protection: Ongoing cooperation in eleven topical areas, involving six working groups and 32 active projects, characterized activities in Fiscal Year 1989. Preparations were made for the 12th Joint Committee Meeting to be held in Washington in 1990.
- Cooperation in the Field of Housing and Other Construction: The agreement is currently under review.
- Cooperation in the Field of Basic Scientific Research: The agreement was negotiated during Fiscal Year 1989 for signature in 1989. It consists of eight broad areas of cooperation, to be implemented through a memorandum of understanding by the U.S. Geological Survey (USGS) and the National Science Foundation (NSF).

- Cooperation in the Field of Transportation: The Department of Transportation is considering various possibilities for rail and road cooperation. The Federal Aviation Administration is now implementing programs agreed to at a Joint Commission Meeting last May, and is pursuing cooperation on a joint space-based geolocation system.

- Cooperation in the Field of Studies of the World Ocean: The fifth meeting of the U.S.-USSR Joint Committee on Cooperation in World Oceans Studies was held in Washington on October 3 to 5, 1988. The World Oceans Agreement was extended on December 15, 1988 and again in March and June, 1989, to allow time to review and negotiate a new agreement.

- Public Health and Medical Science: Cooperation in cancer research intensified. Cooperative research programs in AIDS and alcohol and drug abuse are well underway.

YUGOSLAVIA

The program of scientific and technological cooperation between the United States and Yugoslavia, conducted under the terms of a five-year bilateral agreement covering the period

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1988-1993, constitutes a productive and flexible resource which can be brought to bear on some of the highest research priorities of the United States. Participating U.S. government agencies are able to tap a reservoir of highly qualified and cost-effective research skills in support of their most important S&T objectives. During a period of rapid and significant changes in eastern Europe and Yugoslavia, the bilateral cooperation in science and technology with the United States is regarded by the Government of Yugoslavia and the Yugoslav scientific community as an important and well-established component of the overall relationship. Policymakers, administrators and scientists in both countries have traditionally been flexible in developing and funding project activities which meet emerging and newly identified needs. Mapping the human genome and global environmental issues are already being addressed by a far-reaching and constantly expanding network of highly competent U.S. and Yugoslav scientists, drawing on the resources of the Joint Fund established to implement this bilateral cooperation. Projects supported by the Joint Fund also include research in robotics and flexible manufacturing, superconductivity, and many outstanding studies in fields of great interest to the U.S. Department of

Agriculture, such as dryland farming and biological engineering.

Initial discussions conducted in the second half of 1989 with representatives of the National Institute for Drug Abuse and the National Oceanic and Atmospheric Administration are expected to result in new joint research projects of interest to those two agencies. The most recent example relates to the National Drug Strategy, in support of which one or more joint U.S.-Yugoslav teams are being formed to conduct basic research in the neurophysiology of addiction with special attention to the chemical and biological interface between the drugs and neural receptors.

Mapping and Sequencing the Human Genome: Both the Joint Fund and the Department of Energy, operating with its own funds under the general umbrella of the 1988-1993 bilateral agreement, have entered into cooperative research arrangements with the Genetic Engineering Center in Belgrade to identify and develop cost effective methods for mapping and sequencing the human genome.

U.S.-Yugoslav Environmental Management Workshop: One of the special initiatives in 1989 was a favorably received proposal by the Environmental Protection Agency to organize a joint workshop on innovations in environmen-

tal management. Approved by the Joint Board in May 1989, the workshop was successfully held in Zagreb in December -- soon enough for a well-balanced and carefully selected team of U.S. environmental protection experts from federal and state governments, non-governmental organizations and the private sector to bring the U.S. experience and U.S. concerns to bear on drafting of a long-term environmental strategy for Yugoslavia, due for completion in 1990, by a team of Yugoslav experts, most of whom participated in the workshop.

Global Climate Change: Responding to a 1989 initiative from the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory (GLERL), Yugoslav scientists are developing a research proposal in direct support of NOAA's work on global climate change. The body of water in question, Lake Skadar, has unique features of interest to paleoclimatologists and GLERL scientists already possess a significant data base on Lake Skadar from work they did there in the early seventies.

Drug Abuse Prevention and Treatment: Discussions leading toward future cooperative research in support of the National Drug Strategy of the United States were launched with Yugoslav scientists and science administrators in

September 1989, immediately following the announcement of the strategy by President Bush. A Yugoslav delegation visited the National Institute of Drug Abuse in October and returned to Yugoslavia to begin the process of identifying appropriate research centers and scientists possessing the necessary special expertise for cooperating with U.S. scientists on projects related to drug abuse prevention and treatment.

Intellectual Property Rights Protection

With respect to intellectual property rights (IPR) and the requirements of the Omnibus Trade and Competitiveness Act of 1988, most joint projects are carried out in Yugoslav laboratories under the direct supervision of Yugoslav principal investigators who give American scientists equitable and reciprocal access to their research activities and facilities. As a matter of official policy, Yugoslavia encourages professional exchanges of research data and findings among scientists, and practices are largely consistent with this policy. The current bilateral Agreement on Scientific and Technological Cooperation between the United States and Yugoslavia, covering the period 1988-1993, contains protection for intellectual property rights. Such provisions are not contained however, in

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an older arrangement concerning exchanges of nuclear safety information, coming up for renewal in September 1990, between the United States Nuclear Regulatory Commission (NRC) and Yugoslavia's Federal Secretariat for Energy and Industry. The need to incorporate intellectual property rights protection in the successor agreement is recognized and being addressed by the Department of State and NRC in the context of preparations for negotiations leading toward renewal of the nuclear safety information exchange arrangement.

Achieving Greater Cost Effectiveness: The Department of State and the other U.S. government agencies participating in bilateral S&T cooperation with Yugoslavia have devoted considerable time and effort during 1989 to revising Joint Fund procedures in order to sustain a high quality, cost-effective research program in the face of budgetary constraints in both countries and a growing rate of inflation in Yugoslavia. While some further modifications may have to be undertaken in 1990 to protect dinar disbursements to researchers against the adverse impact of inflation, the U.S. dollars being invested in the cooperative S&T program by the United States are fully protected. Jointly funded research projects are now benefiting from a num-

ber of administrative and managerial changes made during Fiscal Year 1989, for example in the processing of U.S. scientists' travel to Yugoslavia and other dollar-denominated items.

Adequacy of Funding: Contributions to the Joint Fund by the United States (in dollars) are fully matched by Yugoslavia (in dinar equivalents), and all joint research projects are jointly funded. According to Article III of the bilateral Agreement on Scientific and Technological Cooperation of June 27, 1988, which entered into force on October 25, 1989, the United States made the following commitment:

"The Government of the United States shall, subject to the availability of funds, deposit in the Joint Fund dollars or dinars, provided that the United States contribution may be deposited annually over the five-year period of the agreement, up to a total of ten million dollars."

Due to the matching feature built into the joint program, this means the total of all dollars and dinars available to the participating U.S. Government agencies and their Yugoslav research partners in a normal year for joint research projects would be in the order of magnitude of approximately four million dollars. To continue receiving scientific and technological benefits from this cost-effec-

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tive program and to meet the total U.S. commitment of ten million dollars by the end of Fiscal Year 1993, which coincides with the fifth year of the agreement, the United States will have to contribute a little over two million dollars in each of the next three fiscal years (Fiscal Year 1991, Fiscal Year 1992 and Fiscal Year 1993) in order to make up for a shortfall in Fiscal Year 1989, the first year of the agreement, when the United States contributed only \$1.4 million research funding. Decisions taken by the joint board in November 1988 and May 1989 reflect the budget shortfall and indicate that the Joint Board and the participating U.S. government agencies may be losing some of their traditional flexibility to enter into new research projects in fields of priority interest to the United States, unless the funding levels envisaged in the five-year agreement are honored. In May 1989 the board had sufficient discretionary funds for only 27 new projects in addition to second- and third-year payments for 109 ongoing projects. This contrasts with funding for 58 new projects approved in November 1988, in addition to follow-on funding for 61 ongoing projects.

Chapter 4: International S&T Activities of U.S. Agencies

DEPARTMENT OF STATE

Title V of the Foreign Relations Authorization Act states that the Secretary of State shall have primary responsibility for coordination and oversight with respect to all international scientific and technological activities of the U.S. government involving foreign countries, international organizations and international commissions. Within the Department of State, this responsibility is discharged primarily by the Bureau of Oceans and International Environmental and Scientific Affairs (OES).

Personnel

During Fiscal Year 1989, the Department of State employed 154 full-time Civil Service and Foreign Service employees in the areas of science, technology and environment, including 34 full-time science and technology officers and fisheries attaches 25 missions worldwide.

The Department of State made significant progress in support of the objectives of Section 4(b) of Executive Order

12591 which requires the Secretary of State to develop a recruitment policy that encourages scientists and engineers from other Federal agencies, academic institutions, and industry to apply for assignments at our embassies as Science Attaches or Science Counselors. Currently, there are personnel from the public and private sector on limited Foreign Service appointments serving in Korea, Paris, Vienna, Mexico, Tokyo, and New Delhi under this program.

The Department of State is working with Congress and the Office of Management and Budget to develop a Science and Environment Resources Package which is intended to project all Departmental resource requirements, both in Washington and in overseas posts, for the conduct of scientific, technological and environmental affairs.

Continuing educational and technical training activities for science and technology officers are ongoing areas of emphasis. The third consecutive annual course entitled "Science, Technology and American Diplomacy" was sponsored by FSI in July 1989. The course provided

perspectives on current key issues in science and technology and their implications for U.S. foreign policy.

In September, 1989, the Department of State held its annual Science and Technology Officers Conference designed to review with current science and technology officers contemporary issues in science and technology and implications for U.S. policy.

Highlights Of Science And Technology Activities

The U.S. was instrumental in establishing the Intergovernmental Panel on Climate Change (IPCC) and the Department of State (DOS) chaired interagency delegations to plenary sessions in 1989. In addition, the U.S. accepted chairmanship of the IPCC Response Strategies Working Group and DOS chaired Fiscal Year 1989 meetings of this body.

DOS joined representatives of the United States, nine members of the European Space Agency, Japan, and Canada in a meeting in Washington of the first government level review of Space Station cooperation.

In the last decade, there has been a rapid growth in the use of high seas driftnets in the Pacific Ocean. In 1989, DOS was instrumental in completion of agreements between the U.S. and Japan, Korea, and Taiwan on restrictions, licensing, and reporting.

During 1989 the Department of State worked closely with the Department of

Energy and other agencies to develop a plan for involving other countries in the SSC initiative.

In Fiscal Year 1989, the United States was engaged in nearly 600 bilateral science and technology agreements involving more than 20 U.S. agencies and 120 foreign countries.

In compliance with the Case-Zablocki Act of 1972, as amended, the Secretary of State reported to Congress the successful negotiation of roughly 25 international science and technology agreements during Fiscal Year 1989.

The U.S. Government negotiated a Science And Technology Umbrella Agreement with Hungary. The U.S. Government reactivated the Umbrella Science And Technology Agreement with Poland. The Department of State led a series of negotiations aimed at renewing S&T agreements with China and Spain. These discussions continue under DOS coordination. Similarly, DOS led negotiations in Moscow aimed at renewing the U.S./USSR World Oceans Agreement and negotiations with India concerning provisions for IPR in S&T cooperation. These discussions also continue.

DOS representatives chaired the Joint Working-Level Committee of the U.S.-Japan Agreement on Cooperation in R&D in Science and Technology. DOS also served on the Boards of Governors of the U.S./Israel Binational Industrial

R&D Foundation and the Binational Science Foundation.

Coordination And Oversight

National Security Directive Document 10 established a Policy Coordinating Committee (PCC) of the National Security Council, chaired by the Department of State, with oversight responsibility for issues related to science, technology and environment. The thrust of this committee's responsibilities is to ensure that the international dimension of these issues are considered in a coordinated interagency process and that interagency differences are resolved on a timely basis.

Recognizing that the improving climate in East/West relations would result in increased interest in science and technology cooperation, the Department of State developed written procedures for interagency review of science and technology agreements and activities with Warsaw Pact countries. These procedures provide a structured approach to assessing the benefits of science and technological cooperation with careful consideration of national security concerns.

Oversight of the Department of State's scientific, technological, and environmental activities is achieved, in part through semi-annual meetings of the Bureau of Oceans and International Environmental and Scientific Affairs (OES) Advisory Committee. The Advisory

Committee provides expert counsel on all issues for which the OES Bureau is responsible. In Fiscal Year 1989, the Advisory Committee examined such issues as global climate change, the state of research into chlorofluorocarbons (CFC's) and their substitutes, and other current issues.

In addition, the Department of State organized, in 1989, its annual strategic trade officers' conference, alerting the U.S. Government international technology and trade community to the implications for export control policy. Joint S&T activities were reviewed.

Project STRIDE (Science and Technology Reporting Information Dissemination Enhancement) was developed in response to the portion of Executive Order 12591 which directed the Departments of State, Commerce, and the National Science Foundation to develop a central mechanism to ensure that information on foreign research is made available to users in Federal laboratories, academic institutions, and the private sector. During Fiscal Year 1989, STRIDE expanded its list of reporters and recipients.

AGENCY FOR INTERNATIONAL DEVELOPMENT

Agriculture

Biotechnology for Fish Production

Marine fish farming offers developing countries low-cost animal protein for im-

proved nutrition. However, an important constraint on the potential development of fish farming enterprises is the lack of a stable supply of young fish (fish fry), particularly of species such as milkfish where maturation and spawning of young adults in captivity and survival of larvae during culture are major challenges. A.I.D.'s cooperative research agreement with the Oceanic Institute in Honolulu, Hawaii has resulted in some significant breakthroughs in fish culturing technology. Techniques were developed that successfully enhanced and controlled the reproductive processes of milkfish and mullet. These technologies for reproduction and larval rearing will be tested in developing countries such as Egypt, which has shown strong interest in adapting them for local fish production. Inter-Agency Collaboration on Global Climate Change. A.I.D. and E.P.A. are collaborating on a study to assess the impact of possible climate change on agricultural production and trade of major food crops - wheat, maize, rice and soybeans - throughout the world, in both food-exporting and food-deficit regions. Yield changes will be estimated in 20 countries (including 10 A.I.D.-assisted countries) using predictive crop growth models and climate change scenarios. Scientists working with A.I.D.'s International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT) project at the University of Hawaii will participate in and guide this study.

IBSNAT is a global network of crop, soil, and computer systems experts who collaborate to develop predictive models for major food crops. Mandated by the 1987 Global Climate Protection Act, the research study on climate change effects and policy response (begun on September 1, 1989) will be completed in three years.

Biological Nitrogen Fixation Technology Helps Small Farmers

A consortium of Private Voluntary Organizations (PVOs) and the Peace Corps is helping to extend the results of the A.I.D. project on biological nitrogen fixation (BNF) to small farmers in four developing countries. BNF research at the University of Hawaii has developed improved nitrogen fixing techniques as an environmentally sound approach to providing low-cost nitrogen in support of sustainable agriculture in the developing world. The use of legumes with improved BNF capabilities reduces the need for industrial chemical nitrogen fertilizers in cropping systems. The collaborative pilot project is providing improved legumes to small-scale farmers in Uganda, Senegal, Haiti and Nepal. It is expected to increase the production and use of improved nitrogen-fixing legumes, develop enterprises in legume crop management and, over time, increase the incomes of farmers using the improved legumes.

Small Ruminant Collaborative Research Support Program (CRSP)

This collaborative research program, which involves researchers from both U.S. universities and developing countries, is continuing to improve breeds, feed and feeding practices, and diagnosis and treatment of the diseases of goats, sheep and other small ruminants. In Indonesia, mineral supplementation of tropical grasses was demonstrated to improve the growth and reproduction of Japanese Thin Tail sheep and the growth of Kacang goats. The supplementation consisted of a complete mineral mixture plus a low-fiber feed that village farmers could supply at low cost. Adoption of improved practices for the use of green legume foliage led to weight-gain increases of 120 percent and to feed efficiency increases of 80 percent.

In Sumatra, a scheme developed for grazing sheep under rubber trees has decreased weed infestation and reduced both the use and cost of herbicides by 50 percent. Research is underway to test the possible uses of processed rubber seeds as a potential supplementary source of energy for sheep.

Identification of a virus-specific antigen for lung cancer in sheep in Peru will be useful in developing a serological test for carrier animals and, eventually, a vaccine. This disease is responsible for severe losses of adult sheep in Peru. The high incidence of neonatal mortality in alpaca in Peru was demonstrated to be related to an increased susceptibility of

newborns to infectious diseases because specific antibodies were not being transferred from their mothers. To improve the methods for diagnosis and prevention of the neonatal infections, an enterotoxin produced by the bacterium was purified using monoclonal antibodies and an ELISA assay was developed to detect its presence.

In Indonesia, a successful pilot outreach program involved 100 smallholder farmers in following recommended methods for improved hair sheep production. The demand by farmers for improved hair sheep has already outpaced the CRSP's ability to produce them.

Rinderpest Vaccine

USAID-funded researchers at the University of California, Davis (UCD) have developed a new recombinant vaccine against rinderpest, a deadly viral disease that kills an estimated two million cattle and buffalo annually. The research team developed the recombinant vaccine by splicing two genes from the rinderpest virus into a derivative of the vaccinia virus (the virus used for smallpox vaccinations). Results of preliminary tests -- performed in cooperation with California Biotechnology, Inc. at the U.S. Department of Agriculture's Plum Island facility and reported in *Science* -- indicate that vaccinated cattle survived exposure to lethal doses of rinderpest virus. Eradication of rinderpest has long been a goal of many

developing countries that rely on livestock as an important part of their economies. Loss of livestock potentially creates economic hardship and hunger. Previous eradication attempts have met with mixed success, in part because the vaccine developed for use in developed countries requires refrigeration and extensive veterinary services. The new recombinant vaccine requires no refrigeration. Following approval from the Animal and Plant Health Inspection Service for export of the vaccine and host government approval, further small-scale trials will be done in Africa to test the vaccine under field conditions.

Anaplasmosis/Babesiosis Vaccines

A.I.D.-funded research at three cooperating U.S. universities is using genetic engineering techniques to develop vaccines for anaplasmosis and babesiosis, two parasitic diseases affecting livestock. Researchers at the University of Florida, Gainesville, the University of Missouri, Columbia, and Washington State University, Pullman are identifying the parasites surface proteins which elicit a protective immune response and are inserting the genes encoding these protein antigens into a derivative of the vaccinia virus. The recombinant vaccines will be tested in the laboratory and in the field through the vaccine research network established during the first phase of this biotechnology research and development project. High sensitivity, specific diagnostic tests

are being developed so that epidemiological surveys can be conducted in developing countries such as Thailand, Kenya and Mexico before the testing begins. The Anaplasmosis Babesiosis Network (ABN) includes over 125 member institutions from 63 developed and developing countries.

Sorghum/Millet CRSP

Pearl millet (common in parts of the developing world) is a new alternative crop for U.S. farmers, particularly since the development of plant types that are appropriate for machine harvesting. Pearl millet grain yields have been raised close to those of sorghum, but much better yields should be possible. The A.I.D.-funded Sorghum/Millet CRSP (INTSORMIL) releases of improved pearl millet germplasm in 1989 and during the next five years will enable the U.S. private sector to produce commercial hybrids for potential markets in the United States, as well as in other industrialized and developing countries.

Other INTSORMIL research showed that in stressful environments, rotation of grain sorghum with a legume crop led to a 120 percent increase in sorghum yield compared to continuous growth of sorghum. In a less stressful environment, the improvement was 39 percent. Preliminary results suggest that the rotational benefits of legumes on grain sorghum yield and soil nitrogen levels are still present at least two years after the legume crop was grown.

Bean/Cowpea Collaborative Special Research Program

Diverse bean and cowpea germplasm has been collected and is serving as a source of material in plant improvement programs in both developing countries and the United States. Drought and heat tolerant lines have been identified and are being used to strengthen production in semi-arid areas of developing countries. These selections also are being used by U.S. bean producers who have been adversely affected by several hot, dry summers.

Bean cultivars with natural resistance to the bean fly have been identified. Breeders are using cultivars with this genetic resistance to reduce pest damage in those areas of Africa and Asia where bean fly is a major problem. New multiple-disease-resistant bean varieties have been developed and released to farmers and breeding programs. These varieties reduce the need for farmers to use environmentally hazardous pesticides. Genetic resistance to bean rust has been identified and is being used by U.S. and developing country breeders to develop cultivars with reduced need for fungicide to control this major disease. Use of newly developed sero-detection protocols for bean common mosaic virus, followed by administration of virus antisera, reduces the risk of transmitting viral diseases in imported beans and, at the same time, enables farmers to plant disease-free seed.

Strains of microbes that destroy cowpea insects have been isolated and made available to the scientific community for testing in biological insect control programs. Preliminary tests in Illinois and New York show that several species of insects can be controlled by this method, thus reducing the need for toxic insecticides. Additionally, a wild species of cowpea has shown resistance to storage insects, and genetic selections have been made for development and testing. A simple double-bagging technology is also dramatically reducing cowpea storage losses to insects, thus further lowering dependency on insecticides.

Peanut CRSP

A highly absorbant clay identified to bind and remove aflatoxin from village-processed peanut oil and peanut meal fed to animals has incalculable potential benefits in controlling this carcinogenic compound. A new peanut line scheduled for 1990 release in Texas has resistance to aflatoxin accumulation in the seed and results in 15 percent lower aflatoxin levels. The improved quality of the new line could increase gross returns by \$1,000,000 per year for Texas farmers alone -- this as the result of A.I.D. funding of less than \$50,000 over a five-year period, an impressive rate of return on investment. Extension of the technology to peanut farmers in Georgia, North Carolina and developing countries will reap greater benefits.

Plant Tissue Culture

Colorado State University, under a cooperative agreement with A.I.D. has developed plant tissue culture and cell methodologies to select cell lines tolerant to salinity, drought or acid/aluminum soil conditions and then regenerate the cells into whole plants for the improvement of crops important to developing countries, i.e. legumes and cereal grains. Project scientists have been able to regenerate plants from stress-tolerant lines of rice, wheat, sorghum, and millet, and regeneration techniques have been developed for tepary beans and pigeon peas. Field tests to confirm tolerance are being conducted on regenerates of sorghum, wheat and rice. When validated, tissue culture methods and germplasm are being transferred to collaborating labs in developing countries and to selected Consultative Group on International Agricultural Research (CGIAR) centers. Technology transfer has been facilitated through the International Plant Biotechnology Network (IPBnet) which includes over 500 plant scientists from 74 countries. IPBnet provides cell and tissue culture information through its newsletter; supports participants on six month training courses; organizes state-of-the-art conferences; promotes collaborative research with visiting scientists from developing countries; and publishes an international directory of collaborating plant scientists.

International Agricultural Research Centers

In 1989, A.I.D. contributed approximately 18% of the core funding to the international agricultural research centers sponsored by the Consultative Group on International Agricultural Research (CGIAR). The CGIAR is an informal group of some 35 donors (national development assistance agencies from Europe, North America, Japan and elsewhere, multilateral banks, U.N. agencies, and foundations) who coordinate their funding decisions (no monies are pooled) to support the international centers' scientific research to solve the food and agricultural problems of developing countries. CGIAR programs emphasize alleviation of hunger, sustainable use of natural resources, and improvement of livelihood and nutrition of both the rural and urban poor.

Special emphasis has been given to sub-Saharan Africa, where productivity of the agricultural sector has not kept pace with burgeoning population growth. These pressures have placed additional demands on land subject to traditional systems of shifting cultivation, which have led to rapid degradation of soils and declining productivity. The International Institute of Tropical Agriculture (IITA), located in Nigeria, is working with several other international centers and national programs to test a promising new system of cultivation known as alley

cropping. Alley cropping uses rows of small legume trees which provide additional nitrogen to the soil, mulch to hold moisture and forage for small ruminants. In between the rows, crops such as maize, cassava, and beans can be raised on a continual basis; intercropping or rotation of beans with the other crops provides additional nitrogen. Alley cropping increases production from lands already under cultivation, reduces the pressure on more marginal lands, preserves watersheds and wildlife and, at the same time, lessens deforestation.

New data from IITA indicate that maize can be grown continuously in alley cropping systems, with or without fertilizer, and give stable, sustainable yields. In the traditional slash and burn system, a farm family could expect 2-3 crops at most, before having to clear more land. Even with chemical fertilization, yields declined precipitously as soils became more vulnerable to erosion. Alley cropping and other types of agroforestry also permit integration of livestock into the farming system, further enhancing economic opportunities for farm families. The International Livestock Center for Africa (ILCA) in Ethiopia works jointly with IITA to manage the Alley Cropping Network. More than 100 on-farm trials are now underway, and 23 countries are participating in the network.

IITA research also identified and developed sources of resistance to black

sigatoka disease of plantains. This has been done by crossing resistant cooking bananas from East Africa with West African plantains, which have no resistance to the devastating disease. Bananas and plantains are the second most important crop in sub-Saharan Africa, and play an important role in sustainable production systems for the tropics. Further progress has been made on cassava, the most important crop in Africa and in many areas the staple food of poorer farmers and consumers. IITA's success in the biological control of serious cassava pests, reported last year, is now benefiting other countries in Africa's cassava belt. With the cassava mealy bug controlled, IITA's high-yielding cassava germplasm offers the promise of both higher yields and better disease resistance throughout Africa.

The above examples involve just two of the international research centers located in Africa; but many other centers located elsewhere are making key contributions in joint activities with developing countries' national programs. Increasingly, networks are allowing each program to focus on a particular problem for which it is well suited, and then share results with neighboring countries where similar problems exist. In this way, CGIAR centers are strengthening the developing countries own capacity for agricultural research, a key factor in developing productive agricultural sectors. Two centers -- the International

Food Policy Research Institute (IFPRI), located in Washington, D. C., and the International Service for National Agricultural Research (ISNAR) in the Netherlands -- work with national programs and governments to provide a better policy framework and research organization for agriculture. Both centers are deeply involved in Africa, where policy and institutional problems have been key constraints in the overall poor performance of agriculture.

Few other multilateral efforts have been as effective and non-political as the CGIAR. U.S. support has been key to the system's success, and the proven productivity and effectiveness of the centers has attracted many new donors over the 18 years since its founding. The donor group is currently responding to critical environmental issues, and will shortly incorporate and sponsor additional activities in forestry and natural resource management. Center programs recognize the need to develop sustainable systems and sound environmental practices, and promote attention to those concerns in the more than 100 countries in which the centers actively work. The 35 CGIAR donors and the nearly 20 centers (counting international centers funded inside and outside the CGIAR mechanism) remain committed to the alleviation of hunger, to economic development and to the reduction of poverty.

Energy and Natural Resources

A.I.D. sponsors research and development on the use of indigenous energy resources and on technologies that are environmentally protective. Efforts are also being made to facilitate private sector investment in projects that capitalize on successful R&D in these areas and to improve power sector investment decision-making as part of A.I.D. assistance to alleviate electric power shortages that hamper economic growth in developing countries. Complementary programs in energy efficiency and conservation are also being aggressively pursued to overcome these electricity shortfalls and reduce environmental impacts.

Renewable Energy. To expand the use of indigenous fuels, A.I.D. is promoting the use of agricultural wastes (primarily sugar cane and rice residues) as an energy source in rural areas. Through adaptation of commercially proven energy conversion technologies, these wastes can contribute to rural electrification.

In related work, Princeton University is evaluating the potential of steam-injected gas turbines to greatly increase electricity output at biomass-fueled power plants. Initial indications are that these new turbines can double or triple the power produced from the same amount of mill bagasse (vegetative waste) and/or greatly increase the total power output from a given biomass resource.

A.I.D. is also promoting the transfer and development of cost-effective and technically competitive renewable energy technologies including small hydro, geothermal, wind, and photovoltaic technologies and, to some extent, improved cookstoves and briquetting techniques. In India's Punjab, the USAID Mission is funding a 4-megawatt demonstration plant utilizing rice straw for cogeneration that could become a prototype for replication throughout that province.

Other Indigenous Fuels. Efforts to augment indigenous fuel use include developing and utilizing domestic natural gas, as well as coal mine-associated methane, in developing countries. These activities are designed to reduce reliance on imported oil while helping to protect the environment. A.I.D. is supporting the application of "clean coal" and other innovative technologies. For example, fluidized-bed combustion is being tested to convert low-grade fuels such as oil shale for central power generation in Jordan. To assist developing country decision-makers manage their energy resources, A.I.D. is also supporting the introduction of information systems, as well as computerized technology screening and planning tools.

A.I.D. is also assisting developing countries to bolster their energy efficiency and conservation efforts. In light of growing concern about rapidly increasing power demand, power shortages,

poor system reliability, inefficient management, tremendous capital requirements for new capacity, and shortfalls in available capital, a large share of this assistance is being targeted toward improving efficiency in the power sector. Specific technical and policy measures under way in several countries involve increasing the efficiency of power generation, transmission and distribution; better managing of power loads, and improving end-use efficiency. These efforts are being conducted with increased emphasis on the linkages between energy efficiency/conservation and environmental impact, including global warming.

Energy Inefficiency in the Asia/Near East Region and its Environmental Implications

A.I.D. is developing an Environment and Natural Resources Strategy for the Asia/Near East (ANE) region in the 1990s. As part of this effort, A.I.D. has prepared a study on energy inefficiency in the ANE region and its environmental implications. The study examines the current and projected energy situation in the ANE countries, donor activities in energy efficiency lessons learned, and options for improving energy efficiency in the region; and recommends priority activities for A.I.D. funding of energy efficiency activities for the 1990s.

Forestry, Environment, and Natural Resources

Natural Resource Policy and Training Project

A.I.D. planned new natural resources policy and training project is being designed to encourage policy actions that conserve critical but threatened natural resource systems. Long-term resource conservation is a recognized need in most developing countries, but must also be justified on economic grounds in the face of competing short-term needs. Research by the World Resources Institute and the Harvard Institute of International Development, with A.I.D. funding, has demonstrated the potential for natural resources accounting in developing countries. The project cooperators will develop and test economic analysis methodologies that express the true economic value of natural resources. These analyses are needed to persuade developing country governments that environmental policy reform is worthwhile. The projects will be measured by the ability of A.I.D.-assisted countries to manage and protect their own resources.

Forestry/Fuelwood Research and Development

A unique dimension of A.I.D.'s forestry/fuelwood research and development initiative is the effort to harness the resources of biological and social scientists to the common objective of developing improved multipurpose tree species (MPTS), which are adapted to local conditions and will be adopted by small-scale growers. Results to date have included

establishment of an MPTS network for sharing information, and the introduction of several species of genetically improved multipurpose trees into agroforestry systems. Thailand, the Philippines, Pakistan, Nepal, Sri Lanka, and Indonesia are members of the MPTS network. Papua New Guinea recently joined the MPTS network. Malaysia formally created a National MPTS Network and CIDA and IDRC (Canada) have agreed to formalize ties between the Canadian-supported rattan and bamboo networks in Asia and the MPTS network. A new forest policy research grants program initiated by A.I.D., will be funded through the MPTS network by the Rockefeller Foundation. A.I.D. guidelines for natural resources development in the humid tropics have been prepared and a plan is under way to involve host-country policy makers and scientists in marshalling evidence on undervaluation of natural resources, particularly tropical forests. Based on analysis of the nature of the deforestation problem in other humid tropics, A.I.D. is developing a strategy aimed at policy change, research and technology transfer, and institutional strengthening in developing countries with the largest humid tropical forests, the most rapid deforestation rates, and the highest potential for A.I.D. program impact.

Forestry Resources Management

A.I.D.'s forestry private enterprise initiative (FPEI) spearheads efforts to in-

crease income and employment in developing countries by mobilizing the funds and talents of public and private partners to manage the harvesting of forest products for local markets and export. In Ecuador, demonstration activities under the new project ranged from sustainable harvesting of timber to final sale as furniture, lumber, or other wood products to consumers; from local markets, where wood is sold virtually unprocessed, to export markets for industrialized products like furniture and plywood with buyers from small and microenterprises to large industrial wood products firms. Stimulated by the A.I.D. project's demonstration activities, two new non-profit institutions were created:

- the Development Corporation for Technical Assistance to Wood Industries (CORMADERA), which promotes forest conservation and provides technical support to the forest industry;
- and the Fundacion Ecuatoriana de Promocion Turistica (FEPROTUR) which promotes tourism.

A.I.D.'s forest resources management program was amended so that it could deal more effectively with the interrelationships between forestry and agriculture within a wide range of topics, such as multi-purpose tree crops, tree crop site quality and soil nutrient issues, soil and water conservation, fodder trees

and livestock production and windbreaks and shelterbelts. One of the first major activities undertaken was publication of an agroforestry manual entitled *Sistemas Agroforestales*. Major field activities over the past three years included: closer coordination of agroforestry training; data collection on cocoa agroforestry systems in Latin America; development of a conservation strategy for an endangered species of palm in Haiti; and participation in the South Pacific Coconut By-Products feasibility study in American Samoa. A U.S./Philippines agroforestry exchange was established to identify agroforestry training opportunities and establish a framework for the exchange of agroforestry research and extension information between the Philippines and tropical Pacific Islands.

Coastal Resources Management

As a result of A.I.D.'s coastal resources management (CRM) initiative, pilot programs are under way in three countries. Under Ecuador's national CRM program, a coastal water quality assessment was completed, shoreline construction standards were formulated, and Ecuador's training and public education programs were expanded to train officials in improving enforcement of regulations as well as in educating the public. Information on shrimp mariculture, one of Ecuador's chief sources of foreign exchange and the major economic activity on the coast, has been synthesized in a major publication en-

titled "A Sustainable Shrimp Mariculture for Ecuador."

In Sri Lanka, a national CRM program was designed and is being implemented. Efforts to decentralize the program have begun and a major policy study of Sri Lanka will be initiated to plan a program extending to the Year 2000.

An A.I.D.-funded national management strategy for coral protection is nearing completion in Thailand, and the nation's first management plan for a marine park has been prepared and is being implemented. From these pilot programs, lessons and training materials have been formulated for use in integrated natural resources management programs in all A.I.D.-assisted nations.

"An Integrated Management Strategy for Coastal Environments in the ANE Region," prepared as part of the A.I.D.'s Asia and Near East natural resources planning effort, sets forth both country-specific and regional priorities for CRM in the ANE region.

CGIAR Forestry Research. Following through on donors' discussions at the Bellagio II meeting in July 1987 on implementing the research aspects of the Tropical Forestry Action Plan, a proposal was submitted to the Consultative Group on International Agricultural Research (CGIAR) to consider incorporation of forestry research into the CG system. At the Consultative Group Meeting held in Canberra, Australia in May-June 1989, the Techni-

cal Advisory Committee recommended that the CGIAR expand its mandate to include research on the utilization of renewable resources related to agriculture and specifically to forestry. Donors will be asked to pledge funds for this new initiative.

Environmental Planning and Management.

A.I.D. seeks to identify approaches that can make natural resource management an environmental protection an integral part of the development planning and policy-making process of less-developed countries. The interest in and demand for country environmental profiles, national conservation strategies, and resource assessments has grown. A computerized directory of environment and natural resource studies and assessments is being undertaken to make this information more readily available.

In Jamaica, Thailand, Central America, India, and Nepal, environmental profiles have been followed by detailed resource assessments. The management and implementation of a multi-donor environmental action plan and a national environmental strategy is under way in Rwanda. Morocco, with A.I.D. assistance, is initiating a country environmental profile. In anticipation of Chile's return to democracy, a strategy for improved environmental and natural resources management is being formulated. Bangladesh is getting ready to embark on a national conservation strategy

and a forest sector master plan. A new Ministry of the Environment and Forestry was created and the President of Bangladesh recently proclaimed 1990 to be the Year of the Environment and the 1990's to be the Decade of the Environment.

Biological Diversity

A ten-year cooperative agreement, designed to conserve biological diversity and preserve the environment while encouraging economic development in developing countries, represents the largest A.I.D. effort, to date, directed at conservation of biological diversity. It will provide technical assistance, research, training, information and evaluation networking, and pilot demonstrations of innovative conservation projects.

The A.I.D. Video, "To Coexist: Diversity and Development," has been viewed widely both within and outside A.I.D. and has been distributed to all U.S. A.I.D. missions. This video highlights examples of interventions that increase the economic benefits of biological diversity conservation.

Health

The goal of A.I.D.'s health assistance program is to improve health status as reflected in increased life expectancy in assisted countries, thereby removing the effects of poor health as principal barriers to economic and social development. The health portfolio designed to

achieve this goal puts special emphasis on child survival and includes interventions in oral rehydration therapy (ORT), the control of diarrheal disease and acquired immune deficiency syndrome (AIDS), maternal and neonatal health, and research and development of new and improved vaccines and other health technologies needed by developing countries.

Current dividends generated by this multifaceted R&D program include new and improved vaccines and immunization technologies and the identification and testing of biological insecticides. The most significant are:

- non-reusable syringe, which is now undergoing field testing and is intended to preclude transmission of AIDS and other diseases when used in immunization programs;
- a measles vaccine that can be given to infants as young as six months. The new vaccine has been deployed in areas of Africa where measles is endemic and the World Health Organization intends to incorporate it in the Expanded Program on Immunization;
- an oral cholera vaccine that induces longer protective immunity;
- prototype sporozoite vaccines for two species of malaria; both have been tested for safety and efficacy in monkeys and have undergone

human clinical trials. (Further research is underway on ways to enhance the protective immunity of these and other malaria vaccine candidates.)

- successful field testing of the microbial agent *Bacillus thuringiensis israelensis* (BTi) for the control of malaria transmitting mosquitoes.

Nutrition

Combatting Dietary Iron Deficiency. A.I.D.-funded research on food fortification has been conducted to develop new ways of delivering bioavailable iron to people. Results include a novel iron fortificant for use with selected food staples such as whole wheat flour. Furthermore, a new sustained release dietary iron supplementation capsule has been developed which slowly releases iron in a way that may improve the effectiveness of the product as well as stimulate user compliance. Both the iron fortificant for staple foods and the slow release iron supplementation capsule are ready for demonstration under field conditions.

Vitamin A and Child Survival. In addition to preventing "night blindness," Vitamin A has now demonstrated a beneficial impact on child survival, especially in regions where intake is marginal-to-low. Major studies commissioned by A.I.D. and others, and conducted in Asia

and Africa have validated the linkage between adequate Vitamin A intake and dramatic reductions in death rates among young children, first observed in A.I.D.-funded studies by Johns Hopkins University in Indonesia. A reductions of 60 percent in mortality rates among children in a controlled study in India was reported at the November, 1989, international Vitamin A conference in Nepal. Other studies show that vitamin A cuts the risk of death from serious childhood respiratory illness and measles. For instance, inexpensive and easy-to-manage Vitamin A supplementation reduced the risk of respiratory disease in Thailand by over 50 percent.

Infant Nutrition and Child Survival

Proper infant and young child nutrition provides the groundwork for successful outcomes of other child survival interventions such as vaccinations and oral rehydration therapy. A.I.D. has been active in providing U.S.-based education and training in lactation management (proper breast feeding techniques) education for teams of doctors and nurses from developing countries who then return to their home countries and, in turn, provide such training for thousands of health workers. This improves the postnatal care of women and the nutrition of their newborns. A.I.D. has also fostered development of programs to assess and improve infant feeding practices such as (1) the promotion of breast feeding (2) the timely introduction of locally

available nutritious complementary foods, and (3) the dietary management of diarrhea.

Population

Voluntary family planning continues to play a vital role in U.S. development assistance. Expanding the number of contraceptive methods available is a critical component of The A.I.D. approach to family planning. Advances made for developing countries also increase contraceptive options for American women.

Biomedical Research

A number of advances in contraceptive research and development have been made in Fiscal Year 1989 with A.I.D. funding. The Food and Drug Administration's advisory committee unanimously recommended that the NORPLANTR six capsule contraceptive implant system be approved for marketing in the United States. Formal approval could come in early 1990. New spermicidal compounds under development show greater germicidal activity as well. One such compound, propanolol, has undergone extensive laboratory testing. Clinical testing is anticipated in the near future.

Improved Barrier Contraception. Many activities focused on improved barrier contraceptive research have been given high priority for A.I.D. funding, reflecting the increasing concern about AIDS and other sexually transmitted diseases. These include: (a) quality assurance test-

ing of latex condoms; (b) development of a less expensive, better condom made of materials other than latex; and (c) pilot testing and limited acceptability testing of a female condom. More testing of the female condom is planned for late 1989 or early 1990.

Improved Vasectomy Technique

With A.I.D. support, the Population Council is developing an improved vasectomy technique, which involves the use of a device that applies clips to occlude the vas. This technique offers the advantages of less trauma to the vas and elimination of the need for an incision, thus potentially lowering the incidence of post-operative complications. These advantages suggest this technique may prove useful in both developing and developed country settings.

Family Planning Business Analysis

Over the past three years, A.I.D. has supported the development of an economic projection methodology that estimates the costs and benefits associated with introducing family planning into employee health benefits packages. Employer benefits are realized through savings related to averted pregnancies. On the basis of this analysis, numerous companies and health insurers have chosen to institute family planning programs for their employees or beneficiaries.

Research and University Relations

Historically Black Colleges and Universities

Since 1984, A.I.D. has provided approximately \$2 million per year to historically Black Colleges and Universities (HBCUs) for research activities in health and agriculture. In fiscal year 1989, projects in health were funded on: the biology of the parasites that cause the diseases schistosomiasis, leishmaniasis, and South American trypanosomiasis (Chagas disease); vitamin A deficiency in children; and a biological method of removing coliform bacteria from sewage water. In agriculture, the HBCUs were funded to undertake research on: the use of sheep and goats in the farming systems of developing countries; agriculture production on sloping lands; and development of sweet potato varieties that are more suitable for developing countries. Through careful selection of proposals (with the help of the National Academy of Sciences) and monitoring of funded activities, this program is producing very useful research results and is strengthening the HBCUs capability for international work. The program is seen as an effective response to the Gray Amendment to the Foreign Assistance Act and to Executive Order 12677.

Israel Cooperative Development Research (CDR) Program

At the request of the Congress, A.I.D. has reactivated the U.S.-Israel Cooperative Development Research (CDR) program. The CDR Program is modeled

after PSTC, but involves Israeli and developing country research collaboration. This year, 45 new proposals have been reviewed, and 16 grants were funded for \$2.5 million. Projects draw on areas of Israeli technical leadership. One project has resulted in a long series of papers on statistical methods used to analyze underground aquifers. Newly funded projects range from biological methods for the control of the Varroa Bee Mite (which is a serious threat to the world's honey bee industry) to studies of vaccines for American Cutaneous Leishmaniasis.

Research on Policy Options

Policy reforms in education can be enriched by a working knowledge of the vast body of relevant research on effective schooling in the third world. Until now, that research has been known only by experts who may have little impact on policy. A major A.I.D. project is compiling the most important research findings and making them accessible on computerized data bases and, through simulations, showing the probable impact of policy change on educational outcomes. This work is being combined with country-specific research and pilot projects to enable LDC educational decision-making on a more scientific base.

Science Advisor

Program in Science and Technology Cooperation (PSTC)

The program seeks to take advantage of breakthroughs on the cutting edge of science and to explore the potential uses of innovative technologies. It is implemented primarily through a research grants program that has become highly competitive. This year 611 pre-proposals were screened, 145 full proposals evaluated, and 51 grants funded.

The PSTC program also provides a grant to the National Academy of Sciences to bring U.S. scientific capacity more effectively into support of the PSTC grant research program. The NAS has also published several important reports during the year. *Lost Crops of the Incas*, for example, details 31 crops including several tubers which might be grown more widely as alternative to potatoes, three very promising grains, and a number of potentially valuable tropical fruits. *Triticale* documents the potential of that grain (a cross between wheat and rye) to become a major staple crop. Under the program, a Thai scientist successfully developed a novel system for producing virus-free potato stock that is already being used to increase production in Thailand. Thailand's scientist of the year is a PSTC grantee, as have been the majority of all recipients of that award. A Philippine scientist has demonstrated the potential for biotechnology to mass produce hybrid rice seed, important because hybrid rice gives higher yields than existing varieties but seed is too expensive to produce by traditional methods. A

Sudanese scientist has developed a new low-cost meat processing method which maintains freshness for several weeks; this might improve nutrition in developing countries and could have important U.S. applications. An Ecuadorian scientist is developing tissue culture techniques to allow plantation culture of babaco, a promising tropical crop that can produce 50 tons or more of fruit per acre. The high overall quality of the PSTC program was confirmed by two evaluation studies--one in Thailand, and one in Nepal, Costa Rica and Ecuador--that were completed during the year.

Bilateral Science and Technology Cooperation

A.I.D. is helping the Government of Pakistan (GOP) establish the National Energy Conservation Center (ENERCON) to meet the goals of saving energy, improving productivity and profitability, reducing load shedding, and minimizing dependence on imported oil. The ENERCON project includes energy analyses of selected industries, buildings, and other energy consuming facilities to identify energy saving recommendations. Benefits obtained to date include average efficiency improvements of 10 percent per combustor in a boiler tune-up program and average fuel savings of 11 percent from tune-ups of 260 automobiles. In addition, savings of \$10.5 million from energy audits have been identified and \$4 million achieved in the

industrial and buildings sectors. A.I.D. and the Government of Pakistan signed an agreement for a major USAID/Islamabad activity, Institutional Excellence Project (IEP), in June 1989. The IEP funds the strengthening of S&T institutions and also supports a research grants program. The IEP project is to be funded by A.I.D. at a level of \$80 million over a ten-year period.

Philippines

A.I.D. sponsored a team of U.S. private power practitioners to assist the Government of the Philippines (GOP) in establishing a new set of legislative guidelines to encourage private investment in the power sector. Estimates indicate that the country will need over \$11 billion for additional power plants to meet power demand that is growing at an annual rate of 8 percent. The U.S. team presented a seminar focusing on the innovative Build-Operate-Transfer (BOT) private sector project financing approach, and worked closely with principal GOP agencies and legislators, as well as the Philippine private sector. This and follow-on technical assistance to GOP has resulted in the promulgation of a comprehensive set of rules and regulations by GOP on private power, and has stimulated an upsurge in the private sector to invest in and construct power plants. It also has enabled the National Power Corporation to initiate construction of the first BOT power plant in any A.I.D.-assisted country (adding 200 MW to the grid), and

to plan the procurement of a major second project (300 MW) on BOT terms.

To further stimulate and facilitate private power in the Philippines, USAID is assisting San Miguel Corporation, a diversified private company that contributes significantly to the rural economy, to plan and implement two private power plants. The use of agricultural biomass wastes as a fuel is being investigated.

Costa Rica

During Fiscal Year 1989, A.I.D. launched the Costa Rican Load Management Demonstration Project, which involved the installation of load management technologies to reduce peak electricity demand by 10 percent. Final results indicated that the 24 companies participating in the analyses reduced their demand by 14 percent. The project made use of local consultants to identify load management options, to identify the equipment needed by participating companies, and to help install energy management systems.

Following an A.I.D. analysis of the potential of the Costa Rican sugar industry to produce grid power, the Government completed enabling legislation and implementation procedures to encourage independent power production. The first Costa Rican mill to test the concept, El Viejo, sold excess power to the grid during spring 1989. Since then, El Viejo has received a commercial bank loan of \$1 million for upgrading and for

new equipment to permit the mill constant power output of 5 MW during the milling season.

Thailand

USAID/Bangkok, through its Agriculture Technology Transfer project (ATT), supports over forty applied research activities on subjects such as livestock disease, prawn production, and post harvest problems. Both the A.I.D. mission and the U.S. Department of Reclamation participate in the ATT project.

Dominican Republic

With technical assistance from A.I.D., including help in preparing private power legislation and funds for establishing a private sector loan program, the Government of the Dominican Republic introduced policies encouraging private sector development of electric generating facilities. These initiatives come at a time when power shortages and funding constraints threaten continued economic growth in that country.

Malawi

At the request of the Government of Malawi, A.I.D. evaluated the economics of expanding the Malawian ethanol industry. Given Malawi's position as a land-locked country, excess molasses from the sugar industry cannot be exported at a profit; at the same time importation of liquid fuels is also very expensive. The analysis delineated a scale at which expansion would be economically sound. The Government and private industry are proceeding to

implement the A.I.D. recommendations.

Education and Communications Technologies

The "Education For All" (EFA) initiative has begun to mobilize both developing countries and donors toward a goal of quality primary schooling for at least 80 percent of their children by the year 2000. The United States has endorsed the convening of an international EFA conference in 1990 and, during 1989, participated in both the North American regional conference and the steering group for planning the world conference. The EFA goal for developing countries may be achievable. That goal may be achievable, and the downward spiral in educational quality reversed through the use of new scientific and technological inputs for both teaching and management that are coming into practical use in educational systems worldwide. A.I.D., for some time, has placed a priority on the development of such new technologies and on their integration into developing countries' school systems.

Teaching Technologies.

A.I.D. research has been developed low-cost ways to help teachers deliver well-designed instruction under difficult conditions. One example is the "interactive radio" curriculum for teaching basic math, language and science, now in use in classrooms in seven developing

countries, and being considered by others. Evaluations of interactive radio projects have shown dramatic gains in student learning in countries on every continent, at operational costs as little as \$1 per student year. Those results have been achievable only because A.I.D.'s major front-end investments in research on effective teaching practices for children have then been embodied in the radio curricula.

Looking to the future, A.I.D. is making preliminary assessments of the impact of computerized instruction, including the use of low-cost hand-held teaching devices which can cost as little as \$1 per student per year. As technology prices decline and processing power increases, the microprocessor's potential for specialized teaching and training needs should begin to be realized in the 1990's. Two-way communication also has a role in upgrading education. To provide in-service professional training while teachers stay on the job, A.I.D. has helped three regions set up "distance teaching" networks using audio tele-conferencing. The economy of reaching professionals on site, rather than transporting them to central sites for in-service training, gives this method special promise.

Management Information Systems for Educational Improvement

Computerized management information systems can have a dramatic impact on the operation of educational systems

in developing countries, which typically are a nation's largest governmental department, reaching every region within a nation. A.I.D. has been working with a number of LDC's in developing such systems to serve a variety of purposes, from fiscal and manpower accounting to mapping of school locations and policy analysis.

DEPARTMENT OF AGRICULTURE

New International Projects - 1989

USDA continued to support numerous international programs which have continued for many years. The screw worm eradication program in Mexico is a good example of this work.

Several programs which have been in existence, but are based on year to year need were very active in 1989. Desert locust control is a prime example of this work. The program of generalized agriculture assistance to Venezuela which originated at the Cancun Conference was increased in size and scope. Poland was added to the list of countries participating in the Cochran Fellows Program.

During President Bush's visit to Hungary a new and extended memorandum on agriculture scientific cooperation was signed. New memorandum of understanding have been presented to Ireland

and Bulgaria and both nations are actively considering them.

USDA sponsored an agro-industrial investment visit to Ireland which is only the first of several programs with that country.

A million dollar Japanese Beetle Suppression project is underway on Terceira Island in the Azores and a regional workshop on fruit fly suppression took place in Mazatlan, Mexico.

USDA is working with Guatemala to develop a phytosanitary inspection, pesticide residue and marketing program; and to research med fly treatment for mangoes and papayas.

DEPARTMENT OF COMMERCE

Export Administration

The Bureau of Export Administration's (BXA) Office of the Assistant Secretary for Export Administration (EA) has the lead role within the U.S. Government and the Commerce Department for developing and administering export control policies for strategic dual-use commodities. EA's goal is to administer a comprehensive and consistent dual-use export control program that will protect, and where possible enhance, the U.S. national security. EA works closely with other agencies, particularly the Defense Department and the State Department to develop policies that focus U.S. export controls on truly strategic dual-use com-

modities. Simultaneously, Export Administration has the responsibility to ensure the long-term viability of the defense industrial base to meet national security requirements, both in peacetime and in times of crisis.

EA, with input from U.S. industry and concerned U.S. agencies, shapes the technical proposals that the U.S. makes for the multilaterally based export control policies of the Coordinating Committee (COCOM). COCOM's focus is controlling the export of strategic goods and technology to the Soviet Bloc countries. EA also is very active in formulating bilateral export control agreements with Western countries outside COCOM.

The Office of the Assistant Secretary for Export Enforcement (EE) is responsible for enforcing the export policies administered by EA. EE has statutory law enforcement powers which enable it to search, detain and seize shipments of goods which are destined for export in violation of the law and regulations, as well as to arrest and refer for prosecution parties which have allegedly violated the law. Administratively, violators may also be subject to civil fines and the denial of export privileges.

EE is also active in promoting compliance with U.S. export controls, particularly through outreach visits to the regulated industries. Such visits are directed at high tech manufacturers and distributors as well as industry groups,

e.g., the American Electronics Association and the Chemical Manufacturers Association. Educating the developers and manufacturers of controlled goods and technologies about their export control responsibilities is of major importance in preventing the loss of items that could damage U.S. national security.

International Trade Administration

The International Trade Administration (ITA) coordinates the Commerce Department's review of international science and technology (S&T) agreements. Per Executive Order 12591 and Section 5171 of the Omnibus Trade and Competitiveness Act of 1988, ITA works closely with other Commerce units as well as agencies such as the State Department, the U.S. Trade Representative and the Office of Science and Technology Policy to ensure that the negotiation and renewal of such agreements takes into account the level of protection for U.S. intellectual property rights offered by the country in question and the equitable allocation of such rights. Adequate protection for intellectual property will greatly aid U.S. businesses that currently incur enormous economic losses due to widespread intellectual property violations. Equitable allocation of intellectual property rights will help commercialize the results of federally-funded or sponsored R&D. In particular, ITA works to ensure that our interest in the effective

protection and equitable allocation of intellectual property rights is balanced with trade policy considerations. In Fiscal Year 1989, we participated in interagency negotiations on the U.S.-USSR Basic Science agreement, the U.S.-PRC Umbrella agreement, the U.S.-Korea Umbrella agreement, the U.S.-Spain Umbrella agreement, and the U.S.-India IPR Accord for S&T.

ITA also is involved in international environmental agreements and issues which have significant impacts on domestic and international business. The recently signed Montreal Protocol on Substances that Deplete the Ozone Layer is an example of the melding of science policy and trade issues which have become an integral part of international trade policy. ITA provided substantial assistance to the development of the final U.S. position and participated in international negotiations to limit ozone depleting substances. The final protocol reflects the orderly removal of these compounds without significant trade distortion. ITA also participated in an agreement to limit nitrogen oxides emissions which was approved by the President in August.

ITA takes part in many interagency and international environmental fora such as the Intergovernmental Panel on Climatic Change (IPCC) and provides input on environmental issues under consideration in the G-7 Summit and OECD Ministerial processes. We are working on

issues relating to future domestic and international action on continued reduction in chlorofluorcarbon compounds production to reduce further their effect on stratospheric ozone. Global warming issues are being examined in light of potential strategies to reduce carbon dioxide derived from the burning of fossil fuels.

ITA is also an active participant in the review of banned and restricted chemicals and pesticides. ITA monitors European Community directives relating to the creation of the single internal market in Europe to ensure conformity of standards and certification with U.S. environmental and business standards. In these latter issues particularly, ITA contributes its expertise to help develop environmental policies which are efficient and effect desired scientific objectives, but minimize trade distortions.

National Institute of Standards and Technology

In carrying out its traditional mission, NIST strives to ensure international compatibility of uniform measurements and international acceptance of U.S. standards, practices and technology. NIST's international collaboration involves both formal agreements and also informal sharing of scientific data by groups of scientists. International collaboration in technical subjects covers the entire range of the Institutes's program measurement methods and stand-

ards, optical spectroscopy, thermodynamics, physical properties, construction technology, and much more.

Serving the objective of strengthening the competitiveness of American industry, NIST represents the U.S. in such organizations as the International Bureau of Weights and Measures and the Organization for International Legal Metrology. NIST scientists are members of numerous technical committees in the International Standards Organization, and the Institute provides policy and technical support to U.S. negotiators participating in the GATT. During 1989, NIST scientists continued to be active in setting, testing and interpreting the interconnection standards required for data transmission among international networks.

NIST also is active in joint S&T programs with research institutions in several nations, for example supervising over 40 collaborative projects in Yugoslavia funded by the Joint Board for Scientific and Technological Cooperation. NIST participates in similar joint programs established in 1988 with Poland and in Fiscal Year 89 with Hungary. Together with the Office of Naval Research, NIST and the Government of India agreed during Fiscal Year 1989 to initiate new collaboration in materials and physical sciences research to be funded by the U.S.-Indo Joint Commission. In addition to the direct benefits this research provides NIST, collabora-

tion with foreign researchers and institutions establishes continuing linkages that benefit U.S. foreign policy.

Exchange of foreign visiting scientists in NIST laboratories has grown steadily, and in Fiscal Year 89 involved more than 380 scientists from 44 countries. In addition to performing valuable research, this activity contributes to improved long-term relations with foreign nations at both the institutional and individual levels. Indirect results of NIST's international involvements also include increased purchases of U.S. manufactured instruments and other equipment.

National Oceanic and Atmospheric Administration (NOAA)

The National Oceanic and Atmospheric Administration (NOAA) measures, studies and predicts ocean and atmospheric processes and manages the U.S.'s marine living resources. These activities are conducted so as to advance economic development, protect national interests and maintain the quality of life in the U.S. This mission, based on research and data requirements about the participation in international organizations and bilateral agreements. The NOAA programs for earth environmental research, monitoring, modeling and data archiving contribute to international understanding of global environmental change, environmental quality, ecosystem dynamics and marine living and non-living resource management.

Global Environmental Change

NOAA's role in the Federal Global Change Research Program includes a balanced program of observations, analytical studies, climate prediction and information management. This national program cannot be implemented without international coordination through such organizations as the Intergovernmental Oceanographic Commission (IOC), World Meteorological Organization (WMO), United Nations Environment Program (UNEP), and Intergovernmental Panel on Climate Change (IPCC), co-convened by WMO and UNEP.

NOAA's leadership in the past year has helped to launch WMO's World Climate Reference Network and IOC's initiative to create an integrated global ocean observing system. NOAA contributes broadly to IPCC's work, and in particular, NOAA is leading international efforts to assess response strategies for sea level rise and other impacts of global climate change.

One of the major areas limiting our ability to ultimately predict global change is our lack of understanding of the role of the ocean in the exchange of heat, water and trace gases with the atmosphere. Eight U.S.-PRC joint cruises aboard Chinese vessels, seven of which have been completed, will significantly enhance our understanding of the pivotal role the Pacific plays in shaping weather and climate worldwide. The cruises would have cost the U.S. approximately

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\$500,000 per cruise in operating expenses if conducted aboard the U.S. vessels.

Data collected through NOAA's participation in the international TOGA program (tropical ocean/global atmosphere) has been successfully used in Peru and Ethiopia to mitigate interannual climate variations. Peruvian changes in agricultural land use and crop mixes, based on estimated precipitation variations, have helped to increase total agricultural income.

Since 1986, the Ethiopian Meteorological Service, using TOGA data, has made accurate forecasts of the rain seasons. By altering land use patterns during the 1988 drought, the government was able to prevent human death and mitigate the effect on agriculture.

Much of the benefit of NOAA's multilateral and bilateral activities results from its producing cost effective research and ensuring access to information from specific geographic locations essential to global change studies. In this connection, efforts are underway to promote international sharing of relevant satellite and in situ data from U.S. and foreign sources.

India and the U.S. approved the first six projects in a new climate research program under the Indo-U.S. Science and Technology Subcommission. The program will formally begin in November 1989. The six projects will deal with interannual variability of the Indian monsoon and its connection to global circulation, break cycles in the monsoon, modeling of

variations in the inter-tropical convergence zone, relationship between Indian Ocean and Pacific Ocean anomalies, and preparation and management of large ocean-atmosphere data sets.

NOAA and the Canadian Climate Program Office continued their studies of the potential effects of climate change on the Great Lakes and, in addition, have commenced planning for a similar joint climate impact assessment on the high plains region of North America.

Increasing international attention has focused on the Arctic's role in the global climate system. U.S./NOAA, Canadian, Norwegian and Danish agencies participated in a March 1989 study to investigate processes affecting Arctic temperatures. Some experts believe that any climate warming caused by greenhouse gases will be observed first in the Arctic.

NOAA and NASA led a cooperative investigation designed to better understand the fluctuations in stratospheric ozone observed over the Arctic and the possible influence of the observed decrease in Arctic ozone on concentrations of stratospheric ozone over heavily populated northern mid-latitudes. During the first six weeks of 1989, NOAA participated in NASA's Airborne Arctic Stratospheric Expedition which was conducted to investigate Arctic stratospheric ozone depletion. This study involved over 200 scientists, technicians and pilots from U.S. and other countries.

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Under the U.S.-Soviet Environmental Agreement, NOAA arranged joint cooperation at the Soviet Heiss Island station to obtain measurements of stratospheric ozone changes in the Arctic during the winter/spring season.

Earth Observation Satellites

Members of the International Polar Orbiting Meteorological Satellite Group (IPOMS) are considering provision of instruments for the next series of polar-orbiters. Notable is the European plan to provide the spacecraft, launch and instruments for morning polar orbit service, and as well as future instruments on the series of afternoon polar orbiters. This should provide a major cost saving to the United States.

Following the failure of one of two U.S. GOES (geostationary satellite) in January 1989, the European meteorological satellite organization, EUMETSAT, and the European Space Agency have proposed to reposition their METEOSAT 3 geostationary satellite to provide the full coverage of weather patterns over the eastern Atlantic for users on both sides of the Atlantic. Data from METEOSAT 3 will be received and processed in Europe and then transmitted to meteorological agencies and users on both sides of the Atlantic. NOAA repositioned its GOES-4 spacecraft from 1985 through 1988 in order to fill a gap over Europe created by the partial loss of service from a previous METEOSAT satellite.

The President affirmed the U.S. commitment to ensuring the continuity of LANDSAT-type remote sensing data. NOAA's 20 year-old LANDSAT program provides land remote sensing satellite imagery and data important for such applications as global change research, environmental monitoring, law enforcement, natural resource estimates, national security and a variety of private sector uses. Funding has been approved by the White House for continued operations of Landsat satellites 4 and 5 as well as funding for the Landsat 6 to be launched in summer 1991. Eleven countries and one intergovernmental agency receive these data.

Living Marine Resources

NOAA works with other countries on a bilateral and multilateral basis to improve knowledge about living resources and apply that information to manage commercially valuable resources and protect endangered and threatened species.

At the 41st Session of the International Whaling Commission (IWC) in June 1989, the U.S. continued to support a strengthening of the IWC moratorium on commercial whaling and closer scrutiny of whaling programs ostensibly undertaken for scientific purposes. Separate resolutions were adopted concerning the scientific programs of Iceland, Japan, and Norway. A resolution invited Iceland to reconsider its proposed take of 80 fin whales (Iceland subsequently reduced its

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proposed take to 68). The resolutions concerning Japan and Norway recorded the IWC's conclusion that these programs had not satisfied the applicable criteria for research involving the taking of whales.

NOAA, in cooperation with U.S. industry, developed fishing techniques that enable the release of 99.5 percent of porpoises encircled by nets set to catch yellowfin tuna in the Eastern Pacific Ocean. In October 1988, the U.S. encouraged similar protective fishing practices by requiring that nations exporting tuna to the U.S., whose vessels fish with purse seines for tuna in the eastern tropical Pacific, have a marine mammal protection program and fleet porpoise safety performance comparable to that of the United States.

In 1989, NOAA, through the Department of State, successfully concluded negotiations with Japan, Taiwan, and the Republic of Korea (ROK) pursuant to the Driftnet Impact Monitoring, Assessment, and Control Act of 1987. Cooperative agreements were reached with Japan, ROK and Taiwan for increased enforcement measures to minimize the take of U.S. origin salmon on the high seas and for observer programs to assess the long-term impacts of driftnet operations on salmonids, marine mammals, sea birds and other forms of marine life.

NOAA continued regular bilateral fisheries cooperation talks with Mexico's Secretariat of Fisheries. The series of

talks held biannually since 1984, have contributed greatly to the improved fisheries relationship between the United States and Mexico. Items regularly discussed include cooperative research programs in the Gulf of Mexico and the Pacific, remote sensing, a marine mammal stranding network, protective measures for dolphins and turtles, and various other cooperative projects.

NOAA, operating from the NOAA Corps vessel SURVEYOR, conducted observations of krill, fish, marine birds and mammals in the Scotia Sea region of Antarctica and South Georgia. Post-cruise analyses of these observations helps form the basis for advice given to the U.S. delegation to the Commission of the Conservation of Antarctic marine Living Resources (CCAMLR). CCAMLR, acting on the advice of its Scientific Committee, has adopted conservation management and other measures designed to protect several species of seriously overfished Antarctic fish stocks. At its 1988 meeting, the Commission adopted a system of Observation and Inspection, the proposals for which were a U.S. initiative.

Emergency Services

NOAA and the Federal Aviation Administration have established a volcano watch service which alerts airline and other pilots when eruptions cause dangerous ash clouds along domestic and international flight routes. While NOAA's satellite imagery is the prime

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source of information, the volcano watch will enlist pilots as volunteer lookouts, expertise of the U.S. Geological Survey and reports from the Smithsonian Institution's worldwide Scientific Event Alert Network.

NOAA assisted the Soviet Union in obtaining Landsat images of Armenia taken before and after the December 7 earthquake to facilitate recovery from the disaster.

NOAA is responsible for preparing marine tropical-cyclone forecasts, advisories and warnings for the Caribbean Sea, Gulf of Mexico and the North Atlantic and Eastern Pacific Ocean. In cooperation with the World Meteorological Organization, NOAA is attempting to develop a tropical cyclone warning system for the nations of the Caribbean. This system includes a computer system to facilitate the communication of Meteorological data throughout the region and the dissemination of tropical cyclone advisories. In addition, NOAA disseminates advisories to the International Civil Aviation Organization.

U.S./NOAA and Soviet satellites continue to provide satellite-aided search and rescue information under the COSPAS- SARSAT Agreement which includes the U.S., U.S.S.R., Canada and France. This joint program has saved more than 1200 lives since its inception in 1982.

United States Patent and Trademark Office Submission for President's Report on Science, Technology and American Diplomacy.

National Technical Information Service

The primary mission of NTIS is to collect and store scientific and technical information (STI) prepared by or for the U.S. and foreign governments, and disseminate it to U.S. business, industry and academia. In more than 60 countries, NTIS has cooperative arrangements with organizations which actively acquire technical information for its collection and disseminate NTIS reports in their countries. To date, acquisition agreements have been signed with more than 160 foreign organizations, and more than 21,000 foreign research reports were added to the NTIS collection during Fiscal Year 1989. Approximately 32 percent of NTIS' collection comes from foreign sources, and 25 percent of NTIS sales are made overseas. Specialized activities were focussed on Japan in 1989. National interest in Japanese technical information continues to increase, but there is no central source in Japan for obtaining such information. In Fiscal Year 1988, an NTIS sponsored research team visit to Japan suggested ways of obtaining Japanese reports. A follow up visit was made in Fiscal Year 1988 to test the recommendations, which resulted in increased access to Japanese S&T data. A

Fiscal Year 1989 study on site in Japan on availability of technical information on HDTV revealed that specific Japanese high-tech information is still very difficult for foreigners to obtain. "Proper connections" are essential for success.

The Department of Commerce prepares and disseminates a directory listing all U.S. programs and services that collect, abstract, translate and distribute Japanese STI. In 1989, NTIS published the second edition of this "Directory of Japanese Technical Resources". NTIS also published the "Directory of Japanese Technical Reports 1987-1988" which lists all Japanese STI obtained by NTIS. As of the end of Fiscal Year 1988, acquisition agreements have been signed with more than 45 Japanese organizations.

National Telecommunications and Information Agency

NTIA is responsible for developing federal telecommunications technology policies, and serves as the principal executive branch adviser to the President on domestic and international communications and information policies. NTIA is also responsible for managing the radio spectrum assigned for Federal use, providing technical support to international telecommunications conference activities, and technical assistance on telecommunications matters to other Federal agencies.

The goals of NTIA cooperation with developing countries are to increase U.S. understanding of their telecommunications policies and infrastructures, and to identify projects that will help improve U.S. access to market opportunities in those countries. In Fiscal Year 1989, NTIA moved forward with the China Protocol, an infrastructure study in Thailand, and government/industry effort to increase U.S. understanding of policies and market opportunities in the Southeast Asia region. NTIA also served on the Joint Telecommunications Board which negotiated with the Federated States of Micronesia and Republic of the Marshall Islands to ensure spectrum management requirements are met within the context of U.S. security interests.

NTIA's infrastructure development projects in Asia, Latin America and the Caribbean enhance the visibility of telecommunications issues. Carried out in cooperation with the International Trade Administration, Export-Import Bank, Agency for International Development, and U.S. Trade and Development Program, these projects have enabled linking telecommunications and trade policy issues with the marketing requirements of U.S. firms. Lack of an adequate telecommunications infrastructure is an impediment to economic growth, productivity and employment opportunities in developing countries. NTIA technical needs assessments include in-

formation on the economic climate and describe planned telecommunications projects. These reports are widely distributed to U.S. industry which in turn can develop commercial proposals to fill the outlined needs.

An example of NTIA development projects was the Southeast Asian Telecommunications Conference held in Bali, Indonesia in November 1988. NTIA also has been preparing for a six month study of the Thai telecommunications infrastructure which will begin in September 1989. The study will be funded by AID and carried out by a joint public/private sector team. NTIA and the Government of Indonesia cosponsored a regional conference in November 1988 for senior telecommunications officials of the ASEAN nations. In early Fiscal Year 1989, NTIA completed spectrum management study for the Government of Saudi Arabia and is considering similar activity requested by other governments.

As part of the U.S. Telecommunications Training Institute, in Fiscal Year 1989 NTIA cosponsored a six week course in "Radio Spectrum Management and Computer-Aided Techniques" for foreign telecommunications managers and engineers from developing countries. Contacts established through USTTI courses have proven valuable to U.S. representatives in international telecommunications fora by helping promote better understanding of U.S.

positions and facilitating cooperative agreements and programs.

Technology Administration

The Technology Administration was established to provide a focal point within the Department for technology-based industry, and an advocate for government policies and actions to remove barriers to commercialization of technology. The new organization works with business, academia, other Federal and State agencies, and governments of other nations to ensure the technological competitiveness of U.S. industry. The Omnibus Trade and Competitiveness Act of 1988 assigns a variety of domestic and international civilian technology responsibilities to the TA, including in the areas of metric conversion, advanced technology programs, federal technology management, and symmetrical access.

The Technology Administration consists of the Office of the Assistant Secretary for Technology Policy, National Technical Information Service, National Institute of Standards and Technology, and National Telecommunications and Information Agency.

Office of the Assistant Secretary for Technology Policy (OTP)

OTP works with industry and other government agencies to develop consensus on technology opportunities and foreign competitive challenges, including identifying barriers to U.S. commercial innovation, quality, productivity, and

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manufacturing. It provides assistance to U.S. business by coordinating information activities in areas such as Japanese science and technology and metric conversion.

In Fiscal Year 1989, OTP was involved in bilateral agreements to foster cooperation between U.S. and foreign small and medium-sized companies for technology development. ("BIRD-F" in Israel, "PACT" with India, and "FACET" with the French.) The National Institute of Standards and Technology hosted the BIRD-F Board of Directors meeting in Washington, at which the decision was made to fund nineteen new joint venture projects. The OTP advises both the U.S. and Indian program management offices for PACT. PACT's mid-term evaluation will occur in late Fiscal Year 1989, which TA will take part in to assess the program's benefits to U.S. business. Sixteen agreements had been signed by U.S. and French technology-based companies as of the end of Fiscal Year 1989 as part of FACET.

OTP also ensures that U.S. industry's interests are reflected in bilateral S&T agreements. The Office of Technology Commercialization under the Assistant Secretary promotes commercialization of technology created with federal financial support. It accomplishes this mission through policies that permit federal contractors who have developed inventions to retain ownership and encourage federal laboratories to enter into

cooperative research arrangements with private firms. The objective of these policies is to ensure the technology remains under the control of those who invented it, understand it best, and have the incentives to exploit its commercial possibilities.

Section 5171 ("Symmetrical Access to Technological Research") of the Omnibus Trade and Competitiveness Act of 1988 requires that S&T agreements provide equitable and reciprocal access to foreign R&D facilities and to the flow of scientific and technological information. These agreements are reviewed by the TA to ensure that there is a fair allocation of resulting property rights between U.S. and foreign participants, and that appropriate consideration has been given to whether the laws of the foreign partner nation adequately protect technology that may result from such cooperation.

Provisions for allocation of intellectual property rights were added to bilateral S&T agreements in Fiscal Year 1989 as they came up for renewal. TA continued to work with the U.S. Trade Representative, Department of State, and other concerned federal agencies to ensure that bilateral S&T agreements are consistent with domestic science and technology policies.

The Japanese Technical Literature Program (JTLP) was created to improve the availability of Japanese scientific and engineering literature in the United States. Although the Program has no direct

bilateral agreements, it works closely with National Technical Information Service in implementing agreements with the Japanese Information Center for S&T and Mitsubishi Research Institute, to review and monitor the quantity and quality of technical and scientific literature obtained through these agreements.

Based on inquiries from U.S. companies, universities and government agencies, the program makes recommendations to the National Technical Information Service for new acquisitions and improved databases. During Fiscal Year 1989, 300 Japanese technical reports (both industrial and governmental) were reviewed, and JTLP assisted in the preparation of English abstracts for the NTIS database, identifying important Japanese reports for translation.

JTLP also participated in implementation of the U.S.-Japan S&T agreement through the U.S.-Japan Task Force on Access to S&T Information, negotiating with Japanese counterparts on issues related to copyright clearance, enhanced dissemination of gray literature, and joint R&D on machine assisted translation systems.

The United States Patent and Trademark Office

The United States Patent and Trademark Office (USPTO) administers the nation's patent and trademark laws. The Office also works to strengthen in-

tellectual property protection worldwide and provides assistance on intellectual property issues to the agencies responsible for foreign affairs and trade matters, including the Office of the United States Trade Representative (USTR), the Department of State, and the International Trade Administration (ITA) of the Department of Commerce.

The USPTO gives advice on intellectual property issues in international science and technology agreements as requested. Executive Order 12591, "Facilitating Access to Science and Technology", directs federal agencies, when considering international agreements on science and technology or when providing bilateral assistance, to take into account whether countries adequately protect U.S. intellectual property rights. Working through the Department of Commerce S&T Coordinating Committee, the USPTO provides technical advice to the Department of State, USTR, the Office of Science and Technology Policy (OSTP), and other agencies on the adequacy of protection available in specific countries, and recommends appropriate terms for science problems. On request and as resources permit, the USPTO also provides knowledgeable personnel to participate in negotiation of intellectual property terms of bilateral agreements.

The USPTO also works to strengthen U.S. competitiveness by improving the intellectual property protection available in other countries. The USPTO has

worked closely with USTR, the Department of State and the ITA on intellectual property issues in multilateral fora such as the GATT, as well as on bilateral consultations. The USPTO recently has participated in consultations on the adequacy of intellectual property protection in Argentina, Chile, People's Republic of China, Colombia, Egypt, India, Indonesia, Japan, Republic of Korea, Malaysia, Mexico, Philippines, Saudi Arabia, Singapore, Taiwan, and Thailand. The USPTO works extensively with the World Intellectual Property Organization (WIPO) on efforts to revise the Paris Convention and to harmonize patent laws.

The USPTO is responsible for administering Section 914 of the "Semiconductor Chip Protection Act of 1984". Interim protection is available under the act to foreign mask work owners as an incentive for other countries to pass similar laws protecting mask works.

The USPTO also offers advice and assistance to help developing countries provide and improve intellectual property protection. The USPTO, in cooperation with WIPO and unilaterally, provides training programs and technical experts and enters into agreements for the exchange of information. Recently, the USPTO has trained nationals from People's Republic of China, Egypt, Republic of Korea, Malaysia, Pakistan, Saudi Arabia, Japan, Taiwan, Thailand, Yugoslavia, Tanzania, and Zimbabwe.

Under a trilateral agreement, the USPTO cooperates with the European Patent Office and the Japanese Patent Office to build a file of U.S. and foreign patents from which information can be readily exchanged among the three offices. This agreement also helps coordinate views on harmonizing and strengthening national patent laws.

U.S. Bureau of the Census

The mission of the Bureau of the Census in the international arena is to maintain communication with sister agencies around the world and to provide statistical support for the U.S. Government's foreign policy. In Fiscal Year 1989, a number of activities were undertaken in support of this mission. The International Statistical Programs Center (ISPC) conducted a publications exchange with more than 150 statistical agencies and international organizations in the world. It also hosted approximately 450 foreign visitors.

In addition, the ISPC provided technical assistance, primarily through the Agency for International Development (AID). The Census Bureau maintained resident advisers in Saudi Arabia, Nigeria, Bangladesh, and Egypt. Short-term technical assistance was provided to approximately 38 countries. The ISPC has offered a comprehensive statistical training program to participants around the world since 1947 and in 1986 began a parallel program in Spanish. In Fiscal

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Year 1989, these two programs together trained more than 180 participants from 47 countries in Asia, Africa, and Latin America.

The ISPC continues to develop generalized computer software for processing censuses and surveys. The Integrated Microcomputer Processing System (IMPS) consists of modules for editing and tabulation of census and survey data. Recently, a data capture module, CENTRY, was added. IMPS and similar mainframe computer software are in use in more than 100 statistical offices throughout the world. A census management and reporting system and a frequency table system are currently under development.

The ISPC has also developed case study materials for censuses and surveys. These serve as the basis for workshops and are used as resource materials in developing countries on three continents.

This year, the Bureau's Center for International Research continued development of a database on the incidence of AIDS around the world. This database is being funded by a consortium of U.S. Government agencies.

The Census Bureau's technical assistance activities are provided on a cost-reimbursable basis. The largest single source of funding is the Kingdom of Saudi Arabia, which underwrites a large program of technical assistance in Riyadh. The other primary source of

funding is USAID, although the U.N. and other governments directly fund many students in the Washington-based training programs.

The Census Bureau continued activities under bilateral agreements for statistical cooperation with Canada, China, and Mexico. In Fiscal Year 1989, the Census Bureau jointly hosted (with the Office of Management and Budget and the Bureau of Economic Analysis) a delegation from GOSKOMSTAT, the Soviet Union's central statistical agency. A return delegation is scheduled to visit the USSR in September or October of this year.

The Census Bureau's international activities do not have major direct foreign policy implications, but they offer the opportunity for quiet cooperation in number of areas where it is in the long-term interest of the United States to improve relations. The international program of the Census Bureau contributes to the improvement of data collection and to more effective use of statistical data around the world.

DEPARTMENT OF DEFENSE

The U.S. seeks to enhance the security of the free world through promoting international defense science and technology cooperation among allies and other friendly nations while at the same time protecting military critical technology from diversion to potential adversaries. Ongoing objectives include the integra-

tion of scientific and technological advances into U.S. military capabilities. Through sustained cooperation in technology and development, the U.S. improves the effectiveness of its own defenses, increases mutual compatibility of military forces, and strengthens alliances. The U.S. also continues to encourage allied countries to field advanced military capabilities or strengthen technology security programs in order to deter the uncontrolled flow of free world technology to the Soviet bloc, hostile countries and terrorist organizations.

Strategic Defense Initiative

When former President Reagan announced the Strategic Defense Initiative (SDI) in a March 1983 speech, he emphasized that the program would be designed to enhance allied as well as U.S. security. In accordance with that mandate, as well as a subsequent national security decision directive, Congressional direction, and DOD policy, the SDI Organization (SDIO) is examining technologies and concepts for defense against all ballistic missiles, irrespective of their range or armament.

In March 1985, the U.S. invited the NATO allies, Australia, Israel, Japan, and the Republic of Korea to participate directly in SDI research. This invitation reflected the view that allied participation and cooperation could result in access to existing facilities not available in the U.S. and to researchers with special

expertise. In addition to scientific and technical contributions, the allies also provide special insights into concepts for regional missile defense. Thus, allied capabilities can reduce both the schedule and cost of the SDI research program and increase its overall effectiveness.

The U.S. has signed Memoranda of Understanding (MOU) with the governments of the United Kingdom, The Federal Republic of Germany, Israel, Italy, and Japan. These overarching MOUs are not related to specific projects, but are designed to facilitate allied participation and cooperation in SDI research insofar as permitted under U.S. laws, regulations, and international obligations (including the Anti-Ballistic Missile Treaty).

Although an MOU is helpful, it is not mandatory for participation. Allied countries that have not signed an MOU have successfully competed for contracts. Approximately 60 to 70 allied firms and research institutions, in both MOU and non-MOU countries, are performing, or have performed, SDI research.

The SDIO has signed several cost-sharing, project-specific cooperative research agreements with allies. For example, the SDIO concluded project-specific Memoranda of Agreement (MOA) with the Netherlands Organization for Applied Scientific Research in July 1987 and the Israeli Ministry of Defense in June 1988 on cooperative re-

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search on electromagnetic launcher technologies and the Arrow anti-tactical ballistic missile experiment, respectively. The SDIO has also concluded other types of cost-share, project-specific agreements with the allies. The U.S. has undertaken jointly with the United Kingdom the development of an Extended Air Defense Test Bed and a study to apply artificial intelligence to aid discrimination of missile re-entry vehicles from decoys and debris. Additionally, the SDIO signed a cost-share contract with Mitsubishi Heavy Industries of Japan for analysis of a theater missile defense architecture for the Western Pacific theater. While specific provisions of these agreements are classified, they address such areas as intellectual property rights, technology transfer, and security.

The following list is a compilation of cumulative prime contracts and major subcontracts awarded to allies since U.S.-allied cooperative SDI research began.

Country	Number of Contracts	\$Value (in millions)
United Kingdom	100	68.71
West Germany	33	65.93
Israel	16	184.50
Italy	25	14.15
Japan	11	2.20
France	10	2.70
Canada	16	2.51
Belgium	1	0.09
Denmark	1	0.03
The Netherlands	2	12.04

Total*.....215.....362.86

* Includes \$31.6 million contributed by Israel and \$7.0 million contributed by The Netherlands

Armaments Cooperation and Defense Trade

The goal of this science program is to achieve maximum return on each research and development dollar spent by coordinating research, development, production, and logistic support. The U.S. and its allies can accomplish this by equitably sharing and protecting mutually developed technology to avoid unnecessary expenditures and duplication of effort. Cooperative joint research, development, production and acquisition programs are explored thoroughly. This includes establishing common operation and design requirements, maintaining mission effectiveness, bilaterally sharing technology with nearly equal benefits, using economies of scale, avoiding duplicative costs, and standardizing forces and equipment to enhance interoperability.

Title 10 of USC 931 provides guidance for the U.S. Government to engage in a wide variety of cooperative research and development programs with NATO allies. Over 100 multilateral and bilateral programs are in various stages of negotiation, with more being planned for each year. Similar efforts are underway with non-NATO allies including Japan, Israel, Egypt, Korea and Australia.

This cooperation and trade is carried out through a framework of coordinated measures to maintain technology security. The Department of Defense has made technology security an integral element of agreements with NATO and other allies on cooperative defense programs in technology, such as SDI, and an important part of other collaborative efforts.

Organizations for International Technology Transfer

NATO Defense Research Group (DRG). DRG, the highest NATO forum for the discussion of its scientific and technical research needs, conducts research through which cooperative efforts might lead to increasing military capabilities or in cases technological advances are needed for current programs. The U.S. participates in seven panels, two special subgroups, and 42 research study groups.

Information Exchange Agreements

Data Exchange Annexes (DEAs). Master Mutual Weapons Development and Data Exchange Agreements are negotiated with each nation in which a program of data exchange is to be undertaken. They specify the general scope of the exchanges, classification limits and channels of correspondence, and provide assurances and procedures concerning the safeguarding of information

received. Mutually desired information exchanges in individual subject areas are subsequently and separately agreed to in annexes to the master agreements. It is, therefore, possible to establish a number of separate DEAs with one country covering a spectrum of technologies and applications and also to establish, with a number of countries, specific DEAs in a single technology or application areas.

Information Exchange Projects (IEPs). Similar to DEAs, IEPs provide for formalized information exchange and cooperation between the Armed Services of the U.S. and other participating nations. The agreements cover operational, tactical and follow-on support of specific equipment as well as the exchange of research, development and test and evaluation information.

Exchange Scientist Program (ESP). The Department of Defense participates in several scientist and engineer exchange programs. For example, several foreign engineers and scientists are hosted by the U.S. military services each year. The Services, likewise, can participate in the program by nominating U.S. scientists and engineers for placement in foreign research and development facilities. ESPs exist with Australia, Brazil, Egypt, France, The Federal Republic of Germany, Israel, Korea, Norway and Pakistan. Exchanges also occur under the Technical Cooperation Program with the U.K., Australia, Canada and New Zealand.

The ESP program involves a broad spectrum of research and development topics, and is valuable in terms of providing hands-on experience with foreign technology and managerial processes. Information obtained is very broad and is generally of a classified nature. The U.S. Army and the U.S. Air Force serve as the executive agents for the Defense Department.

DEPARTMENT OF ENERGY

The Department of Energy currently has 158 bilateral cooperative research and development programs with 27 nations and the European Community in all phases of energy R&D, including basic research areas such as high energy physics, CO₂ climate research and bioscience. DOE also carries out both bilateral and multilateral research projects under the auspices of various international organizations, including the international Energy Agency, the International Atomic Energy Agency, and the Nuclear Energy Agency. The majority of DOE's cooperation is undertaken to meet domestic programmatic needs and is funded directly through the affected program. The rationale for the DOE's cooperation with other nations in energy research has always been to both take advantage of the opportunity to share tasks with other nations, allowing the DOE to economize the dissemination of energy saving technologies which

are in the public domain, thus reducing world-wide demand for energy.

The majority of DOE's bilateral cooperation is with Japan, the Federal Republic of Germany, France, the United Kingdom, Israel and Canada.

In nuclear fission, cooperative work in fast breeder technologies is continuing primarily with Japan and to a lesser extent with the United Kingdom, the Federal Republic of Germany, France and Switzerland. In radioactive waste management, cooperation continued with Belgium, Canada, the European Communities, the Federal Republic of Germany, France the United Kingdom, Switzerland, Sweden and Japan. Joint work in nuclear fuel development continued with France, Japan, Switzerland and the United Kingdom. Cooperation in safeguards and physical security of nuclear materials continued with the European Communities, the Federal Republic of Germany and France.

In fossil energy research, cooperation continued with Canada, the People's Republic of China, Italy, Japan, Mexico, South Korea, the United Kingdom, Venezuela, France and India. Cooperation in renewable energy and energy conservation continued with Israel, Italy, Japan, Saudi Arabia, South Korea and Australia.

In fusion energy, work continued primarily with Canada, China, the European Communities, Japan and the USSR. In high energy physics, coopera-

tion with Japan, China, the USSR and various Western European countries continued. Program to exchange technical information, bibliographic data, and abstracts of energy related information continued with the Netherlands, the United Kingdom, Israel, France, the Nordic Countries, the Federal Republic of Germany, Italy and Sweden. The DOE also continued to cooperate with the other member countries of the IEA in various areas of energy technology, including the Centre for the Analysis and Dissemination of Demonstrated Energy Technologies (CADDET), which was created to share the results of advances in specific energy saving technologies in the building, industrial and commercial sectors.

Major new initiatives which the DOE has undertaken in the last year include:

Cooperation with the USSR

The US/USSR Agreement for Cooperation in the Peaceful Uses of Atomic Energy (PUAE) was signed in June of 1973 and extended in June of 1983 and again in May of 1988 at the Moscow Summit. This agreement has provided the framework for DOE's cooperation in research, development and the utilization of nuclear energy for civilian applications. In recent years the primary activity under the PUAE was in research into the fundamental properties of matter and cooperation in fusion ener-

gy research. In 1986, the US - USSR Joint Committee which manages the bilateral relationship was reactivated after a hiatus of eight years and has since approved the expansion of the bilateral cooperation through a Memorandum of Cooperation in Civilian Reactor Safety signed in April of 1988. This MOC has led to a wide range of joint activities in civilian nuclear reactor safety, complemented by numerous commercial and scientific activities by non-government organizations. The World Association of Nuclear Operators, inaugurated on May 15, 1989 in Moscow is one example of such activities. At the 8th US-USSR Joint Committee Meeting, held in Moscow on May 22-27, 1989, new joint work programs were approved which encouraged greater cooperation in high energy physics and fusion research, and Ad Referendum agreement was reached on language for a new PUAE which incorporates Intellectual Property Rights language reflective of current USG policy and changes the focus of the new dormant cooperation in breeder reactors to one of safety R&D and operations. We expect that the Agreement will be signed at the June 1990 Summit in Moscow.

New Initiatives with Poland and Hungary

The Support for East European Democracy (SEED) Act of 1989 authorizes the DOE to carry out cooperative programs with Poland and

Hungary. The bill provides \$30 million over three years to retrofit a coal-fired power plant in Poland with a proven clean coal technology and to help Poland develop the capability to manufacture the equipment which will enable industrial facilities to use fossil fuels cleanly. Negotiations to implement the Act are currently underway between DOE and the Polish government. DOE is also cooperating with Poland and Hungary in the priority areas of nuclear safety and clean coal technology under pre-existing government-to-government science and technology agreements.

Incorporation of Standard Intellectual Property Rights Provisions

In order to incorporate the policy frameworks established by the Office of Science and Technology Policy (OSTP) into DOE's research and development relationships with other nations, the DOE has been renegotiating agreements as they expire to include the intellectual property rights provision and other language endorsed by the OSTP, as appropriate. Most notable has been the renegotiation of the Agreement for Cooperation in Energy and Related Fields between the U.S. and Japan, which DOE hopes to successfully conclude in early 1990. In addition to this, the DOE has proposed new umbrella agreements in energy research with

France and the Federal Republic of Germany, which are now in negotiation.

International Thermonuclear Experimental Reactor (ITER)

The ITER project is a joint activity undertaken by Japan, the USSR, the EC and the United States to define the technical characteristics, the research and development needs, and the site requirements of an experimental fusion reactor, and to carry out validating research supportive of the design activity. The goals of such a reactor would be to demonstrate controlled ignition and extended burn in a deuterium plasma, to demonstrate the technologies essential to a fusion reactor and to perform integrated testing of the high heat flux and nuclear components required in the practical utilization of fusion power. In April of 1988, the four parties began the joint conduct of a conceptual design in implementation of the multinational fusion initiative of the 1985 Reagan - Gorbachev Geneva Summit. Done under the Auspices of the IAEA, this involves the joint work of 40 to 60 professionals drawn from all of the participants at a technical site at the Max Planck Institute for Plasma Physics in Garching, Germany for several months each year. In November of 1988, the ITER group presented proposed design characteristics and a plan for supporting R&D activities which are now in progress. A final ITER Conceptual Design Report

will be submitted at the end of 1990. There is no commitment to any construction activities.

Energy Technologies for Reducing Emissions of Greenhouse Gases

The DOE is investigating the role of various energy technologies in the reduction of greenhouse gases, and is working through the IEA to identify energy technology options and technology strategies to achieve this goal.

Superconducting Supercollider

During Fiscal Year 1989, the DOE worked through the interagency process to develop a plan for international cooperation in the construction of the SSC.

DEPARTMENT OF HEALTH AND HUMAN SERVICES, U.S. PUBLIC HEALTH SERVICE

Involvement of the Public Health Service (PHS) in international activities enhances its mission of protecting and promoting the health of the American people. PHS bilateral agreements are aimed at fulfilling that goal and at providing mutual benefit to partner countries as well.

Important advances in the biomedical sciences frequently have been based on the work of individual scientists from many countries, who each contribute im-

portant building blocks which eventually can lead to a larger discovery. Communications and exchange of experts, biologicals, data, and research findings promote scientific achievement and reduce duplication of effort as well as conserving scarce resources.

PHS bilateral programs have, historically, focused on mutually beneficial objectives, while at the same time responding to diplomatic initiatives, such as those with India, China, the Soviet Union, and Eastern Europe. The spectrum of interests and responsibilities of the PHS ranges from, inter alia, the fulfillment of regulatory requirements, such as those of the Food and Drug Administration (FDA); to biomedical research of the National Institutes of Health (NIH); and to prevention and control of infectious disease by the Centers for Disease Control (CDC).

Bilateral cooperative projects are selected according to the interest and priority of the agencies involved in each agreement.

Bilateral activities conducted intramurally are reviewed for acceptability and technical merit in the same way that other intramural projects are decided upon. Activities that will be conducted through extramural sources are selected by peer review in the same manner as domestic grant proposals or by a similar process, depending upon the funding source. Monitoring and evaluation is a continuous process, sometimes through

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a joint committee that meets annually or biennially, or during agreement renewal reviews. A significant proportion of PHS bilateral agreements involve FDA regulatory and inspectional matters, in which the FDA and appropriate representatives of a foreign government agree to adhere to certain manufacturing and inspection standards, so that drugs, foods, and medical devices do not have to be rigorously inspected at U.S. port-of-entry. These agreements are a benefit to both the United States and the importing country. Another routine type of agreement involves a quid pro quo sharing of biomedical literature and indexing tasks for the NIH National Library of Medicine and the MEDLINE system.

The remaining agreements largely involve cooperation in various aspects of biomedical research and health science and technology. Over half of these agreements involve the participation of one or more of the Institutes of the NIH. Other agreements, largely involving CDC, provide technical assistance, usually on a reimbursable basis, for such matters as field epidemiology training and monitoring and control of infectious diseases in less developed countries. There also are two regional or "multilateral" agreements to provide this assistance.

The CDC provided technical cooperation to about 20 countries in Southeast Asia (Indonesia), Latin America (Bolivia, Ecuador, Honduras, Peru), and Africa (Burundi, Central African

Republic, Guinea, Ivory Coast, Lesotho, Liberia, Malawi, Mali, Nigeria, Senegal, Sudan, Swaziland, Togo, Uganda, Zaire). Activities and achievements on a country-by-country basis are extensive. In general, immunization activities included strengthening the vaccine storage, distribution and delivery systems in all countries. Sterilizing materials and techniques were improved. Vaccination coverage was increased in many of these countries for which data were available, and a marked reduction in measles cases was reported in Lesotho and Rwanda.

Access to immunization for infants and women of child bearing age continued to increase. Diarrheal disease control efforts were directed toward expanding effective case management techniques in a number of countries and toward closely monitoring the functioning oral rehydration therapy (ORT) practices in existing ORT units. Activities dealing with malaria involved continued surveillance for chloroquine resistance, developing simplified treatment schedules for non-literate populations, and developing and implementing appropriate control strategies.

CDC established and/or institutionalized seven Field Epidemiology Training Programs (FETPs) in collaboration with the governments of: Indonesia, Mexico, Peru, Philippines, Saudi Arabia, Taiwan, and Thailand. The FETP graduated 87 trained field epidemiologists, 98 percent

of whom continue to work for their respective governments. Cumulatively, during their two training years, graduates and current trainees now have conducted over 500 disease outbreak investigations; also, more than 250 field projects (applied research) have been completed, addressing relevant public health problems in their countries. Trainees and graduates of the program continue to publish papers in peer-reviewed journals, documenting their work and disseminating the results to the public health community. The FETP also has helped to establish an international field epidemiology network that is now a resource pool for the World Health Organization (WHO) and foreign governments, with demonstrated capability in providing qualified field epidemiologists for various short-term consultancies.

Bilateral Agreement Highlights

The following are selected agreements/programs which are of particular importance at this time, either because of the scale of the program or the political visibility or sensitivity of the U.S. relationship with the country:

Brazil

The U.S.-Brazil S&T Initiative signed by Presidents Reagan and Sarney in 1983, includes biomedical research in cardiovascular diseases, neurosciences and infections and parasitic diseases. NIH, CDC, and the National Institute of Mental Health of the Alcohol, Drug

Abuse and Mental Health Administration are involved in the cooperative activities. In 1989, the program finally overcame various political difficulties and the PHS and CNPq agreed on a program of work and funding has been made available.

China. The Health Agreement signed in 1979, was renewed for five years during a visit to China of the HHS Secretary in April 1988.

Important areas of cooperation include cancer, cardiovascular disease, health services research, and infectious diseases. A letter of understanding also has been developed between the CDC Influenza Branch and the Institute of Virology of the Chinese Academy of Preventive Medicine to conduct a joint program in the area of influenza viruses. This collaboration has led to the establishment of a national surveillance system in the People's Republic of China (PRC) encompassing five to ten cities and all regions of the country. As a result of this system, CDC has received this year over 40 viral strains within four to eight weeks of their isolation in the PRC - a marked increase in efficiency. This is particularly important because novel strains of influenza virus that travel around the globe frequently have arisen in the PRC.

Eastern Europe

Recent high-level interest has generated a new S&T agreement with Hungary and renewed interest in U.S.-

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Poland collaboration. It is expected that in both countries the PHS will become involved in additional biomedical research projects which require collaboration between the NIH and Eastern European institutions.

Egypt

This program is over 20 years old; a health agreement was signed in 1975 and renewed for successive five-year periods. A new agreement, updated to better reflect the level of cooperation and a change in funding away from P.L. 480, was signed by the HHS Secretary and the Egyptian Minister of Health in May 1989. Cooperation includes infectious disease prevention and control, cancer research, maternal and child health, vaccine development for acute respiratory illness, and other areas. Currently there are 20 project areas carried out through support of the Agency for International Development (A.I.D.). These projects are building important infrastructure in both manpower and information systems which enhances A.I.D. broader program interests in Egypt.

France

Scientists from NIH and the French Institut Nationale de la Sante et de la Recherche Medicale (INSERM) have developed an important new prenatal diagnostic test for Niemann-Pick Disease Type C, a fatal genetic lipid storage disorder. The new method can detect the disease between the eighth and tenth week of pregnancy. Also, a device being

developed collaboratively by NIH and INSERM may spare cancer patients' loss of healthy limbs resulting from hyperthermia treatment to prevent tumor spread. The device will permit oncologists to apply heat to a precise location on a limb, avoiding damage to healthy tissues.

India

This program is more than 20 years old. The PHS currently receives an allocation of about \$2 million in rupees per year under the new U.S.-India Fund for Educational, Cultural and Scientific Cooperation. These funds support a broad-based program of research and related activities in such areas as infectious diseases, nutrition, vision research, reproductive physiology, and others. An important new activity is the Indo-U.S. Vaccine Action Program, which is being implemented in partnership with A.I.D. Implementation of the Indo-U.S. Vaccine Program (VAP) has proceeded well, with full agreement being reached on program procedures and with the designation of priorities for the program--hepatitis viruses, polio, canine rabies, Haemophilus influenza, pneumococcal pneumonia, respiratory syncytial virus, pertussis, typhoid, Escherichia coli, shigellosis, and cholera. The program was announced in mid-1988 to over 500 institutions in India and nearly 200 in the United States. In October 1988, the first four research projects, including research related to cholera, polio,

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hepatitis, and typhoid, were approved by the Joint Working Group.

This program is expected to result in new or improved vaccines and immunodiagnosics. Funding for the program is from the A.I.D., PHS, and the Department of Biotechnology of India. An Indo-U.S. Science and Technology Subcommission project has demonstrated clearing of microfilaremia in patients with Bancroftian filariasis (elephantiasis) with single oral doses of ivermectin. A second trial of ivermectin and diethylcarbamazine (DEC) indicated that the efficacy of ivermectin and DEC were equivalent for 3 months, but by 6 months the recurrence rate of microfilaria in the ivermectin-treated patients was 30 percent while the was only 15 percent in DEC group.

Israel

This bilateral program is also over 20 years old, and a health agreement was signed in 1980. Cooperation focuses primarily on health policy issues with biennial joint symposia serving as the principal medium of interaction.

Italy

U.S.-Italy studies suggest that there is an increased risk of aging-related cataract from specific social, environmental, and dietary factors. Comparisons between study data obtained in each country may determine why the onset of cataract occurs at earlier ages among some communities.

Japan

The most active collaboration in the biomedical sciences area is with Japan. Scientists from the United States and Japan are continuing their investigations on the presence of mutagens in a wide range of foods. Japanese researchers found that several of these mutagens evoked a positive response in a short-term assay for stomach carcinogens. U.S. researchers reported the formation of mutagens during the frying of ground beef. A preliminary U.S. study on the carcinogenicity of one such mutagen showed that it produced liver carcinomas in monkeys. These studies promise to provide knowledge that may help prevent cancer and genetic diseases in which diet is a contributing factor.

Pakistan

Cooperation with Pakistan continued in Fiscal Year 1989, including research on senile cataract, filariasis, pregnancy outcome and perinatal mortality, and cancer. Additionally, the CDC continued its participation, along with Global 2000, in the effort to eliminate guinea worm in Pakistan.

Spain

The CDC Center for Environmental Health and Injury Control has continued providing assistance to the Spanish government in investigation of the Toxic Oil Syndrome (TOS). Studies to date confirm linkage of the disease to adulterated rapeseed oil. The Spanish Ministry of Health is continuing its search for data relevant to the occurrence of TOS

in France. These activities are being coordinated with those of the World Health Organization.

Soviet Union

Agreement for health cooperation was signed in 1972 and renewed at five-year intervals. Major areas of cooperation include cardiovascular research, eye diseases, cancer, viral infections, environmental health, and research in artificial hearts. Since the November 1985 Summit Meeting between President Reagan and General Secretary Gorbachev, there has been a revitalization of this program. Joint Health Committee meetings were held in the United States in 1986 and in the Soviet Union in 1988 with new areas of collaboration added in primatology, HIV infection, and alcohol-drug abuse research. U.S. and Soviet scientists are continuing collaboration on a study of Lyme disease that compares the course of the disease and its clinical manifestations in U.S. and Soviet patients. Serologic testing has revealed elevated IgM and IgG antibody titers to the bacterium that causes Lyme disease among some Soviet patients with clinical manifestations suggestive of this disease. A manuscript describing these studies was published in the October 1988 issue of the *Journal of Infectious Diseases*.

DEPARTMENT OF THE INTERIOR

National Park Service

In Fiscal Year 1989, the National Park Service (NPS) was involved in a broad range of international activities. 117 new separate projects with twenty-nine nations were executed in collaboration with other United States Government agencies, foreign counterpart agencies, international institutions, and national and international non-governmental organizations. Bilateral collaboration has emphasized shared resources, both natural and cultural. Our activities have assisted in furthering Congressional interest in global environmental legislation.

NPS projects fell into the following broad categories:

1. Technical assistance in the design, planning, development monitoring, management and evaluation of national parks and protected areas overseas.
2. Training provided to foreign parks related officials in the conservation of natural and cultural resources. In Fiscal Year 1989 575 training and orientation programs were provided to representatives of 63 countries. A total of 11,862 training days were provided.
3. Information exchange. General park information and specialized research findings on parks and park related matters regularly exchanged with other nations. Guides, planning manuals, scientific papers, books, etc., are exchanged and then adapted to individual

countries' needs. Approximately 1,512 requests for technical information were received during the fiscal year.

4. Conferences and workshops. The NPS participates in conferences and workshop/seminars on a professional basis as well as by legal mandate under Public Laws and bilateral agreements with other nations.

5. International cooperation and exchange. The NPS has cooperative agreements with 23 universities, 3 international conservation organizations, 7 government agencies and 13 foreign governments.

The United States and the nations with which it cooperates derive substantial benefits from NPS international activities and programs. The U.S. gains access to the latest state-of-the-art technology and source material and is in a position to monitor, assess, and adapt to U.S. use the latest professional advances in park, protected area, and wildlife planning and management.

Communication with other participants in the World heritage Convention and Biosphere Reserve program, as well as cross-border shared resources cooperation with Canada, Mexico, Soviet Union and the Caribbean, has been enhanced. Developing countries are made aware of natural resource concerns and are encouraged to plan for sustainable economic growth, and the U.S. is seen as visibly responsive to requesting governments in identifying priorities for con-

serving their national heritage. Both sides of the exchanges are developing greater mutual understanding about common global resource conservation concerns.

U.S. Geological Survey

A highlight of the U.S. Geological Survey (USGS) international activities in Fiscal Year 1989 was the co-hosting, with the U.S. National Academy of Sciences, of the 28th International Geological Congress, July 9 through 19, in Washington, D.C. Just over 6,000 earth scientists, exhibitors, and guests representing 104 countries attended, and nearly 150 sponsors, including scientific societies, governmental bodies, universities, industrial organizations, and individuals, cooperated in the endeavor. More than 3,000 scientific and technical presentations were made on research in geology and related disciplines, many of these were by USGS personnel. Also featured were nearly 50 pre- and post-Congress field trips, many led by USGS personnel, to geologically significant areas of the United States, including Alaska and Hawaii. The Congress addressed problems facing the geological sciences and, as usually results during these conventions (held every 4 years in differing countries unified the worldwide geologic communities.

The USGS conducts international activities in science and technology, as adjuncts to domestic programs, under

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authorization provided in the Organic Act, as revised, and the Foreign Assistance Act and related legislation in which such studies have been deemed by the Departments of State and Interior to be in the interests of the U.S. Government. Programs which foreign governments are operated under bilateral or multilateral agreements sanctioned by the aforementioned Departments. In addition to providing opportunities for comparative studies of scientific phenomena both domestically and abroad, acquisition of data on existing and potential foreign resources, broadening the knowledge, expertise, and international reputation of the Survey's staff, and developing and maintaining relations with foreign counterpart institutions, the activities support programs of other U.S. Government agencies, particularly the political, economic, and strategic interests of the U.S. Department of State. Some USGS activities in science and technology serve as contributions to foreign policy decisions.

Technical assistance is commonly an important aspect of foreign investigations by the USGS benefits by gaining knowledge and experience in the countries studied, which then may be applied to domestic studies and investigations elsewhere. Institution building, training programs, and participation and representation in international earth-science organizations, commissions, and congresses by USGS scientists establish

contacts beneficial to U.S. foreign and domestic policy interests.

Remote sensing from AVHRR, LANDSAT, AND SPOT imagery supply data to three multinational cooperative programs in Africa -- i.e., the Famine Early Warning Systems (FEWS); AGRHYMET, a program to improve collection of agricultural, hydrological, and meteorological data; and Grasshopper and locust Habitat Identification and Monitoring. Remote sensing imagery is utilized also in the bilateral cooperative programs of map preparation in Argentina, map revision in Bolivia, applications and development of geographic information systems and geographic-names data bases in China, image-map processing in Jordan, and image maps of the U.S.-Mexico border prepared for U.S. Customs Service and International Boundary and Water Commission.

Surveying and Mapping in Antarctica provided geodetic and gravity data, aerial photography, and satellite imagery to prepare base maps and other cartographic products. These maps were prepared to support geologic and glaciologic investigations in cooperation with France, New Zealand, United Kingdom, and West Germany. Doppler-satellite and experimental seismologic and gravity data are collected and transmitted daily to CONUS from the year-round manned South Pole Station. The scientific Committee on Antarctic Research (SCAR) Library for Cartography

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is maintained for the National Science Foundation, U.S.-produced maps and charts of Antarctica are distributed to other SCAR-nation libraries, and foreign-produced materials are distributed to NSF-designated university libraries.

The International Strategic Minerals Inventory, a program by the USGS and the U.S. Bureau of Mines in cooperation with Australia, Canada, West Germany, South Africa, and the United Kingdom, continues to develop a global assessment of deposits, resources, and supply-demand relations for a number of critical commodities. During Fiscal Year 1989, studies on tin were emphasized and investigations on cobalt, nickel, platinum, and titanium continued. Mineral resource assessments or research and modeling of mineral deposits under bilateral agreements continued with China, France, Japan, Mexico, Portugal, Saudi Arabia, Spain, Venezuela, and Yugoslavia. The assessment programs provide knowledge of worldwide availability of minerals, especially those critical to supplies in the United States, and assist foreign nations to explore, exploit, and utilize their own deposits, some of which might be plentiful enough for export.

USGS continues to assess worldwide resources of oil and gas under The World Energy Resources Program, an extension of the domestic program. A country-by-country study of the petroleum

geology of South America and a similar study for Antarctica were completed as preludes to estimating those oil and gas resources. USGS issued a map showing the geologic framework, petroleum potential, and field locations of sedimentary basins in China. Soon to be released are a USGS Bulletin on the petroleum assessment of West Siberia and a report on depositional controls, distribution, and effectiveness of the world's source rocks for oil and gas. Other USGS energy studies included the ongoing resources assessments and/or scientific research on coal in Costa Rica, Pakistan, and Yugoslavia, peat in Indonesia, petroleum in Germany, Hungary, and the southwest Pacific region, sedimentary basin analysis in Korea, and bore-hole geophysics in Canada. These studies aid foreign countries in the identification, development, and utilization of indigenous energy resources, thus reducing the needs to import expensive petroleum products and to rely on economic assistance programs from without. Technical assistance in groundwater modeling began in Fiscal Year 1989 in the Senegal River basin, Senegal and Mauritania. The assessment of water resources in Abu Dhabi, UAE, continued for the 2nd year. Other continuing water-resources research activities included studies of biogeochemistry of lakes in Antarctica, humid-regions hydrology in Panama, debris-flow hazards in Japan, sea-ice characteristics

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in the Arctic, ground-water data base development assistance in India, and various projects with Canada. Short-term (less than 1-year duration) water resources assessments and research on modeling also were conducted by USGS in Antarctica, Australia, China, Costa Rica, Dominican Republic, Greenland, India, Korea, Senegal, Suriname, and Venezuela. The many cooperative programs serve to substantiate the unique character of the USGS as a world-renowned organization having highly qualified personnel with knowledge and expertise in the water resources field.

Activities to mitigate geologic and hydrologic hazards, the predictive investigations and monitoring for volcanic eruptions, and the global research on geophysics, seismicity, and earthquakes continued to be major USGS international cooperative programs during Fiscal Year 1989. Activities continued under the Interagency Volcano Early Warning Disaster Assistance Program; volcano monitoring and early warning prediction capabilities for eruptions were assessed for several Latin American countries; monitoring continued in Indonesia and Italy.

Geologic hazard assessment programs continued with El Salvador and in the southwestern Pacific coastal areas; cooperative research on hydrologic and volcanic hazards was done with Japan.

In addition to its continuing multilateral programs to establish and coordinate the

Global Telemetered Seismic network and to monitor worldwide seismic data for earthquake prediction, the USGS carried on bilateral geophysical, seismic, and/or earthquake studies with various countries including Canada, Chile, China, West Germany, Italy, Jordan, Panama, Saudi Arabia, Soviet Union, and Yugoslavia.

The USGS coordinated the dispatch of research teams to the Soviet area devastated by the Armenian earthquake of December 1988, and supplied equipment and personnel to monitor seismicity for sometime thereafter. The continuing stress to expand hazard studies hopefully will lead to worldwide capabilities to predict hazardous events and mitigate resulting destruction, thus saving countless lives and untold suffering and losses, a benefit not only to the United States, but also to all mankind.

Cooperative marine geology investigations in 1989 included processing digital sonar data with Norway, development of methods for seafloor sonar imaging surveys with the United Kingdom, and institution building with Indonesia. Mapping, resource assessment, and other activities related to marine exploration and seafloor imagery derive information for long-term planning strategies to reduce U.S. dependence on foreign supplies of critical minerals.

Climate change and atmospheric deposition programs are receiving increased attention internationally. USGS

expertise in environmental protection research, a long-term effort in the domestic program, is being applied to cooperative preliminary studies with the Soviet Union to monitor climate changes and with Canada on standardization of monitoring equipment and procedures to determine atmospheric contents of substances that might produce acid rain.

During Fiscal Year 1989, 79 foreign nations from 16 countries received training and 57 visiting scientists from 16 countries research in the U.S. Countless individuals were trained on the job during the activities in foreign countries. Institution building was the major activity in Bangladesh and integral parts of the programs in Africa, Pakistan, and Saudi Arabia. Workshops were held in Turkey on marine geology, and a 5 week training course in hydrologic and landslide hazards was conducted in Italy. The U.S. and U.S.S.R. have agreed to a geoscientific research-personnel exchange program beginning next fiscal year. The organization and upgrading of the earth-science institutions along with the development of libraries, information centers, and publication facilities as well as the training programs, allow USGS to access earth-science and resource-assessment information that can be utilized in domestic studies and will form the bases for recommendations on foreign policy decisions.

DEPARTMENT OF TRANSPORTATION

The economic welfare, quality of life and political stability of all countries depend upon the nature of the design, construction and maintenance of efficient, safe, secure, and viable transport systems. Nationally, the role of the Department of Transportation (DOT) is to work closely with states, local authorities, and private industry to build, maintain and improve these lifeline systems to meet the ever-increasing socioeconomic demands of moving people, goods, and services.

In many respects, U.S. national transport goals cannot be accomplished without close and continuous liaisons with other countries and regions, particularly in the development, improvement and interfacing of air and sea operations worldwide. For example, the safety of both American and foreign carrier operations is greatly enhanced by bilateral cooperation and the provision of technical assistance and support to other countries. Further, many national and international transportation regulations and policies (e.g., in areas of safety, security, and trade) are established on the basis of accepted scientific findings.

Recognizing, therefore, that cooperation between and among a myriad of national and international entities is inherent in accomplishing many departmental missions and that no

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country has a monopoly on new ideas or technology (basic or advanced), DOT has continued to encourage and support science and technology (S&T) cooperation, which is carried out in accordance with the following objectives:

- to access and share transport technology and experience to reduce costs and avoid duplication of parallel national efforts;
- to find innovative solutions to common technical and operational problems, particularly in the areas of safety and security;
- to participate in multilateral research and other discussions and to coordinate national positions in international organizations;
- to promote sales of U.S. transportation equipment and technology, and
- to support U.S. foreign policy.

Currently, DOT has bilateral S&T cooperative arrangements with 24 countries, actively participates in 15 international organizations and is involved from time to time in the work of other multilateral groups. In addition, during Fiscal Year 1989, DOT

- (a) provided cost-reimbursable aviation and highway technical assistance to 88 countries;
- (b) conducted a large foreign visitor program for technical orientation, general fact-finding, and/or discussions on policy issues; and

- (c) provided aviation, highway, maritime, and merchant marine training to 424 foreign students.

As the level of activity varies from year to year in many of these programs, only major activities for FISCAL YEAR 1989 are summarized below as these represent progress in achieving one or more of the DOT international program objectives.

Bilateral Programs

Canada

At the October DOT-Transport Canada (TC) Program Review meeting, intensive discussions were held concerning a wide-range of extant and/or planned cooperative work in all modal areas: marine/maritime; aviation; rail; highway traffic safety; highway construction, maintenance and operations; urban and suburban systems; research on accessibility for the handicapped; and studies dealing with the driving habits of senior citizens. It was agreed that greater emphasis would be placed on a better understanding of the role of human factors in transport design, particularly in regard to emerging technologies. Projects to cooperate in these areas are to be developed by a select group of specialists at the DOT Transportation Systems Center and TC's Transportation Development Centre who have pointed out the crucial need for statistics and demographic data.

U.S. Deputy Secretary of Transportation, Elaine L. Chao, led a DOT delega-

tion for meetings with a Transport Canada delegation, headed by Deputy Minister Shortliffe, in Chicago in June. Discussions were held on policy matters, including aviation security, airport congestion in the United States and Europe, marine/maritime national and international operations, safety, rail operational changes and improvements, truck and highway operations and changes in cross-border transport resulting from the Free Trade Act.

The active technology sharing and collaboration on policy issues between DOT and TC specialists and senior-level management contributes significantly to the improvement of transport systems in both countries, facilitates and promotes trade, enhances safety and security, and expedites the solution to many transport problems and issues.

China

DOT proceeded in implementing agreements with Chinese counterparts in the highway, maritime search and rescue, and rail areas. Earlier in the year the U.S. construction of a demonstration highway in a major industrial corridor of China was of high interest in both countries. Technical information was forwarded to Chinese entities in areas of highway and construction; rail research and development; design, calculations and instrumentation on port/waterway construction; and the groundwork was laid for cooperation on maritime search and rescue cooperation.

Agreements were negotiated for cost-reimbursable assistance to the Chinese Civil Aviation Administration for air traffic and airworthiness training, national airspace system planning, supply support services, and flight simulator qualifications.

Federal Republic of Germany

New programs of cooperation in highway, traffic safety, and rail areas were begun during the year which will be of considerable benefit to the United States. Information gained by DOT highway specialist on design of automated highway technology will aid in planning U.S. highways of the future. Cooperative work on gathering data regarding the influence of selected drugs on driver performance and a program to determine relationships between engineering parameters of a crash and the occurrence and severity of injuries will support the adoption of measures to improve traffic safety.

Mexico

Following three years of negotiations, a maritime search and rescue (SAR) agreement with the Government of Mexico was concluded. Cooperation, including exchanges on SAR training techniques, has considerably facilitated communications between and among ships and shore stations which has helped prevent accidents and effect rescues - thus saving lives, time, cargoes, and equipment.

The Netherlands

An agreement to sponsor research in the Netherlands to determine the effects of marijuana use actual driving performance was negotiated between traffic safety entities in both countries. Results should provide data on isolated effects of marijuana use which will enable DOT to determine for the first time the extent of its impact on traffic safety.

Poland

In advance of formal approval and funding in October by the U.S.-Polish Joint Commission of two parallel rail safety projects, involving real-time and theoretical rail stress measurements, DOT and Polish rail engineers have proceeded with planned cooperative work utilizing approximately \$54,000 of FRA/ TSC funds. Pretesting of rail sections to determine optimum measurement methods and trial runs of the computational mathematical model were undertaken, and findings were reviewed during seminars that led to revisions to various aspects of the research plans thus considerably refining and advancing the actual research. Rail engineers and management personnel are confident that significant safety benefits will result from the data developed from this research: reduction in rail fracture and derailments, improved rail manufacturing processes, possibly allowing for greater weight loads to be hauled, and the applicability of the mathematical model in other metallurgy investigations.

Soviet Union

DOT hosted the First Session of the US-USSR Joint Committee on Transportation in early May 1989. Plans for cooperation during Working Group Sessions on Civil Aviation, Rail Safety, Highway Bridge Construction, and Highway/Traffic Safety were approved by the Joint Committee. Arrangements were made for the highway delegates to visit the 3M Company facilities in Minneapolis/St. Paul and the GM Proving Grounds in Detroit and for the aviation delegates to the FAA facilities in Atlantic City and Oklahoma.

Interagency coordination mechanisms have been established to coordinate aspects of the US-USSR aviation cooperations. Meetings of the U.S.-USSR Aviation Accident Investigation Subgroup were held in Moscow during which preliminary plans were made to facilitate/expedite investigation of nationally manufactured plane accidents on foreign soil. Information gained during discussions concerning the composition of aircraft engine parts and inspection/replacement of these were very helpful to U.S. participants in avoiding future accidents. Meetings of the US-USSR Air Traffic Control System Requirements Working Group and the Satellite Navigation/Spectrum Engineering Subgroup are planned for late fall in Moscow.

A U.S. Rail Delegation, headed by Federal Railroad Administrator Gilbert

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Carmichael, visited the Soviet Union in October to view rail facilities and hold discussions on rail management improvements and make plans to begin exchanges on the rail safety topics under the Agreement. The delegation visited rail institutions in Moscow, Krasnyi Liman, and Kiev and was well-received. A wealth of information was provided on various aspects of the Soviet rail system. Discussions were held on the current state of high speed rail technology in each country and the possibilities of cooperating on this topic. Plans were made to begin exchanges of information on rail safety and economics: selecting and training locomotive engineers, human factors affecting crew and performance, continuous welded rail, railway bridges, rail defect detection, high speed rail, nonoperational sources of revenue and managerial training.

A U.S.-USSR agreement concerning cooperation in combatting pollution in the Bering and Chukchi Seas in emergency situations was signed. A joint contingency plan was agreed between the U.S. Coast Guard and the Soviet Ministry of Merchant Marine which will improve cooperation in dealing with pollution incidents in the waters between Alaska and Siberia.

Consistent with improving relations between our countries, the U.S. Coast Guard training barque EAGLE, with 130 cadets aboard, made a port call in Leningrad in June as part of its summer

training cruise. The U.S. Coast Guard Band performed in Leningrad at a joint concert with the Leningrad Military District Band at a ceremony marking the first anniversary of the signing of the Intermediate Nuclear Forces (INF) treaty.

Yugoslavia

Under the US-Yugoslav Science and Technology program, Professor Dr. Lujo Suklje of the University of Ljubljana completed his 6-year study of design criteria and predictive techniques for embankments in soft soils which has made a significant contribution to scientific understandings in this field. He and his colleagues developed a finite element computer model program which has been compared with actual field measurements. The program can also be applied to the plane-strain consolidation analysis of multilayer drained soils.

Western Europe

Deputy Secretary Chao and Federal Railroad Administrator Carmichael led a DOT delegation to Italy, France, and Germany in the fall of 1989 to evaluate the applicability of high speed rail technology developments for U.S. projects, particularly in California, Florida and Ohio. The delegation was briefed on and rode the Pendolino tilt-rail train from Rome to Bologna, the Train a Grande Vitesse (TGV) from LeMans to Paris, the Inter-City Express (ICE) from Wurzburg to Fulda, the Mag/Lev experimental train from near Lathen, and

the Spanish TALGO tilt rail train from Madrid to Avila.

Other Countries. Rail specialists met on several occasions for technology sharing sessions with TGV and French Transportation Department officials on high speed rail, safety, intermodal operations, hazardous materials transport, electrification, signals and telecommunications in freight and passenger service.

Rail specialists continued mutually beneficial technical exchanges and briefings on Japan Railways privatization progress, high speed rail activities, and development progress on magnetic levitation operation.

A Federal Railroad Administration staff member accompanied a Transportation Research Board (TRB) delegation to Utrecht, the Netherlands, to meet with the Secretary General of the International Union of Railways (UIC) and selected representatives of several European railroads to discuss the derivation of the UIC railroad codes developed for high speed rail; viz., railway operations, rolling stock, track standards, signalling, electrification, and communications. A report, "Safety Factors Related to High Speed Rail Passenger Systems" is being published by the TRB.

International Organizations

Transport Policy and Trade

European Conference of Ministers of Transport (ECMT). The ECMT was

founded in 1953 and its membership currently comprises nineteen Western European countries with Australia, Canada, Japan, and the United States as Associate Members, and the Kingdom of Morocco, Hungary, and Poland as Associate Members with observer status. It occupies a special position both in terms of its membership and its interests which are broadly defined as technical, economic, social, and political. The ECMT is concerned with the economic and commercial operation of transport services, routes, investment, and such technical aspects of transport as road traffic rules, high speed rail transport, safety, and signs and signals. While not primarily concerned with science and technology, the ECMT commands the attention of high-level policy makers within transport ministries when policy decisions based on technical findings are tabled for consideration.

The ECMT Council of Ministers' 1989 spring session, attended by Deputy Secretary Chao, considered reports on the use of new technologies to improve information for passengers, combined transport, the dimensions of transport equipment, various aspects of transport for people with handicaps, high speed rail passenger transport, combined transport links, the introduction of lead free gas in Europe, and the preparations for a ministerial level conference on transport and the environment.

During the meeting, Ms. Chao described the Secretary's new initiatives for the improvement of civil aviation security, including the required deployment at international airports of explosives detection systems, such as the Thermal Neutron Analysis device, for the screening of checked baggage.

United Nations Economic Commission for Europe - Inland Transport Committee (UN/ECE/ITC). Science and technology considerations are an integral part of the work of many ITC groups during deliberations on problems of economics, safety and policy formulation. The international harmonization of requirements for the construction of motor vehicles, for example, requires discussions among technical experts and the exchange of test results. The harmonization process ensures that standards exist for safety reasons and not as non-tariff trade barriers which would inhibit trade in motor vehicles, equipment and parts.

The ITC also discusses diverse problems of technology such as the construction, maintenance and handling of transport equipment; the development of multimodal transport; and the effect of developments in microelectronics upon transport systems.

Delegates from the DOT, the Department of Agriculture, U.S. Customs Service, and the Environmental Protection Agency actively participate in the work of the Groups of Experts on Road Traffic

Safety, Perishable Foodstuffs, Dangerous Goods, Construction of Vehicles, Customs Questions, Combined (intermodal) Transport, and Transport Statistics. The goal of each Group has been to promote policy harmonization through the exchange of information and technical expertise to foster improved transport systems.

United Nations Economic Commission for Europe (ECE) Working Party on the Facilitation of International Trade Procedures (WP4). The WP4 is a major element of the ECE Committee on the Development of Trade which has been working on electronic data interchange (EDI) for a number of years. EDI substitutes electronic messages for paper documents and is now used almost exclusively by the private sector, saving millions of dollars each year with potential for further savings. International standards need to be established for EDI to function effectively. DOT, with assistance of U.S. private industry, has been leading the U.S. effort to develop those standards.

Maritime

International Maritime Organization (IMO). The U.S. Coast Guard continued its active participation in IMO, representing the United States at meetings of the Assembly, the Council, and on Committees to discuss maritime safety, marine environment protection, legal is-

sues, technical cooperation, and other topics. Major U.S. achievements were:

- The agreement by IMO to sponsor a convention to implement the initiative announced by President Bush at the Paris Summit for improved international coordination and cooperation in response to major maritime pollution incidents. This initiative is a direct outgrowth of the oil spill resulting from the grounding of the M/V EXXON VALDEZ in Prince William Sound, Alaska, in March 1989. The plan calls for the development of a draft document by an international working group, followed by an international conference for its review and adoption. The U.S. Government, represented by the USCG, will actively participate in all phases of the work.
- An international conference on the Global Maritime Distress and Safety System was held in October 1989. The U.S. took an active role in the conference, the results of which will markedly improve the capability of mariners to communicate via satellite with each other and, more importantly, with shore-based rescue facilities in case of emergencies.
- The International Conference on Salvage was held in April 1989 in which the International Conven-

tion on Salvage was adopted. The U.S. played a major role in the development of this convention which provides added incentive to assist vessels in distress prior to a major maritime casualty.

Aviation

International Civil Aviation Organization (ICAO). The Federal Aviation Administration (FAA) continued its active representation in ICAO at Annual Assembly meetings, Regional Groups and other committees and panels set up to study specific problems and issues on international aviation development and operations.

Following the downing of PAN AM Flight 103 by an explosion, Secretary of Transportation Samuel K. Skinner represented the United States at a special ICAO Ministerial Meeting in February 1989. The Call for the Ministerial was a joint effort by the United States and the United Kingdom. During the Ministerial, the ICAO Council adopted a comprehensive program of actions to meet the terrorist threat.

The United States also participated in meetings of the Aviation Security Panel and a group formed to explore marking of explosive material. FAA representatives actively participated in the major Caribbean/South American Regional Air Navigation meeting in Santiago, Chile, and in technical meetings of important ICAO bodies, including those

charged with developing international standards for future worldwide communication, navigation/surveillance, and airborne collision systems.

Highway Construction and Highway/Traffic Safety

The International Road Federation (IRF)

The Federal Highway Administration (FHWA), in cooperation with the private sector, was a major participant at the 11th IRF World Meeting in Seoul, Korea, in April 1989. The purpose of the meeting was to promote international cooperation and exchange of technical knowledge and management information of highway technology. Over 2,000 delegates from 80 countries, including 15 Ministers of Roads from IRF member countries, attended. The U.S. presence, demonstrated by exhibit and presentation of technical papers, conveyed to the delegates the variety of technical expertise, highway engineering experience, and information on materials and equipment available from the United States. Several U.S. companies have successfully negotiated contracts for new projects as a result of this effort.

Pan American Highway Congress (PAHC)

FHWA has agreed to develop the framework for a Pan American Institute of Highways (PIH) at the request of the PAHC Permanent Executive Committee. Its objective is to establish an

autonomous, self-sustaining, independently financed, and viable institution to provide training and technology transfer services to PAHC members. Substantial progress has been made in establishing the PIH. The Institute is arranging technology transfer activities and has published a quarterly newspaper to be distributed to over 1,000 highway engineers and technicians throughout the hemisphere.

Permanent International Association of Road Congresses (PIARC)

The PIARC is the principal international road policy/technical organization benefiting public sector road authorities. FHWA expanded its participation in PIARC in 1987 to improve domestic highway practices in developed countries and promote the exports of U.S. suppliers of road equipment and services. In 1989, FHWA representatives attended technical committee meetings on Roads in Urban Areas, Flexible Pavements, and Concrete Pavements and planning meetings for the next World Road Congress to be held in Morocco. Technical benefits have been gained in increased international awareness of American innovations and strengthened cooperation with Transportation Research Board and the American Association of State Highway and Transportation Officials on PIARC matters.

International Commission on Illumination (CIE)

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The CIE is a private international organization founded in 1900 to provide an international forum for discussions and exchange of information on all matters relating to the science and art of illumination. The membership is composed of 29 affiliated national illumination committees, including one which develops reports and guidelines on highway and vehicle lighting and visual signaling. Division 4, Lighting and Signaling for Transport, is focussed on requirements, including road and vehicular lighting, signing, marking and traffic signalling, and to develop international technical reports, guidelines, and/or standards. Participation provides U.S. representatives the ability to reconcile the differences between specifications used in the United States and those used in international trade and to keep current on developments in the field which would be useful in designing future aids for driver safety.

Organization for Economic Cooperation and Development

Road Transport Research Program - (OECD/RTRP). The RTRP was created in 1967 to provide scientific and technical support to member governments to assist them in making decisions on roads and road transport and to promote cooperation through the consolidation and exchange of information. These purposes are accomplished through a triennial program of multilateral research and the International Road Research Documen-

tation (IRRD) Program - a computerized scheme for the systematic exchange of scientific and technical literature.

The RTRP is the major forum for the exchange of information on policies and technology among the industrialized countries of Western Europe, North America, and the Pacific region. The program also takes into account other modes of transport and broader socioeconomic concerns. Each research group is led by a pilot country that has the greatest expertise in the selected subject and is charged with providing a background paper, guidance and leadership throughout the cycle of work. Maximum research results at the lowest possible cost are therefore realized.

The results of the last triennial program produced excellent collaborative research reports on international full-scale pavement testing, traffic control and safety improvements in highway work zones, bridge management, truck routes and networks, road technology transfer, expert systems applied to roads and road traffic, road safety in developing countries, just-in-time transport (innovations in logistics), road user capacities and behavioral adaptations in adjusting to changing traffic tasks and accident risks, and promoting the use of traffic safety information. The scientific and technical activities of the triennial program for 1989-1991 cover a wide range of topics within the general categories of

infrastructure research, road safety, road traffic management and control, road transport analysis, and transfer of technology to developing countries.

Rail

International Union of Railways (UIC). The Federal Railroad Administration (FRA) continued participation in the activities of the UIC, particularly in the work of its Office for Research and Experiments (ORE). Through its specialist committee structure, the ORE studies questions of mutual concern to UIC member railway entities. In exchange for results of U.S. rail research, FRA received reports on foreign research on such topics as track design and maintenance, railcar and component designs and load factors, rail track buckling (e.g., and longitudinal rail stress phenomenon involved in the use of Continuous Welded Rail), and rail track fatigue which were highly complementary to U.S. priorities. FRA specialists continued participation in the work of an ORE Committee established to research rolling contact fatigue, a problem of critical concern to the international rail community.

Dangerous Goods Transport

United Nations Economic and Social Council (ECOSOC) - Committee of Experts on the Transport of Dangerous Goods. This U.S.-chaired Committee is concerned with the development and

harmonization of regulations and recommendations for the safe and efficient international transport of dangerous goods other than radioactive materials. The Committee considers highly technical subjects such as proper classification/packaging, hazard evaluation, testing methods, and the use of multimodal tank and intermediate bulk containers for the transport of explosives and other dangerous goods. A number of 1989 amendments to the DOT Hazardous Materials Regulations incorporate transport standards developed through participation in the work of this Committee and other international organizations. Such action is consistent with national law which requires agencies to base regulations on internationally developed performance standards. As the United States currently enjoys a multi-billion dollar positive trade balance in chemicals, our commercial interests are well-served by adopting accepted standards.

Special Multilateral Programs

Strategic Highway Research Program (SHRP)

The SHRP is an international program to improve highway infrastructures of participating countries. Funded under the auspices of the National Research Council in cooperation with FHWA/DOT and other U.S. transport entities, technical problems regarding both materials and processes are being

researched and procedures for continuing international cooperation have been established. Twenty-two countries have appointed international coordinators to foster technology transfer. Several countries are actively participating in the pavement performance area by monitoring pavement composition in their countries and sharing this data through the SHRP. Detailed technical information and data gained has been shared through other international highway organizations.

Experimental Safety Vehicles (ESV)

Initiated in 1970 under the NATO Committee on the Challenges of Modern Society, the ESV program involves nine countries. Current emphasis is being placed on the broader issues of motor vehicle safety rather than on the original thrust of developing state-of-the-art safety design and engineering.

The U.S. sponsored the 12th ESV Conference held in May 1989 in Gothenburg, Sweden. Over 600 delegates representing industry and governments of 17 countries attended. The U.S. Delegation, headed by National Highway Traffic Safety Administrator Jerry Curry, presented over 20 percent of the technical papers on a variety of safety engineering subjects. Benefits include worldwide development of advanced state-of-the-art improvements in vehicle safety performance; valuable information from technical conferences on research progress, problems and issues; reduction

in costs due to cooperative efforts; early introduction of research results into production vehicles; worldwide harmonization of safety regulations; and close working relationships with government and industry specialists.

Technical Assistance

Cost-reimbursable aviation technical assistance in all areas which affect safety (i.e., air traffic control and air navigation facilities, airmen licensing, airport operation, security, and airworthiness) is provided by the FAA through formal agreements with foreign government aviation entities. During 1989, FAA carried out the program under 194 Agreements with 68 countries and organizations throughout the world. As stated in the preamble to this chapter, the safety of both American and foreign carrier operations is greatly enhanced by this program.

During 1989, U.S. Coast Guard officers were assigned as consultants and support staff to many countries and international organizations, e.g., U.S. Mission to the United Nations; and IMO; the Panama Canal Commission; in Antigua to assist in the development of Coast Guards in the Eastern Caribbean; and to U.S. Security Assistance Offices in Barbados and Costa Rica to provide technical assistance in the areas of maritime safety, maritime law enforcement procedures, and disaster preparedness with emphasis on port safety, search and rescue, oil spill

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contingency plans, and cruise ship disaster contingency plans. Other technical assistance involved assignments aboard U.S. Navy ships during training exercises.

The FHWA carried out cost-reimbursable technical assistance programs with Barbados, China, Costa Rica, Kuwait, and Turkey, and the Pan American Highways Conference. Work ranged from planning a modern transport system to specific assistance on highway construction, traffic planning, and conducting workshops on value engineering. Exposure to American industrial capabilities enhances possibilities for exports of highway technology and equipment.

Specialists in the Office of the Secretary (OST) continued to manage the large cost-reimbursable technical assistance program to Saudi Arabia (about \$3.3M in FISCAL YEAR 1989) to carry out the goals established in 1978 with the Ministry of Communications. These goals include the development of a modern transport system, training of professionals in transport technology, transfer and tailor state-of-the-art technology to Saudi's needs, enhance the overall administration of transport, and provide staff and equipment support in critical areas such as data processing.

OST also provided cost-reimbursable experts to the Agency for International Development (AID) for various assignments in developing countries as follows:

- A DOT economist assisted the Government of Jamaica during 1989 in implementing plans for the construction and maintenance of a 450-mile farm-to-market road program. As part of a continuing DOT-AID effort, strategies for development of transport in Southern Africa were prepared to make freight transport of the landlocked countries less dependent on South Africa by rehabilitating portions of the traditional regional transport corridors and by improving the efficiency of transport in the region.
- During the fall of 1988, an OST transport economist spent two weeks in , Zimbabwe, assisting AID personnel in preparing the transport sector report for the Southern Africa Regional Development Strategy Statement. Two OST transport economists spent a month in Malawi preparing the transport sector analysis for AID's Country Development Strategy Statement.
- DOT staff provided assistance in the AID-sponsored World Bank and donor nations' study of the long-term operational viability of railroads in southern African countries. An FRA and an OST staff member spent five weeks in Africa with a team composed of World Bank railroad staff and rail

experts from Canada, the United Kingdom and the Netherlands. The study covered railroads in Angola, Zaire, Zambia, Zimbabwe, Tanzania, Mozambique, Botswana, and Swaziland. Team members met with transport ministry officials and railroad personnel to gather information. The team's findings are being incorporated into a World Bank report focusing on strategies to enhance the financial viability of the rail system in southern Africa. In December 1989, an OST transport economist will begin a two-year assignment in Zimbabwe to assist AID with the formulation, planning, and implementation of transport programs in southern Africa.

Training of Foreign Nationals

DOT provided aviation and maritime training to foreign nationals primarily on a cost-reimbursable basis as follows:

- FAA programmed training at U.S. facilities for 412 international students in Fiscal Year 1989. Several classes, including subjects such as air traffic control, flight standards and instructor training were conducted exclusively at the FAA Academy in Oklahoma City. Other training for various specialties is arranged at U.S. schools and businesses.

- The U.S. Coast Guard Academy now has a total foreign student enrollment of 12 cadets from the Central and South America and Pacific regions. As space is available, foreign students can attend Coast Guard schools on a reimbursable basis or when sponsored by another federal agency. During Fiscal Year 1989, approximately 100 international students attended Coast Guard schools under the U.S. Security Assistance Program. Another 50 attended under various U.S. foreign aid programs, international organization sponsorship or through direct reimbursement from the sending country. The Coast Guard also dispatches Mobile Training Teams to foreign countries to provide training in USCG related missions; e.g., drug law enforcement, fisheries law enforcement, port safety/security, and search and rescue.

Foreign Visitors

In addition to discussions with visiting foreign counterparts on bilateral cooperation and other matters, DOT hosted approximately 1,460 visitors from all over the world during Fiscal Year 1989 for discussions on U.S. transport technology, transport system planning, institutional arrangements, regulation and deregulation, safety, and security.

Aviation and maritime were the modal areas of greatest interest, with approximately 350 in the highway area.

Budget and Resources

During Fiscal Year 1989, costs for carrying out DOT international activities are estimated at \$13 million. Costs must be estimated as many international functions also serve to fulfill national missions of the Department or cover expenditures for a variety of purposes including promotion of international cooperation. The Department does not have a separate appropriation for carrying out international science and technology programs. All costs are absorbed in budgets of the various Departmental entities. @12 = ENVIRONMENTAL PROTECTION AGENCY

U.S.- Canada Environmental Cooperation

During Fiscal Year 1989, the U.S. and Canada established a new understanding on the process by which the two countries would work toward resolution of the transboundary acid deposition issue that was of major concern during the 1980's. During Fiscal Year 1989, the U.S. and Canada had a bilateral consultation on a proposed bilateral air pollution accord that would emphasize acid deposition. This process, while in its early stages, helped to establish a more positive relationship on transboundary pollution control.

In other areas of cooperation, through the leads of the Environmental Protection Agency and Environment Canada, the two countries continued priority efforts to reduce pollution under auspices of the U.S. Canada Great Lakes Water Quality Agreement; made substantial progress in further developing bilateral toxic management strategies for the Niagara River and Lake Ontario; continued to control many transboundary shipments of hazardous wastes between the two countries; and carried out joint scientific and technological project work on air, water and waste pollution control. Technical activities included cosponsorship by the Environmental Protection Agency and Environment Canada of a major international symposium on municipal waste incineration in April 1989. Within the International Joint Commission, the two countries continued their cooperation on the Great Lakes and other transboundary pollution issues. Of particular interest to the U.S. was the issuance in 1989 of an important IJC recommendation on the need to protect the Watertown-Glacier International Peace Park and the pristine Flathead River watershed from a proposed coal mine in British Columbia. The many policy and technical activities on environmental protection that occurred between the U.S. and Canada during Fiscal Year 1989 included substantial participation by state and provincial governments.

U.S.-Mexico City Cooperation

In 1989, the Environmental Protection Agency became National Coordinator for a new bilateral agreement between the U.S. and Mexico on Cooperation for the Protection and Improvement of the Environment in the Metropolitan Area of Mexico City. The new agreement commits the U.S. and Mexico to work together to address the air and other pollution problems of one of the world's largest cities.

Forms of cooperation envisioned under this framework agreement include technology transfers, scientific and technical advice, environmental monitoring and environmental impact assessments by Mexican authorities, joint meetings and reviews, exchange of relevant personnel and exchanges of environmental information and data, coordination on national programs, and cooperation in developing appropriate environmental funding mechanisms. Annexes to the agreement may be concluded to establish specific programs.

At the August 1989 Binational Commission meeting it was agreed that negotiations for a new annex to the 1983 Border Agreement would begin. Thereafter, Annex V was signed by EPA Administrator William K. Reilly and SEDUE Secretary Patricio Chirinos on October 3, 1989.

Transboundary Movement of Hazardous Waste

The issue of hazardous waste management has continued to receive widespread public attention as a major environmental and health issue both for the American public and for the international community. Considerable attention also has been given to the issue of the transboundary movement of hazardous waste, and many countries have joined with the U.S. by participating in several ongoing projects in international organizations such as the OECD and the U.N. Environment Program (UNEP). The U.S. has also played an active and constructive role in the hazardous waste activities of the OECD and UNEP.

Under U.S. hazardous waste export regulations of the Resource Conservation and Recovery Act (RCRA), EPA requires prior notice of proposed export, including information on quantity, type of waste, frequency of shipment and a description of how the waste is going to be treated. Upon receipt of a notice, the U.S. transmits the information to the receiving country with the understanding that EPA must have the country's prior written consent in order for the shipments to take place, which gives the U.S. the capability of enforcing the export regulations.

In addition to the RCRA regulations, there also is a provision in U.S. law allowing for bilateral agreements which may

streamline the notification and consent procedures. This ensures that the regulations do not hamper the legitimate trade in hazardous waste across national frontiers. The U.S. already conclude bilateral agreements with Canada and Mexico. Additional initiatives are now under consideration in the U.S. to further strengthen the hazardous waste export system.

Organization of Economic Cooperation and Development (OECD)

The OECD is an instrument for inter-governmental cooperation among 24 industrialized countries on matters relating to economic, environmental and social policy. Joined by a community of interests, member governments address issues of common concern. This includes sharing information and experience, examining different ways to solve problems, and when appropriate preparing recommendations to guide national policies.

Until recently, virtually all environmental work undertaken by the OECD was led by the Environment Directorate, established in 1970. The Directorate oversees the work of the Environment Committee, which consists of three divisions: Economics, Pollution Control and Chemicals. However, at the Spring 1989 meeting of the OECD Council at the ministerial level, governments gave unprecedented attention to the OECD's

role in the field of environment, and explored ways to strengthen environmental cooperation over the next decade. In view of the interrelatedness between environment and other components of the OECD, ministers agreed to emphasize a cross-sectoral or "horizontal" approach to environmental cooperation in the future, encompassing the organization as a whole.

In line with this objective, member governments have agreed that the OECD's environmental program be defined in terms of "five pillars" of work: 1) Environmental Health and Safety, 2) Environmental Support for non-OECD Countries, 3) Energy and Environment Relationships, 4) Technology and the Environment, 5) Integration of Economic and Environmental Policy. The U.S. will support programs in these five areas.

World Health Organization (WHO)

During the past year, WHO's Division of Environmental Health continued to coordinate multi-year project work under several important U.N. programs in which the U.S. participates. These efforts included: WHO and UNEP Global Environmental Monitoring System (GEMS) program work on worldwide air pollution monitoring and reporting, worldwide fresh water pollution monitoring, and developing newer GEMS efforts on human exposure to

pollution. WHO, UNEP and ILO in liaison with FAO carried out the U.N. International Program on Chemical Safety project work on assessing the health and environmental effects of industrial chemicals and pesticides, improving methods for evaluating the toxicity of chemicals, development of a U.N. chemical safety cards project for eventual use of the cards worldwide for emergency preparedness and response; preparation of a WHO, World Bank and U.N. technical manual on treatment and disposal of hazardous waste in development countries; and other pollution control and health protection projects. The EPA-WHO Collaborating Center for Environmental Pollution Control contributed to the above efforts, as well as supporting the work of the WHO International Agency for Research on Cancer, the Pan American Health Organization, and other WHO-related activities.

Federal Republic of Germany

Bilateral cooperation with environmental authorities and scientists in the FRG provides significant benefit to the EPA domestic programs. The two countries share common concerns and commitments, and benefit through exchange of information and experience on their approaches to the solution of major environmental problems.

Current work under the U.S.-FRG Agreement on Environmental Cooperation focuses on acid deposition and its

ecologic approaches, source controls for air pollution, radiation protection, ground water protection, and other topics. Specialists from both sides visit each other's laboratories and field sites to continue cooperative research on forest damage, a major concern in the FRG and of growing interest to U.S. scientists. At their meetings in August 1989 and November 1989, Administrator Reilly and German Environment Minister Toepfer endorsed ongoing work and discussed net topics for inclusion in he programs.

In addition to an active bilateral program, the U.S. has significant exchanges with the FRG through multilateral fora such as the OECD, the Economic Commission of Europe, and the NATO Committee on the Challenges of Modern Society (CCMS). Within CCMS, the U.S. and the FRG led a major effort on control of dioxins. The German Marshall Fund of the U.S. has promoted and assisted in the exchange of specialists and meetings on development of innovative economic instruments to encourage voluntary compliance with pollution standards.

The Netherlands

Cooperation between the U.S. and the Netherlands takes place under a Memorandum of Understanding (MOU) between EPA and the Dutch Ministry of Housing, Physical Planning, and Environment. Major activities

during Fiscal Year 1989 were symposia on environmental policy and enforcement.

The U.S. Government participated in the Dutch-sponsored international meeting on climate change which was held at Noordwijk in November, 1989.

Ongoing cooperation in other areas is focused on innovative cross-media, results-oriented environmental management, hazardous waste management and emergency preparedness, water quality protection, health effects, acid deposition, and other priority topics. A number of Dutch specialists have worked in EPA laboratories under the EPA program for visiting researchers.

Brazil

EPA has provided training for technical and professional staff of the Sao Paulo State Pollution Control Agency (CETSB) under an MOU. The training program has covered most areas of modern environmental protection programs, and has involved visits and work assignments in EPA laboratories. Senior administrative personnel had working discussions with EPA regulatory officials at the federal and regional levels. EPA also has arranged for U.S. private-sector consultants to conduct training programs in Brazil.

Japan

The U.S.-Japan Agreement on Cooperation in the Field of Environment

was signed in 1975 and extended for five years in 1980 and 1985. EPA and the Japanese Environment Agency exercise general oversight of the agreement and 16 projects which successfully promote the exchange of new technology, practical experience, and data on a broad array of priority environmental issues. Benefits derived by both sides from these exchanges are evaluated at the Joint Planning and coordinating Committee Meeting (JCCM) which is normally held every 12 to 18 months, alternately in the U.S. and Japan. Waste water treatment, air pollution control, solid and hazardous waste management, toxic substances, environmental impact assessment, drinking water, and food chemistry are the subjects of current projects.

Korea

The MOU signed by EPA and the Korea Environment Agency (KEA) on November 2, 1987 does not take effect until the U.S.-Korea umbrella science and technology agreement is renewed with an IPR amendment. Seven possible projects were discussed at the 1987 EPA-KEA meeting including environmental administration, health effects of air pollution, risk assessment, transport of air pollutants, waste water management, eutrophication, and sanitary landfill facilities.

Soviet Union

Activity under the U.S.-USSR Environmental Protection Agreement accelerated measurably in Fiscal Year 1989, with approximately 250 scientists being exchanged. Mutual attention to macro-environmental issues, especially the question of global climate change, has drawn the U.S. and the USSR toward greater cooperation in addressing global environmental problems. In addition, the USSR has taken a major step in organizing its environmental efforts around a new State Committee for Environmental Protection.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

International cooperation has been an important dimension of the NASA space program from its formation by the National Aeronautics and Space Act of 1958. NASA has entered into well over 1000 agreements with more than 135 countries and international organizations. These relationships have covered a broad spectrum of collaborative endeavors, ranging from the development of major space hardware to the sharing of space data among scientists around the globe.

NASA's guidelines for international space cooperation are straightforward; they are designed to gain substantive benefit for NASA programs, to assure fair and equitable terms for participants,

and to avoid unwarranted technology transfer.

The benefits derived from thirty years of international cooperation, both tangible and intangible, have validated this approach. Cooperation offers access to increasingly significant foreign expertise, to geographic locations necessary for study of unique scientific phenomena and for research and operational programs which are global in scale. Pooling resources offers the opportunity to undertake programs which either could not be carried out along or would be developed more slowly as a unilateral effort. Successful international space cooperation promotes positive international perceptions of this nation. Through international cooperation, NASA seeks to advance U.S. foreign and space policy goals.

International Cooperation on Space Station Freedom

On September 29, 1988, in Washington, the United States and its partners signed the multilateral "Agreement Among the Government of the United States of America, Governments of Member States of the European Space Agency, the Government of Japan and the Government of Canada on Cooperation in the Detailed Design, Development, Operation and Utilization of the Permanently Manned Civil Space Station: (IGA)." At the time of the signing, the participating countries of the Space Sta-

tion Freedom program were Japan, Canada, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, and Ireland. The IGA provides the intergovernmental policy direction for conduct of the international aspects of the Space Station Freedom program. On the same date, NASA signed bilateral Memorandum of Understanding with its cooperating partners in Canada and Europe (the Ministry of State for Science and Technology, and the European Space Agency, respectively). A comparable MOU with the Government of Japan was signed on March 14, 1989. The MOU's provide the technical and programmatic details of the international aspects of the Space Station Freedom program.

NASA and its international partners have entered into the detailed design and development phase of the cooperation. Space Station Freedom will offer unparalleled opportunities for scientific and commercial research on its manned base and through the resources of the related polar orbiting platforms over the planned three decade lifetime of the system.

Galileo

On October 18, 1989, a major milestone in international cooperation was reached with the launch of Galileo on the Space Shuttle Atlantis. The Galileo project was initiated in October 1977 with the signing of a Memorandum of Understanding be-

tween the Federal Minister for Research and Technology of the Federal Republic of Germany and the National Aeronautics and Space Administration. The agreement covered participation of the Federal Ministry of Research and Technology (BMFT) in the NASA Jupiter Orbiter and Probe Project, later renamed Galileo. The BMFT provided the Retropropulsion Module which will perform all mission maneuvers. In addition, there are two German experiments in the payload as well as German participation in five additional U.S. experiments. Galileo will reach Jupiter in December 1995.

Cooperation with the Soviet Union

The Agreement between the United States of America and the Union of Soviet Socialist Republics Concerning Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes was signed in 1987. It created five joint working groups (JWGs) in five scientific disciplines: Space Biology and Medicine, Solar System Exploration, Solar-Terrestrial Physics, Astronomy and Astrophysics, and Earth Sciences. The annex to the Agreement specified sixteen cooperative projects; the Agreement was amended in May, 1988 to include two new annex items providing for scientific instruments to fly on each other's spacecraft and the exchange of results of independent national studies of

future unmanned solar system cooperation. All of the JWGs have met at least twice to date.

Several activities highlight recent U.S.-Soviet civil space cooperation. Twenty-nine U.S. experiments were conducted in connection with the Soviet Cosmos 2044 biosatellite mission launched on September 15, 1989. A "Telemedicine Spacebridge" linked U.S. and Soviet hospitals for three months to permit medical consultation via satellite to assist with the longer-term consequences of the Armenian earthquake and injuries from the train explosion in Ufa.

Activities have also been initiated in the area of exchanges of flight opportunities for scientific instruments. NASA is pursuing the opportunity to fly a Total Ozone Mapping Spectrometer (TOMS) on a Soviet Meteor-3 spacecraft in 1990-91, in order to continue the availability of global ozone data to assess important environmental phenomena such as the

Antarctic ozone hole. NASA also has accepted in principle a Soviet proposal to fly a Soviet or French transponder on Mars Observer to enable the U.S. mission to serve as a communications relay for the planned 1994 Soviet Mars balloon mission. NASA is exploring the feasibility of flying an x-ray All Sky Monitor and an x-ray Polarimeter on the Soviet Spectrum-X-Gamma high energy astrophysics mission in 1993/94. Finally, the USSR plans to fly a Soviet "Konus"

gamma-ray burst detection instrument on the U.S. Wind spacecraft in 1992.

International Cooperation in Global Change Studies

NASA's program in Earth Science and Applications continues to contribute significantly to the international efforts to understand and address global environmental change. In January and February 1989, NASA conducted an aircraft campaign over the Arctic region from a base of operations in Norway to measure atmospheric variables and to conduct research on ozone depletion. In 1989, NASA also completed its initial selection of scientific investigations for the Earth Observing System (EOS) which consists of a series of polar-orbiting platforms to make long-term consistent measurements of the Earth's environment from space. The EOS program is being planned in close coordination with the global change research efforts of Europe, Japan, and Canada. Over 500 scientists from 13 countries have been identified to participate in the EOS research program. Throughout the summer and fall, NASA conducted field experiments in Europe and Brazil to support global change studies. Under a bilateral agreement with the USSR, scientists and equipment from the Soviet Union were brought to the U.S. in 1989 to participate in an international campaign to explore land surface-atmosphere interactions.

International Space Year

In the fall of 1988, NASA arranged for the establishment of the ISY Earth Science and Technology Panel of Experts. The panel met for the first time in February/March 1989 in Abingdon, England, hosted by the British National Space Centre, to generate specific projects in support of the primary ISY theme of Mission to Planet Earth. The projects were formally adopted by the Space Agency Forum on International Space Year (SAFISY), of which NASA is a founding member, at its second meeting in Frascati, Italy, in May 1989. NASA has worked throughout the year with other national space agencies and organizations to begin implementing these projects. SAFISY has also commissioned a Panel of Experts on Education and Applications and a panel of Experts on Space Science to consider specific ISY projects in these areas. During 1989, NASA has worked with other U.S. agencies to forward a U.S. proposal to the United Nations Committee on Peaceful Uses of Outer Space for a UN role in ISY. The U.S. proposal seeks to combine the training and educational capabilities of the UN Space Applications Programme with the unique resources available through the United Nations Environmental Programme's (UNEP) Global Resources Information Database (GRID). The proposal includes U.S. supports for training courses, a workshop,

and a major international conference in 1992. The conference will focus on remote sensing applications for resources management and environmental assessment with emphasis on the needs of developing countries.

New International Agreement

German Spacelab Missions

A Memorandum of Understanding Between the National Aeronautics and Space Administration of the United States of America and the Federal Ministry for Research and Technology of the Federal Republic of Germany concerning Space Shuttle Flight Activities was signed July 10, 1989 by the Federal Minister of Research and Technology of the Federal Republic of Germany and the NASA Administrator. The second German Spacelab mission, D-2, is currently planned to be launched on the Space Shuttle in May 1992. A D-3 mission is also on the launch manifest.

Geotail Scientific Satellite

The Geotail spacecraft is part of an international fleet of spacecraft taking solar-terrestrial physics measurements in the first half of the 1990s. Japan's Institute of Space and Astronautical Science is building the spacecraft and NASA will

provide a launch in 1992 aboard a U.S. expendable launch vehicle. Science instruments from the United States, Japan and other countries will fly aboard the spacecraft in order to better our under-

standing of the processes linking the solar interior to the solar corona and the solar wind, as well as the effects of the flow of plasma and energy from the Sun through space to the magnetosphere, ionosphere, and the atmosphere of Earth.

On September 25, 1989, the Governments of the United States and Japan exchanged diplomatic notes supporting this cooperative activity. The Vice President of the United States and the Prime Minister of Japan witnessed the signing of the notes by U.S. Ambassador Armacost and Mrs. Moriyama of the Japanese Ministry of Foreign Affairs. NASA and ISAS plan to sign the implementing Memorandum of Understanding for this project before the end of 1989.

Inter-Agency Consultative Group for Space Science (IACG)

The IACG is a multi-agency international forum where the member agencies coordinate their space physics activities by consensus. The member agencies are NASA, the European Space Agency (ESA), the Institute of Space and Astronautical Science (ISAS) of Japan, and the Intercosmos Council of the USSR Academy of Sciences. The goal of the forum is to increase the science benefits to all members by coordinating the more than a dozen individual missions planned by the member agencies in

the field of solar-terrestrial physics over the next decade. The IACG held its ninth annual meeting in Prague, Czechoslovakia from September 18 to 23, 1989. ESA will host the next meeting in late 1990.

Orbital Debris

Following release by the National Security Council of an interagency Report on Orbital Debris, NASA conducted a series of briefings to foreign space agencies about the Interagency Report, describing NASA's debris program and exploring with our allies potential cooperative activities in this area. A NASA orbital debris delegation has briefed officials from West Germany, France, Japan, Australia, India, the European Space Agency, Canada and the Soviet Union. A cooperative agreement to conduct joint debris imaging has been signed with the German Ministry of Research and Technology (BMFT), and further activities are being discussed.

NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent Federal agency established by the National Science Foundation Act of 1950 to promote the progress of science and engineering in the United States. The Act assigns to the NSF broad authority to encourage and support participation in international activities, consistent with the foreign policy

of the United States and the interests of U.S. science and engineering. During Fiscal Year 1989, approximately 20 percent of the 12,000 research grants awarded by the NSF has an international component. These ranged from support of participation by U.S. scientists and engineers in international meetings to involvement in large multinational collaborative research projects.

During Fiscal Year 1989 the National Science Board (NSB), the NSF policy making body, issued three reports with significant implications for the relationships in science and engineering between U.S. and foreign countries. The report entitled "Openness of Scientific Communication" (December 1988), prepared by an NSB committee chaired by Frank Rhodes, President of Cornell University, explored conflicts between the ideal of open scientific communication and the constraints imposed as a result of issues such as the maintenance of national security and international economic competitiveness. The report stressed that restrictions on open communication in basic research areas that are the primary concern of NSF should be approached as exceptions rather than as norms. It recommended, however, that in all bilateral S&T agreements, the Government should require that U.S. scientists and engineers enjoy reciprocal access to foreign facilities, and that all such agreements should provide for "symmetry and consistency with respect

to intellectual property rights." Additionally, greater efforts should be made to facilitate the flow of foreign scientific information into the United States by encouraging long-term visits abroad by U.S. scientists and engineers and by facilitating access to foreign scientific literature.

The NSB report entitled "Foreign Involvement in U.S. Universities" (June 1989), prepared by an NSB committee chaired by John Hancock, former Executive Vice President of United Telecommunications, Inc., described the impacts of foreign personnel and financial involvement on U.S. universities. The report noted that such involvements are likely to increase as a natural consequence of the globalization of science, and concluded that these involvements have a net positive impact on the U.S. national research system. The report recommended, however, that the feasibility of monitoring foreign financial involvement in U.S. university programs be explored, including financial support for research, facilities construction, and acquisition of expensive equipment. The report also suggested that applications by foreign companies to become industrial sponsors of NSF-funded University and Engineering Research Centers provide useful leverage for negotiating the reciprocity of information transfer from, and access to, critical foreign facilities.

The report entitled "Loss of Biological Diversity: A Global Crisis Requiring In-

ternational Solutions" (August 1989), prepared by an NSB committee chaired by Craig Black, Director of the Los Angeles County Museum of Natural History, noted that we are presently at a critical juncture in understanding and maintaining global biological diversity that is ".. the key to humanity's continued prosperous and stable existence on Earth".

International cooperation is necessary to develop both scientific knowledge and successful mitigation and management strategies with respect to biological diversity. In particular, the report recommended that NSF, in concern with bilateral and multilateral development assistance agencies, devise new mechanisms to support the work of scientists and scientific institutions in developing countries that are engaged in problems related to biodiversity. Although these activities will involve U.S. scientific collaboration, the report recommended that their

primary focus should be directed to improving institutional infrastructure, educational opportunities, and employment of systematists, ecologists, and environmental management specialists in developing countries.

During 1989, the NSB established a Committee of Europe in 1992: Implications for U.S. Science and Technology. The committee is chaired by John Holderman, President of the University of South Carolina. Its charge involves

three components: (1) to investigate and evaluate the growth and changing patterns of cooperation in research and technological applications, reflective of the integrative movement in Europe, and its effects on science and technology; (2) to assess the potential impact of a changed European environment on the U.S. research base and traditional patterns of U.S.-European cooperation; and (3) to evaluate the responsiveness of the U.S. science and engineering community to this situation. The committee will publish a number of interim reports with recommendations for policy directions and activities intended to maximize opportunities for U.S. scientific cooperation with Europe. Its work will be coordinated closely with that of the newly-established Ciset Working Group on European Science and Technology.

During Fiscal Year 1989, the NSF continued its active involvement in the U.S. Global Change Research Program which is intended to monitor, understand and ultimately predict global change. NSF participation includes or will include sponsorship of basic research and related activities in six of the seven interdisciplinary scientific elements of the program. These elements are:

- 1. Climate and hydrological systems -- studies of the tropical ocean and global atmosphere (TOGA); the World Ocean Circulation Experiment (WOCE);

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and Arctic Systems Science (ARCSS).

- 2. Biogeochemical dynamics -- the Global Tropospheric Chemistry Program (GTCP); Global Ocean Flux Studies (GOFS); and a National Ozone Expedition to the Antarctic (NOZE).
- 3. Ecological Systems and Dynamics -- studies of Global Ocean Ecosystems Dynamics (GLOBEC); and Land Margin Ecosystem Research (LMER).
- 4. Earth System History -- Arctic systems Science (ARCSS).
- 5. Solid Earth processes -- monitoring and measurement of landmass movement; global seismic research; field experiments in active tectonics; and the Ridge Inter-Disciplinary Global Experiment (RIDGE).
- 6. Solar Influences -- studies of the Coupled Energetics and Dynamics of Atmospheric Regions (CEDAR); and a National Ozone Expedition to the Antarctic (NOZE).

In addition, NSF is involved in a broad range of other research programs which will contribute to all seven program areas, including human interactions. All of the NSF programs are coordinated closely with those of other Federal agencies through the interagency Committee on Earth Sciences (CES), especially through its Working Group on Global

Change. The NSF also contributes to U.S. global change-related long-term observation and data management programs through the CES Working Group.

In view of the growing impact of foreign research on the progress of science and engineering in the United States, an increasing number of issues dealt with by the NSF senior management have appreciable international components.

In May 1989, the NSF Director and Deputy Director met at Oxford England, with the heads of counterpart research agencies in Japan, Canada, and several Western European countries. This was the seventh in a series of periodic meetings designed to provide opportunities to exchange information and perspectives on problems of common concern and to harmonize where possible, national research programs. Issues discussed at Oxford included support for university and interdisciplinary research, international collaboration in ground-based astronomy. The principals also approved a demonstrator-level computer-based system designed to provide on-line access to pertinent information on research projects supported by participating countries; they also directed that appropriate steps be taken to move toward an operational system.

During Fiscal Year 1989, the NSF was instrumental in helping devise interagency coordination on implementation of the U.S.-Japan Science and Technology

Agreement, signed by President Reagan and Prime Minister Takeshita in June 1988. The NSF Deputy Director, at the request of the President's Science Advisor, initiated the process through a Task Force on Comparable Access to R&D established under the Committee on International Science, Engineering, and Technology (CISSET/FCCSET). The process subsequently was taken over by the U.S. side of the joint U.S.-Japan Task Force on Access to Research and Development which is chaired by the Deputy Director, and which was established under the auspices of the Agreement as an adjunct to the Joint Working Level Committee to deal with issues of access. Interagency agreement took the form of a U.S. Government position paper, submitted to the Japanese side, which delineated U.S. interpretation of access provisions of the agreement and outlined mechanisms for addressing and implementation. Substantial progress has been made in clarifying areas of mutual understanding and agreement with the Japanese. This progress is reflected in the deliberations and joint statement of the Joint Working Level Committee during its meeting in April 1989.

The NSF also concluded an agreement with the Agency of Industrial Science and Technology of Japan's Ministry of International Trade and Industry (AIST/MITI) through which that agency will support up to 30 U.S. scientists and

engineers per year for long-term research visits to AIST laboratories. This new agreement supplements previous agreements concluded with the Japan Society for the Promotion of Science, the Ministry of Education, Science, and Culture (MONBUSHO), and the Japanese Science and Technology Agency which are intended to increase opportunities for U.S. participation in the activities of Japanese research academic, industrial, and government institutions.

Opportunities for U.S. scientists and engineers to collaborate with their counterparts in the Soviet Union were enhanced on May 6, 1989 when the NSF Director signed a Memorandum of Understanding (MOU) creating a cooperative program in basic sciences between the NSF and the Academy of Sciences of the USSR. This MOU, along with another executed the same day between the U.S. Geological Survey and the Ministry of Geology of the USSR, were the first two programs established under an umbrella agreement on cooperation in the field of basic scientific research signed by the Secretary of State and the Soviet Foreign Minister in January 1989. The NSF-Soviet Academy agreement is intended to foster scientific exchange activities in the areas of mathematics, theoretical physics, arctic research, chemistry, life sciences, basic engineering research geosciences, and science policy.

SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

The U.S.-India Science and Technology initiative (STI), launched in 1982 during Prime Minister Indira Gandhi's visit to the United States, was extended for a second three-year period on October 5, 1988. This government-wide initiative for which the NSF serves as Executive Agent exemplifies scientific and technological collaboration between equal partners. The renewal document was signed by K.R. Narayanan, India's Minister of State for Science and Technology, and William Graham, Science Advisor to President Reagan. The past five years have seen important advances in many aspects of the STI program areas of health, agriculture, biomass conversion, monsoon studies, mineral engineering, and photovoltaics. Research will continue in these areas while new STI collaborations will be initiated on the superconducting super collider (SSC), 1987 monsoon drought acquired immune deficiency syndrome (AIDS), tuberculosis, leishmaniasis, and neurologically-induced disorders. India has agreed to contribute \$50 million in kind to the \$7 billion SSC project. Anticipating potential achievements from such joint research, India and the United States have agreed to consider the question of protecting and allocating of any intellectual property rights arising out of the STI program. To this end, the two governments have undertaken bilateral discussions with appropriate representatives.

The U.S.-Brazil Science and Technology Initiative (STI) was mandated by Presidents Reagan and Sarney in 1986 to increase bilateral cooperation in science and technology between the two countries. In 1987, a joint panel of leading scientists and officials co-chaired by Dr. D. Allan Bromley, currently Assistant to President Bush for Science and Technology, identified six broad areas to be included under the agreement: biomedical research, oceanography and meteorology, engineering and materials science, alternative energy sources, basic sciences, and agricultural and environmental sciences, with lead agencies identified for each of these areas. The NSF became lead agency for basic sciences and engineering, elected to participate in several other areas, and was assigned the role as operational coordinator for the STI. A total of \$2 million was allocated as seed money for the initiative, with the participating agencies expected to assume funding after these monies are expended.

Trade issues and the Brazilian focus on adopting a new constitution (ratified in September 1988) resulted in a slower start for the STI than had been anticipated. During Fiscal Year 1989, joint plans in four areas under the basic sciences component (mathematics, chemistry, geology, and physics) were developed and approved by the two sides; program development workshops and a short-term visitors program for young re-

searcher were initiated. Most of these workshops and the short-term visitors program will be more fully developed during the coming year.

A second important set of initiatives involving Latin America involves computer networking. In January 1989, the National Center for Atmosphere Research (NCAR) at Boulder, Colorado, with support from the NSF and NASA, established a

remote satellite link with the national Autonomous University of Mexico (UNAM) and the Institute for Higher Technical Studies of Monterrey (ISTEM). This link provides the two Mexican institutions with access to a computerized network linking U.S. research universities through the NCAR node. The Mexican institutions will serve in turn as nodes for a network that will eventually link all major academic research institutions in Mexico and provide them with access to the U.S. academic network. At a June 1989 meeting in Costa Rica jointly sponsored by the NSF and the Organization of American States (OAS), discussions were initiated with the aim to develop a Latin America-wide computer network. A follow-up meeting on this topic, sponsored by the Pan American Health Organization (PAHO) was held in the fall of 1989.

Since Fiscal Year 1987, the Division of International Programs' Information, Analysis and Japan Programs Section has been collecting and analyzing unclass-

ified information on foreign science and technology trends, developments, policies, and resources. The Section has been disseminating this information to the staff of NSF through two principal media; an on-line report system, available through internal electronic mail, and a periodical publication containing original analytical reports. During Fiscal Year 1990, both the on-line information and the periodical reports will be made more widely available to the U.S. science and engineering community.

NUCLEAR REGULATORY COMMISSION

The NRC's international program in nuclear safety has traditionally included bilateral regulatory and research cooperation and participation in multi-lateral research and other safety cooperation through the International Atomic Energy Agency (IAEA) and the Organization of Economic Cooperation and Development/Nuclear Energy Agency (OECD/NEA). While power reactor safety is the primary focus of NRC cooperative efforts, increased attention is also being given to broader radiation protection matters, waste management activities, and other areas of materials safety, including source and byproduct material fuel handling and international transport of radioactive waste.

Continued worldwide interest in the Chernobyl accident has increased the

role of nuclear safety in U.S. foreign policy and expanded Commission involvement in international nuclear safety cooperation. International programs continue to foster U.S.-Soviet bilateral activities, among others, and to work with the IAEA in promoting international cooperation on nuclear safety and regulatory matters. Some of these efforts are outlined in greater detail in the discussion that follows.

Highlights of NRC Fiscal Year 1989

- NRC hosted meetings with Chairman Vadim Malyshef of the USSR State Committee for the Supervision of Nuclear Power Safety.
- NRC organized and held meetings of seven of the ten working groups under the Protocol of the U.S.-USSR Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCNRS).
- NRC conducted a seven-week reactor inspector exchange with the Soviet Union, sending a U.S. team to the Zaporosche nuclear power plant in the USSR and receiving a USSR team at the Catawba nuclear power plant in South Carolina.
- NRC hosted the fifth annual regulatory meeting with Japan's The Ministry of International Trade and Industry (MITI), and sent a nine-member team to Japan for an in-depth look at Japanese maintenance techniques.
- NRC initiated a review of policy on export and import of radioactive wastes.
- NRC formalized nuclear ties with Canada's Atomic Energy Control Board (AECB) by signing a five-year renewable information exchange and nuclear safety cooperation arrangement.
- The U.S. Government hosted a visit by an FRG delegation led by Environment and Nuclear Minister Toepfer, in the U.S. for discussions with EPA, NRC and DOE on waste management and nuclear safety issues, and to visit Three Mile Island and Yucca Mountain.
- NRC coordinated Commissioner Roger's visit to the FRG and the U.K. for detailed discussions in both bilaterals and in a multi-lateral symposium on Regulatory Practices and Safety Standards.
- NRC concluded an arrangement for cooperation in nuclear safety and exchange of information with Czechoslovakia, NRC's first such arrangement with an Eastern European country.
- The U.S. Government renewed NRC's bilateral information exchange and nuclear safety cooperation arrangements with Brazil, Spain, Sweden, and Mexico.

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- NRC worked closely with the Executive Branch and the IAEA in strengthening international safeguards and physical security. NRC sent experts to Japan, France, the FRG, U.K., European Community, Belgium, Switzerland, Greece, Romania, Yugoslavia, and Austria for discussions and site visits.
- NRC participated in an IAEA-sponsored Technical Committee Meeting to review IAEA's Guidelines on physical protection of nuclear materials against theft or sabotage.
- NRC participated in the 1989 IAEA General Conference held in Vienna from September 25 through 29 and presented papers and chaired sessions at the Scientific Program for Nuclear Safety held during the conference.
- NRC sponsored an IAEA Operational Safety Review Team (OSART) mission to the U.S. Byron nuclear power plant from May 15 to June 2. Team members came to the Commonwealth Edison plant from the FRG, Sweden, the USSR, Belgium, Finland, the GDR, Argentina, Japan and Canada, as well as four members from the IAEA Secretariat. Nuclear safety personnel from Mexico, Czechoslovakia and Brazil also observed the two week review.
- NRC hosted an informal OSART review meeting with U.S. experts who were participants in OSART missions during the past three years, discuss the effectiveness of U.S. involvement in the program. Suggestions for improving the program, which were considered successful by the meeting participants, were provided to the IAEA.
- NRC sent fourteen U.S. experts to participate in eleven IAEA OSART missions to Japan, France, Hungary, the USSR (two missions), Brazil, China, the U.K., Korea, Czechoslovakia, and Poland.
- NRC participated in IAEA's Nuclear Safety Advisory Group (NUSSAG) meeting in April in Vienna to review reactor safety standards-related activities and to set priorities in IAEA's nuclear safety program.
- NRC sent an expert on Radiation Protection Advisory Team mission to Ghana and Zimbabwe.

Further Discussion of Key International Cooperation Activities

U.S.-Soviet Civilian Nuclear Safety Cooperation. The Soviet Union and the United States continued to develop potentially fruitful cooperation in

nuclear reactor safety through meetings of working groups of the Joint Coordinating Committee on Civilian nuclear Reactor Safety (JCCCNRS) and continuing interactions, meetings and exchanges. Cooperative activities included a visit to the United States in May by Vadim Malyshev, Chairman of the USSR State Committee for the Supervision of Nuclear Power Safety.

The largest bilateral technical meeting ever hosted by NRC was held June 5 through 9 when thirty-two Soviet scientists came to Rockville for discussions in seven of the ten working groups set up under JCCCNRS. Discussion topics included Safety Approaches and Regulatory Practices, Analysis of the Safety of Nuclear Power Plants in the USSR and U.S., Radiation Embrittlement and Annealing, Fire Safety, Severe Accidents, Exchange of Operational Experience, and Erosion/Corrosion of Piping and Components.

A successful seven-week inspector exchange occurred during the summer at reactor sites in the United States and in the Soviet Union. The U.S. team was assigned to the Zaporozhe plant in the USSR and the Soviet team to the Catawba plant in South Carolina.

The NRC participated in working group meetings in Moscow and Kiev in September dealing with the environmental and health effects of the Chernobyl accident. The potential for joint work in this area is far greater than previously thought.

Intergovernmental and interagency cooperation activities are now being developed. The NRC is also encouraging private industry to join in these activities in order to broaden their scope and to accommodate the large flow of information and attendant activity.

Canada. The NRC and the Atomic Energy Control Board of Canada formalized their nuclear ties by signing a five-year renewable information exchange agreement at the Canadian Embassy in Washington, DC in June 1989. Under the arrangement, both parties will exchange safety-related information about the regulation of nuclear facilities for which each agency is responsible, including siting, construction, commissioning, operation and decommissioning. The agreement covers a broad range of topics, including regulatory standards and procedures for nuclear facilities; technical reports and safety assessments; safety research programs; possible exchanges of personnel; and reports of radiological events, accidents or emergencies.

The Federal Republic of Germany. In November the FRG sponsored and co-hosted with the IAEA and the NEA an "International Symposium on Regulatory Practices and Safety Standards for Nuclear Power Plants," in Munich, Germany. Commissioner Kenneth Rogers and several senior NRC managers participated and presented papers or chaired panels. An IAEA sur-

vey of individual country practices revealed wide differences among countries and their practices with respect to IAEA codes, principles and standards. Most supported further meetings to explore the implications of existing differences and ways to minimize them.

In August, FRG Minister of Environmental Affairs and BMU Director Klaus Toepfer led a delegation to the U.S. for discussions at NRC, EPA and DOE. He met with Commissioners Rogers and Curtiss, and his delegation exchanged information with NRC divisions on a number of subjects including high-level waste disposal, regulatory approaches to spent fuel management, accident management, and risk assessment. Minister Toepfer also visited Three Mile Island, and members of his delegation visited the Yucca Mountain Test Site, the Waste Isolation Pilot Project storage facility, and the Diablo Canyon Nuclear Power Plant.

A direct line of communication was opened between senior NRC and BMU technical officials on time-sensitive matters such as unusual occurrences at operating nuclear power plants. The first visit of a technical team to the FRG took place in November of 1989.

The United Kingdom. Commissioner Rogers visited the U.K. in May to learn more about ongoing nuclear safety programs and regulatory practices, and to gain a better understanding of the process of privatization on nuclear

programs and institutions in the U.K. He visited the URENCO enrichment plant, the Haysham 1 and 2 Nuclear Power Plants, the THORP reprocessing facility at Sellafield, and a low-level waste disposal site. Earlier, in March, officials of the U.K. Nuclear Installations visited the NRC for discussions of emergency planning, including studies they had sponsored comparing U.S. and U.K. requirements. The NRC is developing an exchange of inspection practices with UKNII, which may include an NII representative on an NRC inspection of a U.S. commercial nuclear power plant.

In July, the U.K. Health and Safety Executive's Director General, John Rimmington, and his deputy met in Washington with Commissioners Rogers and Curtiss to discuss recent revised licensing rules for standardized plants in the U.S. as well as the new role that the Health and Safety Executive now assumes in the area of safety research. Mr. Rimmington reported on progress in the U.K.'s transition from government to private ownership of electric power production, and indicated that privatization is proceeding without significant impact on electric energy supplies.

Japan. It was an active year of cooperation between Japan's nuclear safety program and the NRC. Senior officials and technical personnel from Japan and the U.S. visited each other's facilities and held meetings on current issues and joint programs. The continuous sharing of

useful information included relevant data on Japan's experience with thermal stress in piping and weld cracking. NRC also received, on a regular basis, MITI's press announcements of operational events at Japan's 37 power reactors.

The NRC hosted the fifth regular NRC-MITI meeting on nuclear regulatory matters October 2-3 in Washington. A 20-member MITI delegation of government and utility representatives met with NRC to discuss technical topics that included severe accident issues, reactor plant life extension, and advanced light water reactors. Following the discussions, several members of the MITI delegation visited the Three Mile Island and Limerick nuclear power stations and the Brookhaven National Laboratory where NRC safety research is conducted. Also in October, a nine-member team of regional and resident inspectors, led by one headquarters representative from the Office of Nuclear Reactor Regulation, visited Japan for 10 days to take an in-depth look at Japan's approach to surveillance testing and maintenance procedures. In addition to discussions with government representatives, the team, divided into a boiling-water reactor subgroup and a pressurized-water reactor subgroup, and spent a week with utility management and plant personnel.

Taiwan. In May, several members from NRC participated as delegates to the American Institute in Taiwan (AIT) and Coordination Council for North

American Affairs (CCNAA) Joint Standing Committee Meeting on Civil Nuclear Cooperation, which was held in Taipei. Presentations were made by both sides on the status of their nuclear activities, followed by a discussion of current and future cooperative items. Proposed cooperation includes visits to NRC by Taiwan's nuclear specialists, short-term assignments of Taiwan nuclear safety experts at NRC, visits to Taiwan by NRC experts to present information on current safety topics, and joint cooperation on safety research projects.

Korea. The NRC has a long history of close cooperation with Korea in nuclear safety and regulation, both bilaterally and through the IAEA. The U.S.-Korea Joint Standing Committee on Nuclear and Other Energy Technologies (JSCNOET) met at the Department of State in Early October 1989. In these discussions, Korea's Ministry of Science and Technology (MOST) identified operational safety, radiation protection, public acceptance, and confirmatory research as areas in which Korea hopes to work closely with NRC in the future.

Czechoslovakia. In April, former Chairman Zech and Dr. Stanislav Havel, Chairman of the Czechoslovak Atomic Energy Commission, signed an agreement to exchange nuclear safety-related technical information and to cooperate in civilian nuclear safety matters. This is the first NRC nuclear safety agreement with an East European country.

Hungary. On July 12 during a visit to Hungary, President Bush announced that the U.S. had proposed a U.S.-Hungary agreement on scientific and technical cooperation in various areas, including nuclear safety. Following the President's initiative, a delegation of representatives from involved U.S. agencies met with Hungarian counterparts in Budapest from July 31 through August 2. International Programs represented NRC in the delegation to assess Hungarian interests and expectations in the nuclear safety area.

The People's Republic of China. For most of Fiscal Year 1989, NRC carried out an active program of bilateral cooperation with its counterpart, the Chinese National Nuclear Safety Administration (NNSA), to assist China in building a nuclear safety program in preparation for commissioning their first nuclear power reactor at Qinshan. Several NRC staff visited China to provide technical assistance, and several Chinese assignees worked at NRC for on-the-job training. Following the Chinese government's suppression of the pro-Democracy movement in June, the NRC and other U.S. government agencies placed cooperation programs with China on hold while assessing the impact of Chinese actions on our policies toward China. As part of this, the Department of State also decided to withhold action on all export applications licensed by the Department of Commerce, and con-

curred in by the NRC, involving transfers of commodities to the PRC for nuclear-related uses and controlled for nuclear nonproliferation reasons.

Foreign Assignees to the NRC Staff. The NRC work/training assignee program continues to be of strong interest to foreign regulatory organizations and the Commission. Six countries sent 12 staff members to participate in the program. Although licensing activities related to engineering and system technology have continued to attract a number of participants, an increasing number of foreigners have been accommodated in activities related to the analysis and evaluation of operational data, safety programs and waste management.

Participation in International Organizations and Conferences

Meeting of the IAEA Board of Governors and General Conference. The NRC was represented at both the February and June Board of Governors meetings where IAEA policy decisions on program, budget and staffing are taken. NRC Chairman Kenneth Carr participated in the 1989 IAEA General Conference, held in Vienna from September 25 through 29. As in the past two years, special scientific meetings took place during the conference. NRC's Individual Plant Safety Examination program was described in a session chaired by Chair-

man Carr during the Scientific Program for Nuclear Safety.

OSARTs and Other IAEA Activities. Four NRC staff members participated in separate IAEA Operational Safety Review Team (OSART) missions to the PAKS Nuclear Power Plant in Hungary, the Rovno Plant in the USSR, the Qinshan Plant in China, and the Dukovany Nuclear Power Plant in Czechoslovakia. NRC arranged to have U.S. utility experts take part in OSARTs in Japan, France, Brazil, the U.K., Korea, Poland, and again in the USSR. The NRC was also represented on a Radiation Protection Advisory Team mission in Ghana and Zimbabwe in June to assess the infrastructure and training of personnel for control of radiation sources in those countries. NRC also participate in several IAEA meetings, some of which were joint NEA/IAEA sessions, to discuss potential benefits and experience in the use of severity scales to rank the significance of events at nuclear power plants. The NRC continued its practice of providing nuclear safety advice and assistance through the IAEA's technical assistance program and through its bilateral contacts with countries developing their own nuclear power programs.

Activities in the OECD/NEA. The NRC continued its involvement in the reactor safety, radiation protection and waste management programs of the Nuclear Energy Agency (NEA) in Paris.

The NRC participated on the key standing committees of the NEA as well as the governing body, the Steering Committee for Nuclear Energy. Under the sponsorship of the Committee on Safety of Nuclear Installations, an NRC-proposed multinational research program to study the TMI-2 vessel lower head is being implemented. Substantial funds are being provided by other member countries to conduct the research. A major development during the year was the restructuring of the standing committee organization, which splits off the functions of the Committee on Safety of Nuclear Installations Subcommittee on Licensing to create a new committee to deal with regulatory issues. The mandate of the new Committee on Nuclear Regulatory Activities (CNRA) was approved by the Steering Committee in early October for an interim term. The first meeting of the Committee will take place in early November. The Director of NRC's Office of Nuclear Reactor Regulation is the U.S. delegate to the Committee.

During the year, steps were taken to transfer the NEA Incident Reporting System data bank operations to the Oak Ridge National Laboratory as part of the U.S. contribution to the NEA program and budget. An Agreement between the OECD and the U.S. Government formalizing this transfer was signed at the end of the year.

Appendix

Database

Summary of U.S. International S&T Agreements

Explanation of Database and Footnotes:

The information in the following database is intended to provide an overview of international cooperative activities in science and technology between government agencies of the United States and their counterparts in other countries. For the most part, the items listed in the database are at the Memorandum of Understanding level or higher; however, information for some additional activities was included, based on their scope.

Country designates the cooperating foreign nation. "Multilateral" and "regional" are designations assigned to activities conducted with more than one country.

Agency refers to the United States government agency which serves as the lead agency to the agreement.

Entry Into Force (EIF) and Termination (Term) Date indicate start and end times of agreements. Agreements renewed with no significant alterations usually retain the original EIF date. Agreements with no termination date have an indefinite term.

Funding provides Fiscal Year 1989 information where known. Amounts are in thousands of dollars. The following notes are used in this column:

cr = cost reimbursable option nb = no specific budget amount

rmk = see Remarks column NA = Not Available

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Algeria	USDA	Agricultural Science	02/02/84	02/02/89		
Argentina	NOAA	Space Technologies	09/24/84	NA	NA	
Argentina	NSF	Basic Sciences	08/01/72	08/01/92	19	
Argentina	NSF	Environment	06/19/89	06/19/91		Ozone in upper atmosphere study.
Argentina	US Gov	S&T Cooperation	08/11/72	08/11/92		
Argentina	USDA	Agricultural Science	05/20/81	11/17/92		
Argentina	USGS	Earth Sciences	12/29/87	12/29/92		Pilot project investigating the use of satellite images for mapping; funding of \$15,000 in FY 88 provided by the Pan American Institute of Geography and History. Project completed Dec. 1988. Image map of Viedma area printed
Australia	DOE	Energy	04/11/88	04/11/98		Establishing wider cooperation in the area of research and development
Australia	DOT	Transportation	10/1/68	10/16/90	nb	Projects and technical exchanges carried out under the U.S.-Australia S&T Agreement. All modes of transport and policy issues. Each side pays costs of its participation.
Australia	HHS	Biomedical Sciences	08/01/76			

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Australia	HHS	Food & Drug Reg.	01/28/81			
Australia	HHS	Food & Drug Reg.	09/12/86			
Australia	NASA	Space & Aeronautics	07/21/81	02/26/90	rmk	Funding is NASA programmatic.
Australia	NASA	Atmospheric Science	01/13/85	07/24/90	rmk	Funding is NASA programmatic.
Australia	NASA	Atmospheric Science	07/24/85	07/24/90	rmk	Funding is NASA programmatic.
Australia	NASA	Space	09/01/87	09/01/97	rmk	Funding is NASA programmatic.
Australia	USDA	Agricultural Science	02/22/82		48	Agricultural R&D; soil and water conservation industrial utilization.
Austria	HHS	Biomedical Sciences	04/14/87	04/14/92	10	Agreement between NIH and Austrian Science Foundation for the support of biomedical scientist exchanges.
Austria	NSF	Basic Sciences	02/28/82	02/28/89	80	Joint research; joint S&T education projects; visits; exchange of personnel & information; meeting seminar and workshop support.
Bangladesh	USGS	Earth Sciences	05/01/82	01/01/95	rmk	Seven-year \$1.5 million program funded by Asian Development Bank for institution building of Geological Survey of Bangladesh including 98 man-months of USGS consultants and \$900,000 for on-the-job training of GSB personnel in the U.S.; about 17 man-months in FY 19891 funded at \$387,000

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Belgium	DOE	Energy (Nuclear)	01/19/81	01/19/94		Establish a reasonably balanced exchange of technology in the field of radioactive waste management to include terminal storage in geological formations; technology of retrievable storage; waste processing technology and environmental effects.
Belgium	HHS	Food & Drug Reg.	11/06/74			MOU; FDA recognizes certificate of analysis from government authorities of dry milk products.
Belgium	HHS	Biomedical Sciences	02/06/84	02/06/89		NIH agreement with the Belgian National Fund for Support of Research (FNRS) to obtain funding for Belgian scientists to work in U.S. laboratories.
Belgium	NRC	Nuclear Safety	02/01/83			Severe accident research.
Belgium	NRC	Nuclear Safety	05/02/88	05/02/93		Information exchange.
Belgium	NRC	Nuclear Safety	07/26/88	07/26/90		Thermal hydraulic research.
Belgium	NSF	Basic Sciences	06/02/85	06/01/90	40	Activities include scientific exchanges and fellowships joint seminars and workshops joint research and staff exchanges.
Bolivia	USGS	Earth Sciences	08/17/84			
Bolivia	USGS	Earth Sciences	05/29/85	05/28/90		Evaluation of SPOT/Landsat images for exchange, detection and map revision at 1:50,000 scale; funding of \$14,000 in FY 88 provided by DMA Inter-American Geodetic Survey in support of PAIGH Commission on cartography project
Botswana	USGS	Earth Sciences	08/13/86			MOU to establish facilities to be incorporated into the reference network.
Brazil	NASA	Atmospheric Science	09/01/89			Global Tropospheric Experiment.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Brazil	BReclam	Natural Resources	11/01/86	06/01/90	120	Land and water resources institution building; advisory assistance to Ministry of Irrigation on expanding irrigated agriculture in northern Brazil; World Bank funding.
Brazil	DOE	Energy (Fossil)	05/26/84			Feasibility of a suitable site with a 4 meter seam of 55% ash coal near Porto Alegre Rio Grande do Sul.
Brazil	DOT	Transportation	03/29/84		nb	Identified areas for cooperation: civil aviation; urban mass transit; vehicle fuel conservation and alternative fuel technology; and highway transportation.
Brazil	EPA	Environment	10/01/86	12/01/90		Agreement to provide technical assistance to CETESB Sao Paulo state pollution control agency.
Brazil	HHS	Biomedical Sciences	01/01/77			NIH/National Library of Medical MEDLARS Agreement with Centro Latino-Americano de Informacao em Ciencas de Salude (BIREME); quid-pro-quo interlibrary exchange.
Brazil	NOAA	Space Technologies	05/05/84		NA	MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5.
Brazil	NRC	Nuclear Safety	05/18/89	05/18/94		Information exchange; renewal being negotiated.
Brazil	NSF	Basic Sciences	04/13/84	05/01/91	330	Project under S&T umbrella agreement; information and personnel exchanges; joint research; seminars workshops and meetings.
Brazil	NSF	Basic Sciences	03/06/84	05/01/91	330	S&T initiative signed by Presidents Sarney and Reagan; NSF has a lead role in basic sciences and engineering. Approximately \$600,000 has been designated for NSF \$300,000 for basic sciences; the rest for engineering.
Brazil	US Gov	S&T Umbrella	12/01/71	04/01/90	200	The agreement is awaiting reorganization by an experts' panel formed under the Presidential S&T Initiative of 9/86. NSF is the designated lead agency.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Bulgaria	HHS	Biomedical Sciences	11/04/86	11/04/89		Agreement between NIH and Bulgarian Medical Academy for support of biomedical scientist exchanges under the umbrella U.S.-Bulgaria Exchanges Agreement.
Bulgaria	NSF	Basic Sciences	02/09/78	02/09/93	40	Joint research seminars & workshops; and short-term project development visits.
Bulgaria	US Gov	S&T Umbrella	03/23/78			No current copy.
Bulgaria	USDA	Agricultural Science				A previous Joint Statement between the USDA and Bulgaria expired at the end of 1984. The only substantive changes in the new Joint Statement are Article IV on the protection of intellectual property rights and an annex covering this issue in detail.
Burma	NPS	Natural Resources	09/30/87		301	Technical assistance in conservation resource management and protected areas management; other funding of \$23,000. Agreement initially involves only Burma but may be expanded to include Pakistan India and Poland as well.
Cameroon	USGS	Earth Sciences	11/09/88	11/09/93		
Canada	DOE	Energy (Fossil)	06/04/79	12/04/89		Establish a framework for cooperation with R&D activities in tar sands and heavy oil extraction processing and related technologies. Being extended through 12/4/94.
Canada	DOE	Energy (Nuclear)	08/25/82	08/29/92		Study of mutually agreed topics associated with the management of radioactive waste.
Canada	DOE	Energy	12/04/86	12/04/96		Establishing wider cooperation in the areas of research and development, and related activities of the nuclear cycle i.e. preparation and packaging decontamination and decommissioning; surface and subsurface storage.
Canada	DOE	Energy (Fusion)	11/19/87	11/19/92		Finding solutions to mutually agreed upon problems associated with the development of magnetic fusion as a source of energy.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Canada	DOT	Transportation	06/18/70		nb	Urban systems; rail research; marine transportation technology and systems research; aeronautics; passenger origin-destination survey exchange data; traffic and vehicle safety; highway research; systems for disabled; hazardous materials transport (informal); R&D on broad aspects of transport systems; drug interdiction; human factors; and exchanges on emerging technologies. IPR under negotiation.
Canada	EPA	Environment	10/17/85		nb	A second MOU outlines a plan of cooperative measures for dealing with accidental releases of pollutants which cause damage along the border and constitute threat to public health property or welfare; a Joint Contingency Plan is being developed.
Canada	EPA	Environment	10/17/85	10/17/90	nb	Activities include pollution measurement and control R&D and improved technologies
Canada	EPA	Environment	10/28/86	10/28/91	nb	A third MOU provides for export import and transit of hazardous wastes across the boundary for treatment storage or disposal.
Canada	FWS	Nature Conservation	04/17/85	04/16/90		Documents operational management arrangements for management and research of the Whooping Crane.
Canada	FWS	Nature Conservation	07/17/87		100	To conserve through joint cooperation and coordination of users and management authorities the migrating Porcupine Caribou Herd.
Canada	FWS	Natural Resources	03/16/88		75	Tripartite (with Mexico) cooperation on waterfowl and wetlands cooperation.
Canada	HHS	Food & Drug Reg.	04/30/48			FDA MOU with National Health and Welfare on sanitary practices prevailing in the shellfish industry of Canada and the U.S.
Canada	HHS	Food & Drug Reg.	12/16/74			FDA MOU with Health Protection Branch National Health and Welfare; radiation transmission and human exposure from electronic products; control of radiation emission and human exposure from electronic products.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Canada	HHS	Food & Drug Reg.	10/01/73			FDA MOU with Health Protection Branch National Health and Welfare; drug GMPs pharmaceutical inspection; mutual cooperation and exchange of drug plant inspection information.
Canada	HHS	Food & Drug Reg.	05/10/79			FDA MOU with Health Protection Branch Department of National Health and Welfare; covers standards for good laboratory practices for non-clinical laboratories and establishes inspection standards.
Canada	HHS	Biomedical Sciences	07/30/74			NIH/National Library of Medicine MEDLARS Agreement with Canada Institute for Scientific and Technical Information (CISTI); quid pro quo interlibrary exchange.
Canada	HHS	Health Statistics	01/01/87	12/31/89		Cooperation between the PHS National Center for Health Statistics and Vital Statistics Council for Canada; Statistics Canada Advisory Commission on health statistics.
Canada	HHS	Food & Drug Reg	07/26/88	07/26/98		FDA MOU with Medical Service Branch Department of National Health & Welfare; monitor food beverages and sanitary services provided on common carriers between Canada and the U.S.
Canada	NASA	Space & Aeronautics	07/09/76			Cooperative participation in the development and procurement of a Space Shuttle Attached Remote Manipulator System.
Canada	NASA	Space & Aeronautics	09/29/88		rmk	Entering Phase C/D of Space Station Program; Detailed design and development; total funding for international partners in excess of \$7 billion with Canadian hardware accounting for over \$1 billion.
Canada	NIST	Basic Sciences	09/20/88	09/20/93	nb	Action is in support of NIST statutory mission to collect evaluate and publish standard reference data. Reference IPR - Agreement states NIST owns database and specifies royalties for use to be paid to NIST.
Canada	NOAA	Space Technologies	07/26/84		NA	MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Canada	NOAA	Atmospheric Science	06/28/85	06/27/90	30	MOU to improve climate cooperation and coordination; current projects include development of programs to address climate change and impact on the Great Lakes region of North America and on the High Plains region of North America
Canada	NPS	Natural Resources				Policy coordination; U.S.- Canada Joint Commission on National Parks; Joint World Heritage nomination; Cabin Creek Coal Mine policy coordination; supplemental funding from other sources of \$30,000.
Canada	NRC	Nuclear Safety	05/20/87			Piping integrity research.
Canada	NRC	Nuclear Safety	02/10/84	01/10/87		Severe accident research; new agreement signed by NRC; awaiting signature by Canada.
Canada	USGS	Earth Sciences	04/02/81	04/01/91	200	Joint marine geophysical and water resources research; ore deposit modeling; platinum group element projects; Great Lakes seismic studies; Arctic research; mapping data exchange; international strategic minerals inventory. Canadians provide funding for their participation.
Canada	USGS	Earth Sciences	01/31/96	04/01/91	10	Atmospheric deposition; standardization of monitoring equipment and procedures; Canada provides an estimated \$20,000 in funding.
Chile	USGS	Earth Sciences	09/16/87	08/02/92		The IPR clause contains the sentence: "Unless the Parties mutually agree to the contrary no information and data shall be subject to copyright protection in the United States of America.
China	Army/COE	Water Resources	04/09/86	04/04/91		Protocol under the umbrella S&T agreement on water resources and related subjects; agreement between the U.S. Department of the Army and the Ministry of Water Resources & Electric Power; annexes for specific studies involving the Corps of Engineers currently being negotiated follow-up to Hydropower Protocol which expired in 1984.
China	Census	Statistics	07/24/84	07/24/89	None	Cooperation and exchange in the field of statistics. Annexes: exchange of statistical information; exchange of professional delegations; university statistical instruction; and applied statistical training.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
China	DOE	Energy	01/31/79	01/31/89		Establish a framework for cooperation in high energy physics to include theoretical and experimental research accelerator design and construction techniques other participating agencies: NSF; CAS of China.
China	DOE	Energy (Fusion)	05/11/83	05/11/89		Cooperation in promoting each others' program in nuclear physics and controlled magnetic fusion. Agreement technically expired.
China	DOE	Energy (Fossil)	04/16/85	04/16/90		Cooperation in fossil energy R&D with emphasis on atmospheric & pressurized fluid bed combustion; surface coal gasification; coal liquefaction and enhanced oil recovery other participating agencies: NASA; NOAA; NCAR; CAS Institutes of atmospheric physics and geography.
China	DOT	Transportation	01/20/87		nb	Covers all areas of search and rescue cooperation. IPR provision in Governing Agreement.
China	DOT	Transportation	05/06/87	05/11/88	nb	Port engineering and waterborne transport. Army Corp of Engineers also participates. Funding decided on a case-by-case basis. IPR contained in Governing Agreement.
China	DOT	Transportation	05/11/83	05/11/88	nb	Protocol with the Ministry of Communications (MOC) under the umbrella S&T agreement; urban systems; transport research planning; highway construction and safety; civil aviation technical assistance.
China	DOT	Transportation	10/10/86	05/11/88	nb	Covers all areas of highway transportation research and development. IPR contained in Governing Agreement.
China	DOT	Transportation	12/15/86	12/15/91	nb*	Covers all areas of rail transportation research and operations. Administered by the Federal Railroad Administration.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
China	EPA	Environment	02/05/80	02/05/90	nb	U.S.-PRC Protocol on Environmental Cooperation (5-year renewals) involves five ongoing projects under two annexes on aquatic effects of environmental pollution; health research (lung cancer); modeling of air pollution transport and transformation; water pollution transport; pollution of soil and groundwater. A sixth project environmental management under the newly signed fourth Annex is in planning.
China	FWS	Natural Resources	11/19/86		20	Exchange of scientists to work on activities relating to conservation of wildlife and their habitats.
China	HHS	Food and Drug Reg.	02/26/88			Agreement to regulate ceramicware intended for use in the preparation serving or storage of food or drink and offered for export to the U.S.
China	HHS	Biomedical Sciences	05/11/83	05/11/88	2	Agreement between NIH and the Chinese National Academy of Sciences on basic biomedical sciences.
China	HHS	Biomedical Sciences	06/28/83	06.28.89	2	Agreement between National Institute of Neurological and Communicative Disorders and Stroke; NIH; and the Shanghai Brain research Institute Academy of Sciences.
China	HHS	Biomedical Sciences	08/01/87	08/01/92		Agreement between the National Eye Institute NIH and the Zhongshan Ophthalmic Center Chinese Academic Medical Sciences.
China	HHS	Biomedical Sciences	06/22/79	06/22/93	239	Cooperation under Health Protocol on cancer cardiovascular diseases infectious diseases environmental health human genetics reproductive physiology immunology biomedical information science food and drugs mental health; public health; and health services.
China	NIST	Metrology	01/01/79	05/01/89	nb	NIST now in the process of renewal. Joint studies in metrology standards (including engineering standards) and related applied sciences; temperature electrical optical etc. standards. NIST has agreed on five-year renewal pending negotiation of S&T agreement.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
China	NIST	S&T Information	04/30/84	04/30/89	25	Reciprocal exchange of S&T report literature and facilities in the use of available information systems and databases.
China	NOAA	Marine Science	05/08/79	05/09/94	NA	Under protocol on Marine and Fisheries S&T information exchange; cooperative research training and supply of equipment.
China	NOAA	Atmospheric Science	05/08/79	05/08/94	40	Protocol on Atmospheric S&T; joint meteorologic studies and training; participating agencies include NSF; NASA and USDA.
China	NOAA	Space Technologies	07/08/85		NA	Direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5. China
China	NPS	Natural Resources	11/19/86	11/19/91		Protocol designed to promote cooperation and exchanges in the field of wildlife conservation and protected natural areas.
China	NRC	Nuclear Safety	10/17/81	10/16/91		Information exchange.
China	NSF	Earth Sciences	01/24/80	01/23/90	750	Protocol under S&T agreement; joint program with USGS.
China	NSF	Basic Sciences	12/10/80	12/09/90	857	Protocol under S&T umbrella agreement; basic applied and social sciences.
China	US Gov	S&T Umbrella	01/31/79	01/12/89		Original umbrella agreement left IPR considerations to the individual MOU's under the umbrella. Currently operating under extension.
China	USDA	Agricultural Science	01/31/79	01/12/89	100	Agricultural R&D under umbrella S&T agreement; exchange of soybean germplasm; comparison of import/export. Negotiations for livestock; corn disease research; watershed management.
China	USGS	Earth Sciences	07/17/84	01/23/90	103	Earthquake Studies Protocol; PRC provides \$264,000 funding; studies on deep crustal structures in fault zones; premonitory phenomena; crustal stress measurements; seismic networks; rock mechanics; intraplate active fault studies.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
China	USGS	Earth Sciences	01/24/85	01/24/90	130	Earth Science Protocol; PRC provides \$23,000 funding; joint research on pyrophyllite deposits; geochemical anomalies in Xinjiang and southwestern U.S.; genetic and descriptive model of Bayan Obo iron-niobium-rare earth deposit; NSF also participates.
China	USGS	Earth Sciences	04/16/85	04/15/90	50	Survey & Mapping Protocol; joint projects in cartographic application of remote sensing and in the development of geographic information systems in cooperation with the Defense Mapping Agency and National Geodetic Survey.
China	USGS	Earth Sciences	10/16/86	10/17/91	50	Surface Water Hydrology Protocol; joint research in sediment transport hydrologic extremes hydrologic measurement procedures instruments and equipment; exchange of hydrologic data and analysis techniques; PRC provides funding estimated at \$50,000 other agencies: DOC; NOAA National Weather Service.
Colombia	HHS	Biomedical Sciences	03/12/81			National Library of Medicine MEDLARS Agreement with the Pan American Federation of Associations of Medical Schools; interlibrary exchanges.
Colombia	USGS	Earth Sciences	06/22/84	06/22/89		Provides for exchanges of scientific and technical information and exchange visits by scientists.
Cote D'Ivoire	USGS	Earth Sciences	03/21/86			Establishes a station for the reference network.
Czechoslovakia	NSF	Basic Sciences	06/27/88	06/27/91	66	Basic framework of cooperation; activities to include cooperative research projects; joint seminars and workshops; and individual scientific visits.
Denmark	HHS	Food & Drug Reg.	10/30/75			MOU; FDA recognizes certificate of analysis from government authorities on dry milk products. Denmark Denmark/Faroe Island to fishery resources within the U.S. EEZ.
Egypt	BRReclam	Energy	09/01/82	09/05/92	730	Hydro-power and electrical systems rehabilitation; advisory assistance on turbine-runner replacement and rehabilitation of electrical generating equipment at the Aswan High Dam; funding by USAID.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Egypt	BReclam	Natural Resources	03/01/87	07/01/91	100	Development of computer models for the Nile River and various canals; funding by USAID.
Egypt	FWS	Natural Resources	04/01/77	12/01/89	100	Training and research; technical assistance in natural areas management. This is a Special Foreign Currency program of FWS in which excess foreign currency is held by the FWS for use in conservation programs.
Egypt	HHS	Biomedical Sciences	01/01/82	11/01/91	8m	AID-funded NIH program under Congressionally-mandated Middle East Cooperative Program established following the Camp David Accord; epidemiologic and immunologic studies on vector-borne diseases.
Egypt	HHS	Biomedical Sciences	05/01/84	05/01/89	2.1m	U.S.- Egypt agreement on Health Cooperation to develop projects on environmental health; epidemiology of respiratory infections; eye diseases; genetic studies of congenital anomalies; lymphoma/leukemia research; biomedical instrumentation; drugs; biologics; health statistics; and emergency medical services. A.I.D. funded.
Egypt	NRC	Nuclear Safety	06/08/81			Information exchange; renewal under negotiation.
Egypt	NSF	Basic Sciences	03/15/83	03/15/88		1983 MOU provides for activities carried out under the expiring umbrella S&T agreement; including information exchange and joint research. Currently under negotiations.
Egypt	US Gov	S&T Umbrella	11/09/86	11/09/91		Agreement relating to cooperation in the areas of science and technology.
Finland	HHS	Biomedical Sciences	10/29/82			Interagency agreement between the PHS and the Ministry of Social Affairs and Health of Finland on occupational safety and health; food and drugs; alcohol abuse; and health services; vaccine development.
Finland	HHS	Biomedical Sciences	11/16/82			Activities provided for include exchange of information and publications; exchange of information on research progress; visits by scientific staff personnel; and organization of scientific symposia and conventions.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Finland	HHS	Food & Drug Reg	03/08/84			MOU; FDA recognizes certificate of analysis from government authorities on food products.
Finland	NRC	Nuclear Safety	02/28/85	02/28/88		Thermal hydraulics and materials research. Extension under review.
Finland	NRC	Nuclear Safety	09/29/85	09/29/90		Information exchange.
Finland	NRC	Nuclear Energy	07/06/89	07/06/93		Participation in Severe Accident Research Program.
Finland	NSF	Basic Sciences	04/07/86	04/07/91	99	Projects under the umbrella S&T agreement; prior MOU existed from 8/80 to 8/85; visits; personnel and staff exchanges; fellowships; joint research; seminars; governed by umbrella agreement. Finland cooperation in science and technology; agreement contains an Intellectual Property Annex for protection of copyrights; patents; other intellectual property; individual cooperating agencies negotiate funding with counterpart agencies.
France	DOC	Technical Commercial	02/25/86	02/25/91		Through Office of Productivity; Technology and Innovation; Economic Affairs; Department of Commerce. Modeled after the Israel BIRD and India PACT agreements. Seven joint ventures concluded in 1988. Progressing satisfactorily despite severe USG resource limitations. More than 20 joint ventures as of 12-15-89.
France	DOE	Energy (Nuclear)	01/18/77	12/31/90		Establish for mutual benefit a balanced exchange of LMFBR technology; i.e.; safety to include experimental out-of-pile and in-pile research and theoretical analyses; and physics including nuclear data; calculation methods; etc.
France	DOE	Energy (Nuclear)	04/22/83	04/22/93		Cooperation on research; development; test and evaluation to improve physical protection of nuclear materials and facilities.
France	DOE	Energy (Nuclear)	07/26/83	07/26/93		Cooperation in all phases of radioactive waste management.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
France	DOE	Energy (Nuclear)	05/31/85	05/31/90		Cooperation on research; development; test and evaluation of technology and procedures to improve national nuclear material accounting and control measures.
France	DOE	Energy (Nuclear)	09/13/85	09/13/90		Establish a basis for cooperation in the field of remote systems technology; i.e.; applications feasibility; remote work efficiency; optimization and refinement.
France	DOE	Energy (Nuclear)	06/20/86	06/20/91		Exchange and sharing of nuclear criticality data.
France	DOE	Energy (Fossil)	02/16/88	02/16/91		Establish a balanced exchange of energy information on enhanced oil recovery techniques.
France	DOE	Energy (Nuclear)	12/19/88	12/19/90		Establish and cover a program of scientific cooperation to engage in and be specifically limited to the unclassified utilization of high-power lasers in laser-matter interaction physics; diagnostics; and associated technological developments. NOTE: specifically excluded is the physics of indirectly driven inertial fusion target implosion and their design.
France	DOT	Transportation	10/07/71		rmk	Program implemented with U.S.; France; Germany; Italy; Japan and the U.K. under the auspices of NATO CCMS. Funding: each side pools funds subject to availability.
France	DOT	Transportation	02/14/72		nb	Exchanges on automated guideway transit assessment; numerous project agreements including work in the areas of automated guideway transit; marine traffic systems and pollution; tunneling technology; urban rail and traffic systems; aviation; waste and byproduct utilization; experimental safety vehicle research; and electromagnetic interference research. Cooperative activities on high-speed rail; safety; intermodal operations; hazardous materials; electrification; signals and telecommunications.
France	EPA	Environment	06/21/84	06/21/89	nb	Five-year renewable MOU between EPA and the Ministry of Environment; exchanges on drinking water; wastewater treatment and sludge management are current focal points.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
France	HHS	Biomedical Sciences	12/20/74			National Library of Medicine MEDLARS Agreement with the French Institute of Health and Medical Research; quid pro quo interlibrary exchanges.
France	HHS	Biomedical Sciences	10/26/84	10/26/89	132	Agreement between NIH and the French Institute of Health and Medical Research on cancer; cardiovascular; pulmonary; immunology and infectious diseases; instrumentation; biomedical engineering and neurosciences; instrumentation; technology and AIDS research.
France	HHS	Food & Drug Reg.	03/18/86			MOU; mutually recognized good laboratory practices inspections.
France	HHS	Food & Drug Reg.	01/15/87			Assures products meet import standards.
France	NASA	Space & Aeronautics	03/23/87		19	Cooperative participation in TOPEX/POSEIDON oceanography mission.
France	NIST	Materials Science	10/01/84	09/30/89	nb	NIST is installing a cold neutron source; guide system and instrumentation; the Institute has operated a cold source since 1972 and installed a second source in 1986 for use in developing new instruments; research involves studies in nuclear and fundamental physics.
France	NIST	Engineering	12/31/86	12/31/91	nb	This is the fourth five-year joint program of research in building technology under an understanding signed in 1969 by the Science Advisor to the President. Cooperation in building technology; joint research and exchanges; extensive collaboration in environmental engineering materials durability; fire research; acoustics; evaluation of building systems; plumbing; and building economics.
France	NOAA	Marine Science	11/01/69			U.S.-France cooperation in oceanography; joint multidisciplinary oceanographic research; information and data exchanges.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
France	NOAA	Space Technologies	03/20/86		NA	France provides onboard data collection system flown on NOAA polar-orbiting satellite; France also provides the data processing system for ARGOS.
France	NRC	Nuclear Safety	01/10/84	01/10/89		Safety of radioactive waste management.
France	NRC	Nuclear Energy	09/17/84	09/17/89		Establishes exchange of technical information and cooperation in the regulation of nuclear safety.
France	NRC	Nuclear Safety	09/16/86	09/16/91	None	Thermal hydraulic research.
France	NRC	Nuclear Safety	12/31/86	12/31/91		LWR safety R&D; light water reactor safety. Previous agreement signed 12/03/84 between the NRC and the Commissariat A L'Energie Atomique regarding the behavior of polymer base materials subjected to beta radiation.
France	NRC	Nuclear Safety	05/05/87			Piping integrity research.
France	NRC	Nuclear Safety				Pressure tests to failure of a concrete containment model.
France	NSF	Basic Sciences	01/01/70	05/02/88	420	MOU for joint research and workshops.
France	USDA	Agricultural Science	03/15/87	03/15/92	70	Agricultural S&T; forestry; comparison of remote sensing data for agricultural use; plant science; bioprocessing; economics; etc.
France	USGS	Earth Sciences	07/23/88	07/23/91	50	Joint studies in water resources research; radioactive waste; oceanographic research; geochemistry research; mineral deposits; geophysics; and sea-ice research and remote sensing in polar regions. \$15,000 govt. of France and other funding.
Germany (GDR)	NOAA	Fisheries	03/01/77	08/01./90	NA	Governing International Fishery Agreements established on a bilateral basis; conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. EEZ.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Germany; Fed Rep	DOE	Energy (Nuclear)	12/20/74	12/31/89		Cooperation in radioactive waste management regarding the disposal of separated waste products and disposal of spent fuel.
Germany; Fed Rep	DOE	Energy (Nuclear)	06/09/76	12/31/90		Finding solutions to mutually agreed upon problems connected with the design; development; construction; and operation of nuclear power systems utilizing LMFBFRs and to exchange information developed during the resolution of these problems.
Germany; Fed Rep	DOE	Energy (Nuclear)	02/11/77	02/11/92		Development of gas-cooled reactors; possible use as high- temperature gas-cooled reactors for steam cycle direct cycle or process heat or as gas-cooled fast breeder.
Germany Fed Rep	DOE	Energy (Nuclear)	09/29/77			R&D to improve nuclear material safeguards and physical security.
Germany Fed Rep	DOE	Energy	04/24/87	04/24/92		Establish basis for cooperation in the field of remote systems technology in areas such as remote connector evaluations low-flow ventilation system off-gas technology; robotic process samples and advanced semimanipulator hardware.
Germany Fed Rep	DOT	Transportation				Vessel traffic systems transport economics and planning highway construction and engineering traffic safety and railway construction and operation.
Germany Fed Rep	EPA	Environment	05/09/74			Governmental agreement five-year automatic renewal with EPA and the Ministry of Environment; Nature Protection and Reactor Safety as the lead agencies; broad range of cooperation on auto emissions acid deposition economic incentives improved regulatory approaches hazardous waste management and enforcement chemical substances pesticides radiation water pollution control technologies for control of air pollution from stationary sources protection of drinking water; soil; etc.
Germany Fed Rep	HHS	Biomedical Sciences	10/08/74			NIH/National Library of Medicine MEDLARS Agreement with the FRG Institute of Medical Documentation and Information; quid-pro-quo interlibrary exchanges.
Germany Fed Rep	NASA	Space & Aeronautics	10/05/77		71	Cooperative participation in Galileo mission to Jupiter. Spacecraft launched 10/89.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Germany Fed Rep	NASA	Space & Aeronautics	10/15/81			Cooperative participation in the Active Magnetospheric Particle Tracer Explorers.
Germany Fed Rep	NASA	Space & Aeronautics	08/08/82		2700	Cooperative participation in Rosat x-ray survey satellite.
Germany Fed Rep	NASA	Space & Aeronautics	10/06/87			German X-band Synthetic Aperture Radar (X-SAR) to fly with SIR-C on STS.
Germany Fed Rep	NASA	Space	07/10/89	12/31/99		Space shuttle flight activities.
Germany Fed Rep	NRC	Nuclear Safety	04/01/81	04/01/91		Reactor safety research program.
Germany Fed Rep	NRC	Nuclear Safety	04/25/84	04/25/94		SIMMER- II computer code transition phase phenomena.
Germany Fed Rep	NRC	Nuclear Safety	09/06/84	09/06/89		Nuclear safety research program at a high-temperature demonstration reactor facility.
Germany Fed Rep	NRC	Nuclear Safety	02/01/85	06/30/87		Gundremmingen KRB-A reactor pressure vessel. Extension under negotiation.
Germany Fed Rep	NRC	Nuclear Safety	02/06/85	02/06/91		Thermal hydraulic research.
Germany Fed Rep	NRC	Nuclear Safety	01/01/86	09/01/88		Joint development of a prototype AFDM.
Germany Fed Rep	NRC	Nuclear Safety	07/17/86	07/17/91		Information exchange.
Germany Fed Rep	NRC	Nuclear Safety	06/08/88	12/31/90		Severe accident research; extension under review; new agreement under negotiation.
Germany Fed Rep	USDA	Agricultural Science	01/06/81		70	Agricultural S&T; plant biotechnology integrated pest management; reproductive biology of swine etc.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Germany Fed Rep	USGS	Earth Sciences	07/01/75	07/16/91	30	Joint research in marine seismology radioactive wastes petroleum resource assessment and Antarctic studies; sea-ice studies marine minerals; international strategic minerals inventory.
Germany Fed Rep	DOT	Transportation	11/05/70		nb	Program carried out by the U.S. France Germany Italy Japan and the United Kingdom. Begun under auspices of NATO CCMS.
Greece	NRC	Nuclear Safety	07/15/88	07/15/93		Information exchange.
Greece	USDA	Agricultural Science	06/27/81			Germplasm exchange. Currently in abeyance no activities planned.
Guatemala	HHS	Biomedical Sciences	01/01/79		235	Ministry of Health Universidad del Valle and the U.S. Centers of Disease Control collaborate in vector-borne parasitic disease research and training.
Hungary	DOT	Transportation	10/11/78		nb	Highway and bridge construction; high traffic control and safety railway transport and operation; urban transport; human factors; computer techniques (applications); and conservation of energy.
Hungary	HHS	Biomedical Sciences	04/01/77	12/31/87	43	NIH projects under the U.S.-Hungary Cultural Education and Science agreement; cardiovascular pulmonary and blood diseases; individual health sciences exchanges.
Hungary	HHS	Biomedical Sciences	02/23/81		17	Agreement between the National Cancer Institute and the Hungarian National Institute of Oncology for cancer research.
Hungary	NIST	Metrology	04/01/77		nb	Implementing arrangement under Articles II and III of the Agreement on Cooperation in Culture Education and Science and Technology. Provides for short-term exchange of scientists extended visits in cooperating laboratories joint research intercomparison of national standards and information exchanges.
Hungary	NIST	Metrology	11/22/84		nb	Same as previous item.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Hungary	NSF	Basic Sciences				Cooperation in natural and engineering sciences social sciences and math. An earlier agreement predated the umbrella agreement.
Hungary	US Gov	S&T Umbrella	07/01/77	07/01/92		S&T is a subset of overall agreement for cooperation in culture education science and technology.
Hungary	USGS	Earth Sciences	02/09/88	12/31/92		
Hungary	USGS	Earth Sciences	07/01/88	07/01/89		Assessment of petroleum resource potential in the Pannonian Basin of Hungary; funded by the World Bank at \$360,000.
Iceland	HHS	Food & Drug Reg.	12/28/78			MOU for establishing procedures for assuring the safety of imported shellfish.
Iceland	NOAA	Fisheries	11/01/84	07/31/91	NA	Governing International Fishery Agreements established on a bilateral basis conditions under which foreign fishing vessels are granted access to fishery resources in the U.S. EEZ.
Iceland	USGS	Earth Sciences	04/09/82	04/08/90	80	Agreement in cooperation with the National Research Council; information and personnel exchanges; joint research in geophysical geological and hydrological phenomena.
India	BRReclam	Natural Resources	06/01/87	06/01/90	200	Training in dam safety and instrumentation of dams; UNDP funding.
India	DOE	Energy (Fossil)	08/31/87	08/31/92		Cooperation in R&D activities pertaining to enhanced oil recovery underground coal gasification and related technologies.
India	EPA	Environment	11/01/86		nb	EPA works with GOI environmental authorities under the U.S.-India Fund; principal project is the Ganges River cleanup; two joint toxicology research projects are being formulated with initiation expected in FY 89. EPA is reviewing two project proposals by NEERI.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
India	FWS	Natural Resources	01/01/78		500	Research projects in endangered species; training in wildlife management; public education efforts including development of the Indian Wildlife Institute. This is one of the three Special Foreign Programs run by the FWS in which excess foreign currency is held by the FWS for use in conservation projects.
India	HHS	Biomedical Sciences	01/01/62		334	Indo-U.S. Subcommission on S&T; areas include infectious diseases blindness prevention reproductive physiology molecular biology pharmacology child health and development mental health substance abuse longitudinal demographic and health trends iron deficiency anemia health services research occupational health cancer neurology and information exchanges.
India	HHS	Biomedical Sciences	01/01/82	12/31/88	68	Projects under the Reagan-Gandhi S&T Initiative; NIH conducts projects in immunology and reproduction blindness prevention leprosy filariasis tuberculosis malaria.
India	HHS	Biomedical Sciences	11/01/83	11/01/89	300	MOU for cooperation between ADAMHA and the Indian National Institute of Mental Health and Neuro Sciences; projects in alcoholism drug abuse and mental health.
India	HHS	Biomedical Sciences	07/01/84	07/01/89		MOU formalized long-standing relationship between NIH laboratories and selected Indian Council for Scientific and Industrial Research laboratories basic research in cellular molecular biology and biophysics.
India	HHS	Biomedical Sciences	06/01/87	06/01/92	6000	Vaccine and immunodiagnosics development; vaccine quality control; immunization programs development; the Vaccine Action Program is a joint effort by PHS and USAID; nodal Indian agency is the Department of Biotechnology with MOHFW and Council of Medical Research involvement.
India	NIST	Basic Sciences	10/28/74			Projects approved after 10/89 will be subject to IPR requirements presently being negotiated. Includes 11 projects in materials and physical sciences in cooperation with 20 Indian institutions; expansion of the program.
India	NOAA	Earth Sciences	10/01/74			Six joint research projects in the climate research program were approved under the Indo-U.S. Subcommission on S&T.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
India	NOAA	Space Technologies	10/26/84		NA	MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5.
India	NSF	Basic Sci. & Tech.	10/01/83	10/01/91	25	S&T Initiative signed by President Reagan and Prime Minister Gandhi; NSF serves as Executive Agent; FY 1988 extension will continue studies in health agriculture biomass solid state sciences and engineering and monsoon research also initiate studies in infectious and tropical diseases (AIDS tuberculosis herpeticosis neurological disorders) Monsoon Drought of 1987 and collaboration on the SSC.
India	US Gov	S&T Umbrella	01/31/83			Agreement by President Reagan and Prime Minister Gandhi to launch the Science and Technology Initiative; covers the fields of health agriculture monsoons.
India	USGS	Earth Sciences	01/01/75		10	U.S.-India fund provides about \$39,000; multidisciplinary workshops and identification of other mutually beneficial joint research projects. No agreement; administered by the State Department.
Indonesia	BReclam	Natural Resources	06/01/87	06/01/89	490	Dam safety evaluation of existing structure; training in dam safety inspection; funding by Indonesia.
Indonesia	HHS	Biomedical Sciences	10/01/79	09/30/88	144	Centers for Disease Control/AID technical assistance program with MOH aimed at reducing morbidity and mortality due to vaccine-preventable and diarrheal diseases.
Indonesia	US Gov	S&T Umbrella	10/01/79	10/05/89		Agreement on cooperation in scientific research and technological development; individual cooperating agencies negotiate funding with counterpart agencies.
Indonesia	USGS	Earth Sciences	02/03/86	06/30/90		Five year marine geology program funded by the Asian Development Bank at \$1 million; project provides for a resident team leader and 10 TDYs for 2.5 man months each. Funded at \$130,000 in FY 89.
Indonesia	USGS	Earth Sciences	01/01/87		23	Cooperative research project on peat studies as modern analogs to U.S. coal fields; field visit to Kalimantan. Extension of U.S. domestic research project.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Indonesia	USGS	Earth Sciences	01/02/89	01/02/90	rmk	Assistance to Directorate of Mineral Resources in selecting areas having possibilities for platinum group mineralization. Funded by the ADB at \$58,000 in FY 1989.
Ireland	HHS	Food & Drug Reg.	01/22/88	01/28/93		FDA agreement covering caseins caseinates and mixtures thereof exported to the U.S.
Ireland	USDA	Agricultural Science			80	Agricultural S&T forage/livestock management extension food technology agribusiness promotion. IPR considerations current impasse.
Israel	BRReclam	Natural Resources	06/01/84	05/22/94	20	S&T exchange program in water resources; joint funding.
Israel	BRReclam	Natural Resources	06/01/84	05/01/89	30	Technical assistance in water resources development; funding by Israel.
Israel	DOE	Energy	06/03/84	06/03/90		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research and development.
Israel	DOE	Energy (Physics)	05/27/87	05/27/92		Cooperation in high-energy physics applied mathematical sciences and other basic energy sciences.
Israel	DOT	Transportation	11/01/74		nb	Memorandum of Understanding with the Ministry of Transportation of the State of Israel; general areas of transport planning and technology; currently inactive.
Israel	DOT	Transportation	11/12/74		nb	Transportation planning and information systems; and urban transport including traffic control systems.
Israel	HHS	Biomedical Sciences	03/01/83	03/01/90		Activities are under a Plan for Mutual Cooperation with the Ministry of Labor and Social Affairs in the areas of alcohol abuse and alcoholism; covers mutually beneficial exchanges work study programs and joint studies.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Israel	HHS	Biomedical Sciences	05/06/85	05/06/90		Agreement with the Israeli Ministry of Health; covers areas of biomedical sciences of mutual interest and health statistics.
Israel	NOAA	Marine Science	06/05/89	06/05/94		MOU for marine and freshwater cooperation.
Israel	NRC	Nuclear Safety	07/11/88	07/11/93		Information exchange. Israel
Israel	US Gov	S&T Umbrella	10/25/77			Agreement to establish the Binational Industrial Research and Development Foundation (BIRDF); U.S. and Israel contributed equally to a \$110 million endowment; interest earnings are used to fund joint venture projects between U.S. and Israeli companies. Agreement also establishes the Binational Agricultural Research and Development Fund (BARD). U.S. and Israel contributed equally to a \$110 million endowment. Interest earnings are used to fund joint agricultural research projects.
Israel	USGS	Earth Sciences	05/01/85			Global Digital Seismic Network.
Italy	BRReclam	Natural Resources	10/16/86	10/16/91	100	Technical cooperation in dam safety engineering; joint funding.
Italy	DOE	Energy (Renewable)	06/03/75	06/03/90		Collaboration in geothermal R&D to include hot dry rock brine utilization and deep drilling methods.
Italy	DOE	Energy	12/05/85	12/05/90		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research and development. This MOU replaces the MOU between the same parties which expired in 1979. A separate MOU for information exchange was signed for this MOU on 9/17/86. This MOU was for a 2 year period.
Italy	DOT	Transportation	19710511		nb	

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Italy	DOT	Transportation	04/12/85	04/12/90	nb	Initial areas of mutual interest: a) containerization b) major infrastructure construction technology c) emergency transportation d) transportation safety and e) intermodal foreign transportation. Replaces MOU of 10/3/69.
Italy	EPA	Environment	03/01/87			At Italian request EPA concluded a formal MOU with the newly-established Ministry of Environment; subsequent governmental reorganization has precluded implementation; ongoing contacts exist in the fields of dioxin control wastewater management and solid waste management and recycling.
Italy	HHS	Biomedical Science	08/02/68			Exchange of information. Interlibrary exchange.
Italy	HHS	Biomedical Sciences	11/21/77		190	Agreement under the umbrella S&T agreement with the Italian Ministry of Health.
Italy	HHS	Food & Drug Reg.	12/19/88			Good laboratory practices MOU.
Italy	NASA	Space & Aeronautics	03/13/86			Undertake joint development of a Tethered Satellite System (TSS) for use with the Space Shuttle.
Italy	NASA	Space & Aeronautics	02/13/89			Cooperative development of the Lageos-2 satellite system.
Italy	NRC	Nuclear Safety	05/29/75	04/01/81		Information exchange; renewal text is awaiting signature.
Italy	NRC	Nuclear Safety	01/23/86	01/23/91		Thermal hydraulic research.
Italy	NRC	Nuclear Safety	06/05/87	06/05/91		Severe accident research.
Italy	NRC	Nuclear Energy	04/03/89	04/03/94		International piping research group.

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Country	Agency	Subject	EIF Date	Term Date	Fund- ing	Remarks
Italy	NSF	Basic Sciences	06/19/67	04/01/93	240	Projects under S&T umbrella agreement (NSF was Executive Agency through June 1986); provides for joint research seminars and workshops; information and personnel exchanges; installation utilization; training. NSF counterpart is the Italian National Research Council.
Italy	US Gov	S&T Umbrella	04/01/88	04/01/93		Agreement for scientific and technological cooperation; agreement contains intellectual property provisions; individual cooperating agencies negotiate funding with counterpart agencies.
Italy	USGS	Earth Sciences	06/07/84	06/07/89		Installation of digital real-time seismography
Italy	USGS	Earth Sciences	11/06/85	11/05/90	24	Program under the S&T umbrella agreement; development and installation of digital real-time seismographs; hydrological hazards workshop; development of new technology. \$97,000 GOI and other funding.
Ivory Coast	HHS	Disease Control	05/01/871			Centers for Disease Control and Ministry of Health collaboration in HIV-1 and HIV-2 epidemiology laboratory surveillance and research.
Japan	DOE	Energy (Nuclear)	01/31/79	01/31/90		Cooperation in the design development construction and operation of liquid metal fast breeder reactors.
Japan	DOE	Energy (Nuclear)	12/03/86	12/03/96		Study topics and develop cooperatively and jointly technology and techniques necessary for the safe management of radioactive wastes.
Japan	DOT	Transportation	07/31/69		nb	Major areas are urban systems traffic management high-speed rail including magnetic levitation; aviation R&D; environment control strategies.
Japan	DOT	Transportation	11/18/70		nb	Program implemented by U.S. France Germany Italy Japan and U.K. Begun under auspices of NATO CCMS.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Japan	EPA	Environment	08/05/75		nb	Self-renewing governmental agreement on environmental protection; 15 projects cover a wide range of issues including mobile and stationary source control hazardous waste management wastewater treatment drinking water protection management of contaminated bottom sediments etc.
Japan	HHS	Food & Drug Reg.	10/24/62			MOU with FDA on sanitation of shellfish for export; inactive since 1984 since there have been no shellfish exports.
Japan	HHS	Biomedical Sciences	04/01/65		185	U.S.-Japan Cooperative Medical Sciences Program; projects have been divided into nine agreed upon categories: cholera and cholera-like diarrheas; immunology; leprosy or Hansen's Disease malnutrition; parasitic diseases; tuberculosis; viral diseases; environmental mutagenesis; and carcinogenesis and viral hepatitis.
Japan	HHS	Biomedical Sciences	01/01/74			NIH/National Library of Medicine MEDLARS Agreement; interlibrary exchanges.
Japan	HHS	Biomedical Sciences	09/01/84	09/01/88	14	Gerontology research; agreement between the National Institute on Aging and Tokyo Metropolitan Institute of Gerontology.
Japan	HHS	Biomedical Sciences	01/01/80	06/01/88	23	Projects under the non-energy umbrella S&T agreement; exchanges work-study.
Japan	HHS	Food & Drug Reg.	04/01/83			Mutual acceptance of inspectional data concerning good laboratory practice with Pharmaceutical Affairs Bureau MOH.
Japan	HHS	Biomedical Sciences	09/01/84	05/01/89	95	Nakasone Cancer Program.
Japan	NASA	Space & Aeronautics	09/05/89			Entering Phase C/D of Space Station Program; Detailed Design and Development; total funding with international partners in excess of \$7 billion; Japanese hardware accounting for \$2 billion.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Japan	NASA	Space & Aeronautics	01/28/88			Direct reception of data from Japan's JERS-1 spacecraft at a NASA receiving station.
Japan	NASA	Space & Aeronautics	01/24/85	01/01/90		Use of Japanese airport for Shuttle emergency landing.
Japan	NIST	Telecommunications	09/14/89	09/13/94	nb	Agreement with the Nippon Telegraph and Telephone Corporation which is a private corporation; joint research on semiconductors telecommunications computers and computer networking time and frequency measurements and related fields. Second generation of agreement originally signed in 1984.
Japan	NOAA	Marine Science	01/01/64		NA	U.S.-Japan Cooperative Program in Natural Resources; joint multidisciplinary research projects; information and data exchange.
Japan	NOAA	Space Technologies	08/11/83		NA	MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of the Landsat-45 AND LANDSAT-5.
Japan	NOAA	Fisheries	12/31/87	12/31/89	NA	Governing International Fishery Agreements established on a bilateral basis conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. EEZ.
Japan	NPS	Natural Resources	11/01/86	11/01/91	10	Exchange; U.S.-Japan agreement on development and utilization of natural resources; U.S.-Japan panels: national parks and other natural areas conservation recreation and parks and city parks and urban affairs.
Japan	NRC	Nuclear Safety	02/11/84	01/31/92		
Japan	NRC	Nuclear Safety	11/07/84	11/06/89		Radioactive waste management.
Japan	NRC	Nuclear Safety	12/01/84	09/01/88		Contain 1.0 computer code for LMFBFR containment analysis.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Japan	NRC	Nuclear Safety	06/30/86	06/30/89		AFDM prototype and Contain computer code; one year extension under negotiation.
Japan	NRC	Nuclear Safety	09/30/86			High-level vibration test of nuclear power plant piping.
Japan	NRC	Nuclear Safety	05/27/87	12/31/90		Information exchange.
Japan	NRC	Nuclear Safety	10/09/87	10/08/92		Severe fuel damage and fission product source term research. Japan
Japan	NSF	Computer Science	04/01/87		rmk	Establishes exchange program. Funding is variable \$70,000 to date.
Japan	NSF	Basic Sciences	06/01/88	06/01/93		
Japan	US Gov	S&T Umbrella	06/20/88	06/20/93		Agreement on cooperation and in research and development in science and technology; joint R&D in all areas of S&T except energy and cooperation in developing S&T policies of the two countries; individual cooperating agencies negotiate funding with counterpart agencies.
Japan	USGS	Earth Sciences	10/28/88	10/28/91	49.5	Debris flow research; experimental studies of bedform alignment related to sediment transport studies on continental shelves and in estuaries. Japan provides approximately \$37,800.
Jordan	USGS	Earth Sciences	09/01/82	03/31/90		Seismic network program remote sensing; funded by USAID at \$523,800. Jordan framework for cooperation. Referenced IPR clause unlike most actually stating that "unless the parties mutually agree to the contrary"
Kenya	HHS	Biomedical Sciences	01/01/79		200	Malaria research by the Centers for Disease Control and collaborating Kenyan agencies.
Korea	DOE	Energy	11/06/81	11/06/91		Cooperation in the broad area of energy conservation.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Korea	DOE	Energy (Renewable)	11/06/81	11/06/91		Cooperation in all phases of solar energy research.
Korea	DOE	Energy (Fossil)	11/06/81	11/06/91		Exchange of coal related information; personnel exchange and consultation in coal technology.
Korea	EPA	Environment			nb	An MOU between EPA and Korea Environment Agency was signed on Nov. 2 1987 but does not enter into effect until the umbrella S&T agreement is signed.
Korea	HHS	Biomedical Sciences	05/01/76	10/01/88		Genetic engineering under the U.S.-Korea S&T agreement.
Korea	HHS	Biomedical Sciences	04/01/86	04/01/91		Toxicological data information exchange and training. Korean Institute of Chemical Technology.
Korea	NIST	Metrology	06/01/86	06/01/89		Agreement with the Korea Standards Research Institute to improve knowledge and engineering practices in measuring mechanical properties of materials at low temperatures; low pressure measurement techniques; methodology development for secondary ion mass spectrometric analysis. Awaiting completion of a new IPR package.
Korea	NIST	Metrology	10/22/86	10/21/89	nb	Metals; investigation of electrodeposited amorphous alloys for application in small scale industrial processes with emphasis on wear corrosion and magnetic performance.
Korea	NOAA	Fisheries	03/01/77	07/31/91	NA	Governing International Fishery Agreements established on a bilateral basis conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. EEZ.
Korea	NRC	Nuclear Safety	05/01/86			Thermal hydraulic research.
Korea	NRC	Nuclear Safety	11/01/81	11/01/86		Information exchange; renewal under negotiation.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Korea	NRC	Nuclear Safety	12/28/87	12/28/90		Severe accident research.
Korea	NSF	Basic Sciences	05/24/87	05/24/92	370	NSF-KOSEF MOU under S&T umbrella agreement; joint research seminars and workshops; long-term joint research visits; short-term project development visits; annual seminars identify joint priorities. IPR under negotiation.
Korea	US Gov	S&T Umbrella	11/22/76	10/01/88		Agreement relating to scientific and technical cooperation; negotiations currently underway on renewal of agreement; individual cooperating agencies negotiate funding with counterpart agencies.
Korea	USGS	Earth Sciences	10/16/78	12/31/89		All activities determined by project annexes. There are seven such annexes to date.
Kuwait	USGS	Earth Sciences	12/04/88	12/31/93		Amended and extended a 1983 MOU. Now includes intellectual property rights stipulations.
Liberia	USGS	Earth Sciences	03/24/86	03/24/91		General framework for cooperation. IPR contains the sentence: "Unless the parties mutually agree to the contrary; no information and data shall be subject to copyright protection in the United States of America."
Malaysia	BReclam	Natural Resources	07/01/83		35	Technical assistance during initial filling of Batu Dam for water conservation and flood control; funding by Malaysia.
Mauritania	USGS	Earth Sciences	01/11/18	01/11/92		
Mexico	Census	Statistics	03/27/86	03/27/91	None	This cooperation agreement provides for the exchange of methodologies; documents; information; and training and the development and execution of joint statistical projects.
Mexico	DOE	Energy (Fossil)	06/20/83	06/20/89		Exchange information and develop basic and applied research programs in petroleum technology.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Mexico	DOE	Energy (Renewable)	04/07/86	04/07/94		Develop and understanding of geothermal reservoirs in sedimentary and fractured igneous rocks.
Mexico	DOT	Transportation	11/16/72		nb	Highway; rail; maritime search and rescue; oil pollution control; joint border transport planning.
Mexico	DOT	Transportation	06/01/89		nb	Agreement between the United States Coast Guard and the Government of Mexico for cooperation in maritime search and rescue.
Mexico	EPA	Environment	08/14/88		nb	U.S.-Mexico governmental agreement for cooperation in the protection; improvement and conservation of the border environment; specific programs are outlined in the annexes to the agreement: 1. solution of the border sanitation problem at San Diego and Tijuana; 2. cooperation on discharges of hazardous wastes along the border; 3. cooperation on transboundary shipment of hazardous substances; 4. cooperation on transboundary air pollution from copper smelters.
Mexico	FWS	Natural Resources	05/12/84	05/11/94	50	Cooperative projects on endangered species; migratory birds; law enforcement; training; and other wildlife matters.
Mexico	FWS	Natural Resources	03/16/88		75	Tripartite cooperation on waterfowl and wetlands cooperation.
Mexico	HHS	Biomedical Sciences	06/30/76			NIH/National Library of Medicine MEDLARS Agreement with Centro Nacional de Informacion y Documentacion en Salud (CENIDS); interlibrary exchange.
Mexico	HHS	Food and Drug Reg.	10/15/81			General umbrella agreement between the FDA and the Mexican SSA to cooperate in the scientific and regulatory fields of health.
Mexico	HHS	Biomedical Sciences	03/01/82	12/31/88		National Institute of Alcohol Abuse and Alcoholism agreement for scientific cooperation with the Mexican Institute of Psychiatry includes exchanges; work-study programs and the conduct of joint collaborative alcohol research studies.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Mexico	HHS	Biomedical Sciences	12/01/83	12/01/88	24	Joint Working Group on Health; U.S.-Mexico Mixed Commission on Science and Technology; covers diarrheal diseases; maternal and child health (nutrition and breast feeding); diabetes and pregnancy biomedical instrumentation and repair.
Mexico	HHS	Biomedical Sciences	01/01/84;	11/01/88	5	Plan for scientific cooperation between NIH and the Center for Research regulation transport systems.
Mexico	HHS	Biomedical Sciences	01/01/84	12/31/90	100	Field epidemiology training by the Centers for Disease Control with the Secretaria de Salud.
Mexico	HHS	Food & Drug Reg.	02/22/88	02/22/98		FDA MOU with Secretaria de Salud on sanitary practices prevailing in the shellfish industries of Mexico and the U.S.
Mexico	NOAA	Fisheries (Gulf)	11/19/86	11/30/89	NA	a MOU for cooperative research on shared resources in the Gulf of Mexico for the exchange of scientific information and cooperative research on the fisheries sector.
Mexico	NOAA	Fisheries (Pacific)	11/19/86	11/30/89	NA	A MOU for cooperative research on shared resources in the Pacific and for the exchange of scientific information and cooperative research on the fisheries sector.
Mexico	NOAA	Fisheries	06/24/88	11/30/89	NA	A MOU for the exchange of scientific and economic data and information on the fisheries sector.
Mexico	NPS	National Parks	11/30/88	11/30/93		Noting the mutual objectives and interest of the parties declared in the Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere of 1940.
Mexico	NRC	Nuclear Safety	04/01/81	04/01/96		Information exchange; extension under review.
Mexico	NRC	Nuclear Safety	05/27/87	05/27/92		Nuclear safety research.
Mexico	NSF	Basic Sciences	06/15/72		138	Projects under the S&T umbrella agreement; information and personnel exchanges; joint research; seminars; workshops and meetings.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Mexico	US Gov	S&T Umbrella	06/15/72			Agreement for scientific and technical cooperation; individual cooperating agencies negotiate funding with counterpart agencies; restructuring of bilateral mixed commission in 1988 to deal with policy and coordination issues only.
Mexico	USDA	Agricultural Science	12/06/83	10/01/87	16	Agricultural R&D; plant genetic research; screwworm research; pine beetles seminar; nutrition seminar; distributed watershed modeling.
Mexico	USGS	Earth Sciences	03/31/89	03/31/94		Goal is to establish an active continuing program of scientific cooperation in geothermal and related volcanic investigations and to improve the technical capabilities of both parties.
Morocco	BRclam	Natural Resources	05/01/84	09/30/89	700	Development assistance in weather modification programs to increase natural water supplies; funding by USAID.
Mozambique	USGS	Earth Sciences	04/10/86	04/09/91		All activities governed by project annexes. IPR clause not standard; includes the following: "Unless the parties mutually agree to the contrary; no information and data shall be subject to copyright protection in the United States of America."
Multilateral	DOT	Transportation	01/01/70		nb	EUROCONTROL group: Civil aviation; management information exchanges on air navigation.
Multilateral	DOT	Transportation			nb	Commission International de L'Eclairage - Division 4 - Lighting and Signaling for Transport; development of technical reports; guidelines; and/or standards.
Multilateral	DOT	Transportation			nb	United States International Telecommunications Union (ITU): World Administrative Radio Conference for Mobile Services.
Multilateral	DOT	Transportation			nb	Permanent International Association of Navigational Congresses (PAINC); technology and policy sharing.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Multilateral	DOT	Transportation			nb	United Nations International Civil Aviation Organization (ICAO); annual Assembly Meetings; 9 regional groups; 3 special committees; 13 panels which have established various ad hoc study groups. Multilateral
Multilateral	DOT	Transportation			nb	Permanent International Association of Road Congresses (PIARC).
Multilateral	DOT	Transportation			nb	European Conference of Ministers of Transport; various technical subjects; high-level policy discussions in Council sessions.
Multilateral	DOT	Transportation			nb	Pan American Railway Congress Association (PARCA).
Multilateral	DOT	Transportation			nb	United Nations International Maritime Organization (IMO); annual Assembly; Council; Committees on Maritime Safety; Marine Environment Protection; Legal; Facilitation; and Technical Cooperation.
Multilateral	DOT	Transportation			nb	Organization for Economic Cooperation and Development (OECD); DOT represented on Road Transport Research Program Steering Committee and active in selected research studies.
Multilateral	DOT	Transportation			nb	United Nations International Atomic Energy Agency (IAEA); Standing Advisory Group on Safe Transport of Radioactive Materials.
Multilateral	DOT	Transportation			nb	International Organization for Standardization (ISO); transport vehicle hardware standardization.
Multilateral	DOT	Transportation			nb	Maritime: special groups: International Association of Lighthouse Authorities; International Working Group on LORAN C; International Ship Structures Congress; International Radio Consultative Committee; Panama Canal Seminar on Tonnage System Changes; Seminars on Marine Pollution and Chemical Tankers and Gas; International Symposium on Remote Sensing of the Environment; Venezuela Air Safety Congress; Search and Rescue Satellite-aided Tracking Demonstration Project; UNEP Monitoring Committee on the Action Plan for the Caribbean Environment Program.

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Country	Agency	Subject	EIF Date	Term Date	Fund- ing	Remarks
Multilateral	DOT	Transportation			nb	Pan American Highway Congress - Pan American Institute of Highways; training and technology transfer for highway construction to member countries.
Multilateral	DOT	Transportation			nb	International Road Federation: highway projects and technical database coordination.
Multilateral	DOT	Transportation			nb	Organization of American States (OAS): Inter-American Port and Harbor Conferences.
Multilateral	DOT	Transportation			nb	United Nations Economic and Social Commission of Asia and the Pacific (ESCAP).
Multilateral	DOT	Transportation			nb	United Nations Economic Commission for Europe (ECE); Inland Transport Committee Groups of Experts on Construction of Vehicles; Road Safety; Combined Transport; Transport of Dangerous Goods; Committee on Development of Trade; Facilitation.
Multilateral	DOT	Transportation			nb	United Nations Economic and Social Council; Committee of Experts on Transport of Dangerous Goods.
Multilateral	FWS	Natural Resources	04/30/42		499	Institution building and training in Western Hemisphere Countries; grants and projects in support of regional capabilities for managing wildlife; environmental education; graduate program development; technical information data centers.
Multilateral	FWS	Natural Resources	01/01/87		30	Training and research in 8 Asian countries; 8 grants in support of biological diversity; USAID funding at \$260,000.
Multilateral	FWS	Natural Resources	01/01/87		40	Training and research in 13 Near East countries; 12 grants in support of biological diversity; USAID funding at \$186,000.
Multilateral	HHS	Biomedical Sciences	03/01/79	09/01/91	5610	Child survival and combatting childhood communicable diseases; Centers for Disease Control program of training and logistics planning for advancement of childhood immunization programs; malaria prophylaxis and diarrheal disease control; covers 12 African countries: Burundi; Central African Republic; Guinea; Ivory Coast; Lesotho; Liberia; Malawi; Nigeria; Rwanda; Swaziland; Togo and Zaire (USAID funded).

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Multilateral	HHS	Biomedical Sciences	01/01/84	12/31/89	31	International Collaborative effort on Perinatal and Infant Mortality with Denmark; FRG; Israel; Japan; Norway; Sweden and the UK by the National Center for Health and Statistics.
Multilateral	NIST	Materials Science	05/01/87	04/30/90	nb	International accord with France; UK; Italy; Canada; Japan; FRG and Commission of European Communities; participation in the Versailles Project on Advanced Materials (VAMAS); which now operates independently of the economic heads; VAMAS aims to introduce advanced materials into high-tech products and engineering structures and to encourage trade through agreement on codes of performance; NIST represents the U.S. and chairs the steering committee.
Multilateral	NOAA	Space Technologies	09/01/88		NA	Search and Rescue Satellite System.
Multilateral	NPS	Natural Resources	09/23/81		10	Technical assistance; Western Hemisphere Convention and Caribbean Basin Initiative park development; participants include Argentina; Barbados; Brazil; British Virgin Islands; Chile; Colombia; Costa Rica; Grenada; Jamaica; Mexico; Panama; Peru; St. Vincent and the Grenadines.
Multilateral	NPS	Natural Resources	03/09/84	03/09/90	13	Technical assistance and information exchange; Man and the Biosphere Program; biological surveys and monitoring; reference text development; biosphere reserves; participants include Canada; Mexico; Rwanda; FRG and all MAB countries; other U.S. Government funding of \$30,500.
Multilateral	NPS	Natural Resources	06/21/84		53	Policy coordination; World Heritage Site nomination; cultural resource cooperation with ICOMOS; participants include World Heritage Convention countries.
Multilateral	NPS	Natural Resources	09/22/86	09/22/91		Training; Peace Corps Volunteer training in national parks and conservation; participants include Malawi; Morocco and Sierra Leone; other U.S. government funding of \$18,000.
Multilateral	NPS	Natural Resources		07/31/89	17	Training and information exchange; training for foreign park professionals in U.S. National Parks; provision of technical information on parks and protected areas to USAID missions and foreign governments.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Multilateral	NRC	Nuclear Safety	09/20/84	09/20/89		EURATOM; nuclear safety research.
Multilateral	NRC	Nuclear Safety	01/01/85	12/31/90		OECD Halden Reactor project.
Multilateral	NRC	Nuclear Safety	09/01/86	09/30/89		OECD project on LOFT experimental program.
Multilateral	USGS	Earth Sciences	01/01/86			Acquisition of geodetic and gravity data; aerial photography; satellite imagery and production of maps; Operation of the Scientific Committee on maps; Operation of the Scientific Committee on Antarctic Research (SCAR) Library for Geodesy and Geographic Information. Funding at \$300,000 provided by the National Science Foundation.
Multilateral	USGS	Earth Sciences	01/01/72		rmk	Antarctic ice cap motion studies; seismology investigations and data telecommunications at the South Pole. Funding of \$160,000 by DMA.
Multilateral	USGS	Earth Sciences	01/01/74		68.7	Advisory coordination and training in the southwest and western Pacific; coastal geological hazards and resources; one USGS employee in residence in Fiji; CCOG/SOPAC provides approximately \$13,000 and Government of France \$2400.
Multilateral	USGS	Earth Sciences	01/01/74		240	Circum-Pacific Map Project.
Multilateral	USGS	Earth Sciences	01/01/86		40	Advisory consultations to intergovernmental geoscience bodies in eastern Asia; particularly in resource assessment methodologies; about \$5000 in travel funds from the U.S. Department of State and \$5000 from the International Union of Geological Sciences.
Multilateral	USGS	Earth Sciences	08/01/86	07/31/91	22	Interagency Volcano Early Warning Disaster Assistance Program funded by USAID/IFTA and AID/Guatemala at \$200,000; provides for emergency response to volcano crises.
Multilateral	USGS	Earth Sciences	03/01/87	09/01/91		Famine Early Warning System (FEWS) Program; application of Geographic Information System (GIS) to target populations at risk of famines in 8 sub-Saharan countries and 6 Horn countries. AID funding \$497,000.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Multilateral	USGS	Earth Sciences	04/01/	09/01/		
Multilateral	USGS	Earth Sciences	10/01/87	12/01/89	13	Low frequency ice radar experiments in Antarctica. NSF funding at \$6,000.
Multilateral	USGS	Earth Sciences	11/01/87	02/01/89	26	Field research at lakes in dry valleys related to global carbon cycle in Antarctica. NSF funding at \$18,000; 6.5 man-months TDY's in 1989.
Multilateral	USGS	Earth Sciences	01/01/88		60	International Strategic Minerals Inventory: Global Inventory of Strategic Commodities including cobalt; nickel; platinum; and titanium. Participants are from Australia; Canada; South Africa
Multilateral	USGS	Earth Sciences	04/01/88	04/30/91		Identify remote sensing data requirements for AGRHYMET agricultural assessments in 9 west African countries. AID funding of \$1.2 million.
Multilateral (EC)	DOE	Energy (Nuclear)	01/28/82	06/30/90		Nuclear material safeguards research and development.
Multilateral (EC)	DOE	Energy (Nuclear)	10/06/82	10/06/92		Exchange of information on the management of radioactive waste; i.e. characterization of waste forms and disposal in geologic formations.
Multilateral (EC)	DOE	Energy (Nuclear)	07/07/86	07/07/91		Cooperation on a range of R&D aspects of radiation protection in areas such as source and dose determination; environmental processes and effects; somatic health effects; genetic health effects.
Multilateral (EC)	DOE	Energy (Fusion)	12/15/86	12/15/96		Maintain and intensify cooperation between EURATOM and DOE in the areas covered by their respective magnet fusion programs in order to develop the scientific and technological understanding underlying a magnetic fusion power system.
Multilateral (EC)	NOAA	Fisheries	06/01/77	07/31/91	NA	Governing International Fishery Agreements established on a bilateral basis; conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. EEZ.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Multilateral (EC)	US Gov	Environment	06/04/74			Letters establishing the framework for cooperative environmental activity. Initial areas of interest: exchange of information on methods of analysis and measurement of certain air and water pollutants and on the state of knowledge of their harmful effects including the harmful effects of noise; exchange of information in establishments of criteria and quality objectives; exchange of information on pollution problems posed by certain industries; exchange of information on possible US-EC trade problems resulting from environmental matters; exchange of information on the effects of energy production on the environment; study of the possibility of conducting jointly epidemiological investigations; exchange of information on procedures for testing the toxicity of certain pollutants; exchange of information about toxic wastes; exchange of information concerning the impact of certain agricultural activities on the environment; exchange of information on programs for public awareness and education; joint organization of conferences and symposia.
Multilateral (EC)	USDA	Remote Sensing				Remote sensing applications to agriculture and forestry. Currently delayed because of IPR impasse.
Multilateral (ESA)	NASA	Space	03/21/74			Memorandum of Understanding between the European Space Research Organization and the United States National Aeronautics and Space Administration.
Multilateral (ESA)	NASA	Space	03/17/75			International Sun/Earth Explorer program.
Multilateral (ESA)	NASA	Space & Aeronautics	03/29/79		10	Ulysses; cooperative mission to study the poles of the sun.
Multilateral (ESA)	NASA	Space & Aeronautics	01/14/86			Agreement for tracking and data reception for the ESA Earth Remote Sensing Satellite (ERS-1).
Multilateral (ESA)	NASA	Space & Aeronautics	09/29/88			Entering Phase C/D of the Space Station Program; Detailed Design and Development; total funding with all international partners in excess of \$7 billion; ESA hardware accounting for \$4 billion. Agreement also includes Canada and Japan.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Multilateral (ESA)	NASA	Space				Procurement and use of a space laboratory in conjunction with the space shuttle system. Currently delayed because of IPR impasse.
Multilateral (ESA)	NOAA	Space Technologies	02/23/84		NA	MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5.
Netherlands	DOT	Transportation	09/28/77		nb	Transportation economics studies; highway traffic safety; civil aviation; urban systems; drug testing studies.
Netherlands	EPA	Environment	11/17/85		nb	Self-renewing MOU between EPA and the Ministry of Housing; Physical Planning; and Environment. Covers the same broad range of topics as the U.S.-FRG agreement. EPA and the Ministry co-sponsored a major symposium on ozone; the third in a series of trilateral symposia on major air-related issues.
Netherlands	HHS	Food Sciences	10/18/88			Dry milk products; FDA MOU recognizes certificate of analysis from government authorities.
Netherlands	NRC	Nuclear Safety	09/23/87	09/23/92		Information exchange.
Netherlands	USDA	Agricultural Science	11/20/85	11/20/90	50	Agricultural S&T; plant physiology; economic research; soil and water science; integrated pest management.
New Zealand	HHS	Food & Drug Reg	11/11/75			FDA MOU covering dry milk products certification for export to the U.S.
New Zealand	HHS	Food & Drug Reg	10/30/80			MOU; shellfish sanitation and certification for export to U.S.; annual inspection of growing areas and processing facilities.
New Zealand	NSF	Basic Sciences	07/01/88	06/30/92	108	Projects under S&T umbrella agreement; joint research; information and personnel exchanges; utilization of installations.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
New Zealand	US Gov	S&T Umbrella	02/27/74	08/27/89		Agreement for scientific and technological cooperation; individual cooperating agencies negotiate funding with counterpart agencies.
New Zealand	USDA	Agricultural Science	11/29/83	11/29/88	2	Agricultural R&D; tree improvement; animal diseases surveillance systems.
New Zealand	USGS	Earth Sciences	06/23/86		50	Joint USGS-New Zealand project to map regions of high scientific interest in McMurdo Sound area of Antarctica; funded by NSF; USGS completed its work on the first 5 sheets which were sent to New Zealand for compilation.
Norway	DOE	Energy (Fossil)	04/22/87	04/22/92		Establish an exchange of scientific and technical information regarding fossil energy R&D and conduct joint basic and/or applied fossil energy research projects. Norway
Norway	NASA	Space & Aeronautics	07/17/75			Agreement for sounding rocket launches from Andoya.
Norway	USGS	Earth Sciences	02/04/88	02/04/93		All MOU activities are set forth in project annexes which include referenced IPR arrangements. One project for developing methods for digital sonar image data active in 1989.
Norway	USGS	Earth Sciences	10/12/89	10/12/94		
Pakistan	BReclam	Natural Resources	04/18/84	04/18/89	500	Technical assistance in the design and construction of irrigation drainage systems; reclamation of saline and waterlogged agricultural lands; funding by the World Bank.
Pakistan	FWS	Natural Resources	01/01/78	12/01/92	500	Research in endangered species; training in wildlife management; conservation education. One of three Special Foreign Currency programs run by the FWS in which excess foreign currency is held by the FWS for use in conservation projects.
Pakistan	NOAA	Space Technologies	11/26/84		NA	MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Pakistan	NPS	Natural Resources	12/06/82			Technical assistance and training; national/cultural heritage conservation and management technical assistance; wildlife conservation training; operations are conducted under the auspices of the referenced agreement; there is no separate NPS agreement.
Pakistan	NSF	Basic Sciences	03/02/81	05/31/89		Cooperative Science MOU with the Pakistan Ministry of S&T; joint research and seminars and workshops; visits; supports attendance at international meetings; information and data exchanges; translation services. Now expired; was funded through SFC appropriations of about \$1 million annually; No funds allocated to support the MOU since 10/87. Pakistan Ministry of S&T has recently asked the NSF to renew it; NSF plans to review new requirements for IPR before responding.
Pakistan	US Gov	S&T Umbrella	12/06/82			Agreement to establish a Joint Commission on economic; commercial; scientific; technological; educational and cultural cooperation.
Pakistan	USGS	Energy	08/07/85	07/31/89	2m	Four-year \$5 million program for coal resources exploration and assessment; national coal exploration plan; coal analytical laboratory system; geodata center; and institutional modernization of the Geological Survey of Pakistan. Funded by USAID.
Philippines	HHS	Biomedical Sciences	06/01/87	12/31/89	265	Centers for Disease Control and Department of Health program in field epidemiology training (USAID funded).
Philippines	NRC	Nuclear Safety	06/01/85	06/01/90		Information exchange.
Philippines	NRC	Nuclear Safety	08/01/85	08/01/90		Thermal hydraulic research.
Philippines	USDA	Agricultural Science	02/10/88	02/10/93	3	Agricultural S&T; cocoa production technology.
Poland	DOT	Transportation	11/03/71		rmk	Transportation agreement carried out; and projects funded under the 1988 U.S.- Poland S&T agreement. Special interests are rail safety and highway basic science R&D. Funding for FY 1989 from MSC-II fund of \$24,000 and dollar equivalent; supplemented by \$54,000 of DOT funds; for two parallel rail safety projects.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Poland	EPA	Environment	09/10/87	09/10/92		Agreement between EPA and the Ministry of Environment which may cover air and water pollution; hazardous waste management; effects of pollutants on flora and fauna; radiation; health effects of pollutants and environmental management and planning. EPA also participates in the U.S.-Poland agreement on S&T cooperation and is developing projects on health effects; radiation; and hazardous waste management.
Poland	HHS	Biomedical Sciences	10/01/84		294	Agreement between HHS and the Polish Ministry of Health and Social Welfare; cooperation on mental health problems; cardiovascular and pulmonary diseases; individual health scientist exchanges; cancer research and mental health.
Poland	HHS	Biomedical Science	10/08/87	10/08/92		Epidemiological; basic; and clinical investigations in the field of cancer.
Poland	NIST	Basic & Applied Sci.	09/29/87	09/28/92	35	NIST is one of several U.S. technical agencies cooperating under the U.S.- Polish agreement for scientific and technological cooperation. The Maria Sklodowska-Curie Fund is established as the funding vehicle.
Poland	NOAA	Fisheries	02/01/87	07/01/91	NA	Governing International Fishery Agreements established on a bilateral basis; conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone.
Poland	NPS	Natural Resources	09/01/87	09/01/92		Cooperation and exchange; natural and cultural heritage conservation and management; personnel; information exchange.
Poland	NSF	Basic Sciences	06/13/88	06/13/93	153	MOU under the 1987 S&T umbrella agreement provides for joint research projects; seminars and workshops; and short-term project development visits.
Poland	US Gov	S&T Umbrella	09/28/87	09/28/92		Agreement established a joint commission and a joint fund with contributions from both sides after lapse of an earlier agreement signed in 1972; extensive language on protection of intellectual property.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Poland	USGS	Earth Sciences	08/25/88	08/25/92	rmk	Establishes a framework for cooperation. Scope of cooperation determined by Article 1 of the Agreement on Cooperation in Science and Technology. \$36,000 joint Commission in FY 1989.
Portugal	USGS	Earth Sciences	05/18/87	05/17/92		Funded by the LUSO-American Foundation for \$43,000; massive sulfide deposit studies in the Iberian Pyrite Belt during 1986-1989.
Regional	HHS	Biomedical Science	10/26/77			NIH/National Library of Medicine MEDLARS Agreement for interlibrary exchanges.
Regional (Africa)	DOT	Transportation			cr	Civil aviation technical assistance in Cape Verde; Egypt; Liberia and Morocco.
Regional (Africa)	DOT	Transportation			cr	Regional highway technical assistance; transport planning and development in cooperation with USAID.
Regional (Asia)	DOT	Transportation			cr	Highway technical assistance in Kuwait and Turkey.
Regional (Asia)	DOT	Transportation			cr	Civil aviation technical assistance in Australia; Burma; Brunei; China; Hong Kong; ICAC; India; Indonesia; Israel; Japan; Korea; Malaysia; Marshall Islands; The Maldives; Micronesia; Nepal; New Zealand; Oman; Pakistan; Palau; The Philippines; Saudi Arabia; Singapore; Sri Lanka; Taiwan; and Thailand.
Regional (Asia)	DOT	Transportation			cr	Technical assistance to Saudi Arabia on transport system infrastructure establishment and training.
Regional (Europe)	DOT	Transportation			cr	Civil aviation technical assistance in Austria; Belgium; Denmark; EUROCONTROL; the FRG; France; Greece; Iceland; Ireland; Italy; the Netherlands; Poland; Portugal; Spain; Switzerland; and the United Kingdom. Programs have various start and end dates.
Regional (Oceania)	DOT	Transportation			cr	Highway technical assistance in Indonesia.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Regional (S America)	DOT	Transportation			cr	Civil aviation technical assistance in Argentina; Bolivia; Brazil; Chile; Colombia; Ecuador; Peru; Surinam; Uruguay; and Venezuela.
Regional (W Hemis)	DOT	Transportation			cr	Highway technical assistance in Barbados and Costa Rica.
Regional (W Hemis)	DOT	Transportation			cr	Civil aviation technical assistance in Barbados; Bahamas; Canada; Cayman Islands; COCESNA; Dominican Republic; Grenada; Guyana; Haiti; Iceland; Jamaica; Mexico; Netherlands Antilles; Organization of Eastern Caribbean States; Panama; Trinidad and Tobago and Turks and Caicos Islands.
Romania	DOT	Transportation	11/01/71		nb	Currently inactive. Rail; motor vehicle; highway maintenance; and human factors.
Romania	HHS	Biomedical Sciences	12/01/74			U.S.-Romania cooperation and individual health scientist exchanges; renewable every two years.
Romania	NSF	Basic Sciences	02/27/79	02/27/88	50	Joint workshops and seminars; short-term project development visits; joint research. Renewal pending.
Saudi Arabia	BRReclam	Natural Resources	02/13/75	02/01/90	1300	Technical assistance in the development of land and water resources; desalination application and research; institution building; funding by Saudi Arabia.
Saudi Arabia	DOE	Energy (Renewable)	02/04/87	02/04/92		Finding solutions to mutually agreed problems in renewable energy research and development.
Saudi Arabia	DOT	Transportation	10/26/83		rmk	Technical assistance to Saudi Arabia on transport system infrastructure establishment and training; primarily in highway and urban land transport systems. Funding: cost reimbursable; amount set each year. Termination and Renewal: can be terminated by termination of governing agreement.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Saudi Arabia	HHS	Biomedical Sciences	09/01/74	09/01/90		Under the U.S.-Saudi Joint Commission; economic cooperation to enable sharing of knowledge and transfer of technology for food and drug control and emergency medical services.
Saudi Arabia	HHS	Biomedical Sciences	10/01/86	12/31/93	146	CDC field epidemiology training program.
Saudi Arabia	NOAA	Atmospheric Sciences	02/01/75	02/01/90		Technical Cooperation Agreement; cooperation in integrating Saudi meteorological services and supporting research programs.
Saudi Arabia	NOAA	Space Technologies	09/25/84		NA	MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5.
Saudi Arabia	NSF	Basic Sciences	06/01/79	02/13/90	574	Umbrella project agreement in conjunction with the U.S. Treasury Department; institutional development; development of a national S&T information system; grants program and a national research institute; science education. An exchange of letters between the U.S. Government and the Saudi Arabia Government has agreed upon an indefinite extension until such time as King Fahd can come to the U.S. for a signing ceremony.
Saudi Arabia	USGS	Earth Sciences	01/01/83	01/29/90	rmk	Establishment of an earth sciences organization with staff, facilities; and procedures development. Geographic and geological cartography; mining; geologic; geochemical and geophysical studies; geologic and mineral resources database; \$5.8 million from Saudi Arabia in FY 1989.
Senegal	US Gov	S&T Umbrella	08/17/82	08/01/87		Agreement for scientific and technological cooperation.
Senegal	USGS	Earth Sciences	05/01/88	12/31/89	rmk	Extension of PASA. Funded by USAID at \$18,000.
Sierra Leone	HHS	Biomedical Sciences	01/01/82			Long-term agreement between Centers for Disease Control and Ministry of Health in joint research for viral hemorrhagic fevers.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
South Africa	NOAA	Space Technologies	10/19/83		NA	MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5.
South Africa	USGS	Earth Sciences	12/01/87	12/01/90		Agreement to jointly establish and run an integrated; real-time global seismic data acquisition system.
Spain	BRReclam	Natural Resources	10/01/84	04/01/90	100	Information exchanges and joint research; river basin modeling; irrigation design and operation; funding by Spain. An interagency agreement between the Department of State and the U.S. Department of the Interior under the authority of Section 632 of the Foreign Assistance Act.
Spain	DOE	Energy	06/06/86	06/06/91		Cooperation in R&D pertaining to nuclear waste management; renewable energy; including biomass; coal; and gas technologies; conservation; high energy physics; and environmental impact of energy technology.
Spain	DOT	Transportation	11/10/71		nb	Transportation planning exchanges; concrete structure research; seismic effects on bridge deck systems; five projects were funded under the U.S.-Spain Agreement of Friendship-Defense and Cooperation and carried out by U.S. universities.
Spain	NRC	Nuclear Safety	11/15/85	11/15/90		Nuclear reactor safety.
Spain	US Gov	S&T Umbrella	05/01/84	05/01/88		The U.S.-Spain Agreement of Friendship, Defense and Cooperation under which a Complementary Agreement on Culture and Education and Science and Technology functions expired in May 1988. Rights and obligations continue for 1 year. \$1.75 million in FY 88 ESF funds were allocated to Spain for the purpose of completing ongoing projects and terminating all activities; approximately \$5.5 million from previous years' allocations remain. U.S. and Spanish negotiators of the new security agreement have agreed that a new S&T agreement should be negotiated at the same time. Clearance on language proceeding.
Sri Lanka	NPS	Natural Resources	06/01/84	09/30/89		Training and technical assistance; Mahaweli protected area management; USAID funding of \$500,000.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Sri Lanka	US Gov	S&T Umbrella	06/01/84	06/01/90		Agreement on cooperation in science and technology.
Sweden	DOE	Energy (Nuclear)	09/09/80	12/31/90		Exchange of information in radioactive waste management; particularly in the assessment of rock formations for terminal storage.
Sweden	HHS	Food & Drug Reg.	10/17/72			FDA MOU; mutual acceptance of drug inspection reports on good manufacturing practices.
Sweden	HHS	Biomedical Sciences	10/20/74			National Library of Medicine MEDLARS Agreement with Karolinska Institute; interlibrary exchange.
Sweden	HHS	Food Sciences	11/15/77			MOU; FDA recognizes certificate of analysis from government authorities on dry milk.
Sweden	HHS	Biomedical Sciences	05/25/79			FDA MOU; agreement to implement good laboratory practices.
Sweden	NASA	Space & Aeronautics	08/28/73			Agreement for sounding rocket launches from Esrange.
Sweden	NRC	Nuclear Safety	01/01/75	01/01/90		Information exchange.
Sweden	NRC	Nuclear Safety	02/25/85	02/25/88		Thermal hydraulics; extension under negotiation.
Sweden	NRC	Nuclear Safety	09/17/85	12/31/90		Severe accident research.
Sweden	NRC	Nuclear Safety	03/03/87			International piping integrity research. Sweden
Sweden	NSF	Basic Sciences	10/20/84	10/20/89	144	Letter of Agreement for joint research; seminars; workshops and scientific exchanges with the National Science Research Council of Sweden.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Switzerland	DOE	Energy (Nuclear)	04/19/85	04/19/90		Study of mutually agreed topics associated with the management of radioactive waste and related activities under the nuclear fuel cycle.
Switzerland	HHS	Food & Drug Reg.	10/28/68			FDA MOU; mutual acceptance of drug inspection reports relating to good manufacturing practices.
Switzerland	HHS	Biomedical Sciences	02/21/80			National Library of Medicine MEDLARS Agreement with the Documentation Service of the Swiss Academy of Medical Sciences; interlibrary exchange.
Switzerland	HHS	Food & Drug Reg.	04/29/85			FDA MOU; mutual acceptance of non-clinical laboratory inspection reports and good laboratory practices.
Switzerland	NRC	Nuclear Safety	07/01/83	07/01/87		Heavy section steel technology program and research program in fracture mechanics of the Swiss Federal Institute for Reactor Research; extension to be negotiated.
Switzerland	NRC	Nuclear Safety	09/26/86	09/26/91		Radioactive waste management safety.
Switzerland	NRC	Nuclear Safety	03/01/87	03/01/90		International piping integrity research.
Switzerland	NRC	Nuclear Safety	06/01/87	06/01/91		Severe accident research.
Switzerland	NRC	Nuclear Safety	09/13/87	09/13/92		Information exchange; renewal agreement is awaiting signature.
Switzerland	NRC	Nuclear Safety				Thermal hydraulic transients and ECCS REFLOOD program; extension being negotiated.
Taiwan	BRReclam	Water Resources	08/24/87	08/24/92		Li-yu-tan Reservoir and Dam Project and Nan-hua Dam Project.
Thailand	BRReclam	Natural Resources	04/08/88	07/01/93	250	Development assistance in weather modification programs to increase natural water supplies; funding by USAID.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
Thailand	HHS	Biomedical Sciences	04/01/84	04/01/89		NIH activity under S&t Agreement; for aplastic anemia.
Thailand	NOAA	Space Technologies	09/18/85		NA	MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5.
Thailand	NPS	Natural Resources	04/01/84	04/01/89	10	Training and technical assistance in national parks; USAID funding of \$53,000.
Thailand	US Gov	S&T Umbrella	04/13/84	10/13/89		Agreement on cooperation in science and technology; individual cooperating agencies negotiate funding with counterpart agencies.
Thailand	USDA	Agricultural Science	09/19/84	09/19/89		Agricultural development; human nutrition; soil conservation techniques; post-harvest techniques for tropical fruits and vegetables.
Turkey	USDA	Agricultural Science	11/01/85	04/01/90	4	Agricultural S&T; joint activities in FY 1988 included First World Walnut Conference; few activities planned.
United Arab Emirates	USGS	Earth Sciences	02/06/88	02/05/93		An assessment of the ground-water resources of Abu Dhabi; funded by Abu Dhabi Emirate at \$6 million.
United Kingdom	DOE	Energy (Nuclear)	09/20/76	12/31/90		A balanced exchange of liquid metal fast breeder reactor technology in such areas as reactor safety; neutronics analysis; etc.; being renegotiated to include FRG; France; Italy and Belgium.
United Kingdom	DOE	Energy	10/18/84	04/30/90		IPR currently being renegotiated; will eventually be included.
United Kingdom	DOE	Energy (Nuclear)	03/01/85	03/01/93		Establish a reciprocal and balanced exchange of decommissioning technology and experiences with nuclear facilities.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
United Kingdom	DOE	Energy (Nuclear)	10/30/86	10/30/91		Exchange of technology for management of radioactive waste.
United Kingdom	DOE	Energy (Nuclear)	08/26/88	08/26/98		Establish a reciprocal balanced information exchange and collaboration on gas-cooled reactor graphite technology in cooperative areas such as graphite creep data; graphite fracture models and data; graphite strength data; and graphite probabilistic risk assessment methodology.
United Kingdom	DOT	Transportation	05/11/71		nb	Program implemented by the U.S.; France; Germany; Italy; Japan and the United Kingdom. Begun under the auspices of NATO CCMS.
United Kingdom	DOT	Transportation	11/09/81		nb	Original agreement extended and revised for indefinite duration; general transport system planning exchanges; civil aviation security.
United Kingdom	EPA	Environment	06/02/86			Exchange of information regarding management of hazardous wastes and acid deposition.
United Kingdom	HHS	Biomedical Sciences	06/25/74			NIH/National Library of Medicine MEDLARS Agreement with the British Library; inter-library exchange.
United Kingdom	HHS	Biomedical Sciences	06/06/86			FDA MOU; acceptance of medical device inspection reports.
United Kingdom	HHS	Food & Drug Reg.	03/28/88	03/28/92		FDA/EPA MOU with Department of Health and Social Security on reciprocal recognition of Good Laboratory Practice program.
United Kingdom	NOAA	Space Technologies	02/14/86	02/14/94	NA	United Kingdom will provide an Advanced Microwave Sounding Unit for flight on future NOAA spacecraft.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
United Kingdom	NPS	Environment	07/21/86	07/21/91		World Heritage Convention; conservation of protected landscapes; undeveloped coastline; and privately owned land; development of long distance trails and voluntary conservation organizations; environmental education; and the role of public and private sectors in conservation.
United Kingdom	NRC	Nuclear Safety	02/22/85	02/12/90		
United Kingdom	NRC	Nuclear Safety	01/01/86	01/01/92		
United Kingdom	NRC	Nuclear Safety	04/07/86	04/07/91		
United Kingdom	NRC	Nuclear Safety	08/03/87	08/03/92		
United Kingdom	NSF	Basic Sciences			157	
United Kingdom	USGS	Earth Sciences	02/14/84	09/30/89	rmk	Sea floor sonar imaging surveys using the Geologic Long-Range Inclined Asdic (Gloria) system. Project funding at \$4.5 million.
USSR	DOT	Transportation	05/31/88	05/31/93	nb	Civil aviation; railroad safety; highway bridge construction; and highway and traffic safety.
USSR	DOT	Transportation	01/10/89		nb	Agreement between DOT/USCG and MINMORFLOT to cover details of marine pollution response cooperation.
USSR	DOT	Transportation			nb	Agreement on establishment of joint (maritime) radio navigation systems. Awaits adoption of internal procedures.

SCIENCE, TECHNOLOGY AND AMERICAN DIPLOMACY

Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
USSR	EPA	Environment	05/23/72		nb	EPA and GOSKOMGIDROMET are lead agencies for this self-renewing governmental agreement; projects cover areas of water and air pollution; urban environments and park management; pollution associated with agricultural practices; marine pollution; environmental effects on climate; earthquake prediction; environmental education and legal and administrative matters.
USSR	FWS	Natural Resources	05/01/72		15	Exchange of scientists to work on conservation activities relating to wildlife and wildlife habitats.
USSR	HHS	Biomedical Sciences	05/01/72	05/01/91	344	Under government-to-government health agreement on cancer; cardiovascular disease; environmental health; arthritis; biomedical communication; eye disease and individual scientist exchange.
USSR	HHS	Biomed. Science	06/28/74			
USSR	NASA	Space & Aeronautics	04/01/87			Cooperation in 5 areas of space science and applications. Exchange of notes in 1988 extended the agreement to fly scientific instruments on each others' spacecraft and exchange results of independent studies of solar system exploration.
USSR	NIST	Metrology	12/01/78	12/01/89	23	Renewal being negotiated; contains IPR provisions. Cooperation in thermal physics and thermodynamics; materials science; spectroscopy; chemistry and chemical kinetics; cryogenic science; exchange of scientists; information and documentation exchanges joint meetings and seminars; joint research; exchanges are on a receiving side pays basis.
USSR	NOAA	Atmospheric Science	05/23/72	05/01/92	100	Agreement on Cooperation in the Field of Environment Protection; exchange of scientists; information exchange; and joint research on influence of environmental change on climate.
USSR	NOAA	Marine Science	06/19/73	03/13/88	NA	Agreement on cooperation in studies of the world oceans; agreement currently under renegotiation.

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Country	Agency	Subject	EIF Date	Term Date	Funding	Remarks
USSR	NSF	Basic Sciences	05/06/89	05/06/94	NA	Basic framework for cooperation; activities include joint research projects; joint workshops and seminars; individual visits.
USSR	US Gov	S&T Umbrella	01/08/89	01/08/94		Notes the General Agreement between the Government of the United States and the Government of the Socialist Republics on Contacts; Exchanges and Cooperation in Scientific; Technical; Educational; Cultural and other Fields; signed in 1985.
USSR	USGS	Earth Sciences	05/06/89	05/06/94		USSR; DOD and DOI funding of \$124,600; joint projects in predicting earthquakes; estimating seismic risk and understanding seismic sources; studies on marine mineral resources; climate change; Joint Verification Experiment and nuclear testing talks for exchange of geologic data and discussions on expanded cooperation.
Venezuela	NSF	Basic Sciences	07/22/83	07/22/88	67	Agreement expired
Venezuela	US Gov	S&T Umbrella	07/01/83	07/01/88		
Venezuela	USDA	Agricultural Science	07/01/83	07/01/88	18	
Venezuela	USGS	Earth Sciences	02/06/82	12/31/93	rmk	Geologic mapping and mineral resources assessment of the Guyana Shield; funding promised by Venezuela at \$350,000 per year.
Yugoslavia	DOT	Transportation	06/27/88	06/27/93	rmk	Interests are primarily in highway construction and urban traffic planning. Funding based on Congressional appropriation; varies by year.
Yugoslavia	HHS	Biomedical Sciences	11/01/79	11/01/92	365	
Yugoslavia	NIST	Basic Sciences	06/27/88	06/26/93	250	Projects conducted under the umbrella S&T agreement; 40 active projects with Yugoslav institutions in FY 1989 covering a wide range of mutual interests.

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Yugoslavia	NRC	Nuclear Safety	09/19/85	09/19/90		
Yugoslavia	NSF	Basic Sciences	06/01/80	06/01/92		NSF review research proposals in basic sciences and engineering and makes recommendations to a Joint U.S.-Yugoslav Board. Funds for research are provided by the Department of State and matched by the Yugoslav government; no NSF funds involved.
Yugoslavia	US Gov	S&T Umbrella	06/27/88	06/27/93		Supersedes and terminates previous umbrella agreement. Participating agencies: NSF; NIST; NIH; DOE; USGS; Smithsonian Institute; Bureau of Mines; EPA and NIDRR.
Yugoslavia	USDA	Agricultural Science	06/01/80			Special Foreign Currency projects
Zaire	HHS	Biomedical Sciences	01/01/84		400	
Zimbabwe	USDA	Agricultural Science	09/25/80			