Chapter 3

INTERNATIONAL SPACE COOPERATION

Contents

	Page
Introduction	33
International Cooperative Programs Worldwide	35
United States	35
The Soviet Union	41
European Space Agency (ESA)	43
The United Nations	45
International Telecommunications Satellite Organization (INTELSAT)	49
International Maritime Satellite Organization (INMARSAT)	50
World Meteorological Organization	51
Issues in Cooperation	52

List of Tables

Table No.		Page
3-1.	NASA Cumulative Statistical Summary Through Jan. 1, 1984	37
3-2.	Current Membership of COPUOS	46

List of Figures

Figure No.		Page
3-1.	Patterns of Global Governmental Outer Space Activities	34
3-2.	U.N. Bodies	54

Chapter 3
INTERNATIONAL SPACE COOPERATION

INTRODUCTION

International cooperation in civilian space activities has been a major component of U.S. space policy ever since specific provisions for cooperation were included in the 1958 National Aeronautics and Space Act (NAS Act). Later amendments strengthened the role of international cooperative agreements in pursuit of scientific and technical research. Because each successive administration and Congress have perceived international cooperation in civilian space activities to be beneficial to U.S. interests, U.S. involvement in international cooperation has stood the test of time and the annual appropriations process.

In the early days of the Space Age, the United States played a leading role in establishing the international legal regime for outer space. It was also a major force in establishing the multilateral communications organizations, INTELSAT and (to a lesser extent) INMARSAT, and in making the results of remote sensing from space available worldwide; in addition, it offered participation in scientific space projects to other countries (see fig. 3-l).

Recently, the National Aeronautics and Space Administration (NASA) opened its manned space flight program to other nations by flying foreign mission specialists on the Shuttle.

Cooperative programs in space, managed principally by NASA, but also by the National Oceanic and Atmospheric Administration (NOAA) and the Agency for International Development (AID), have supported the following U.S. technological, political, and economic goals:

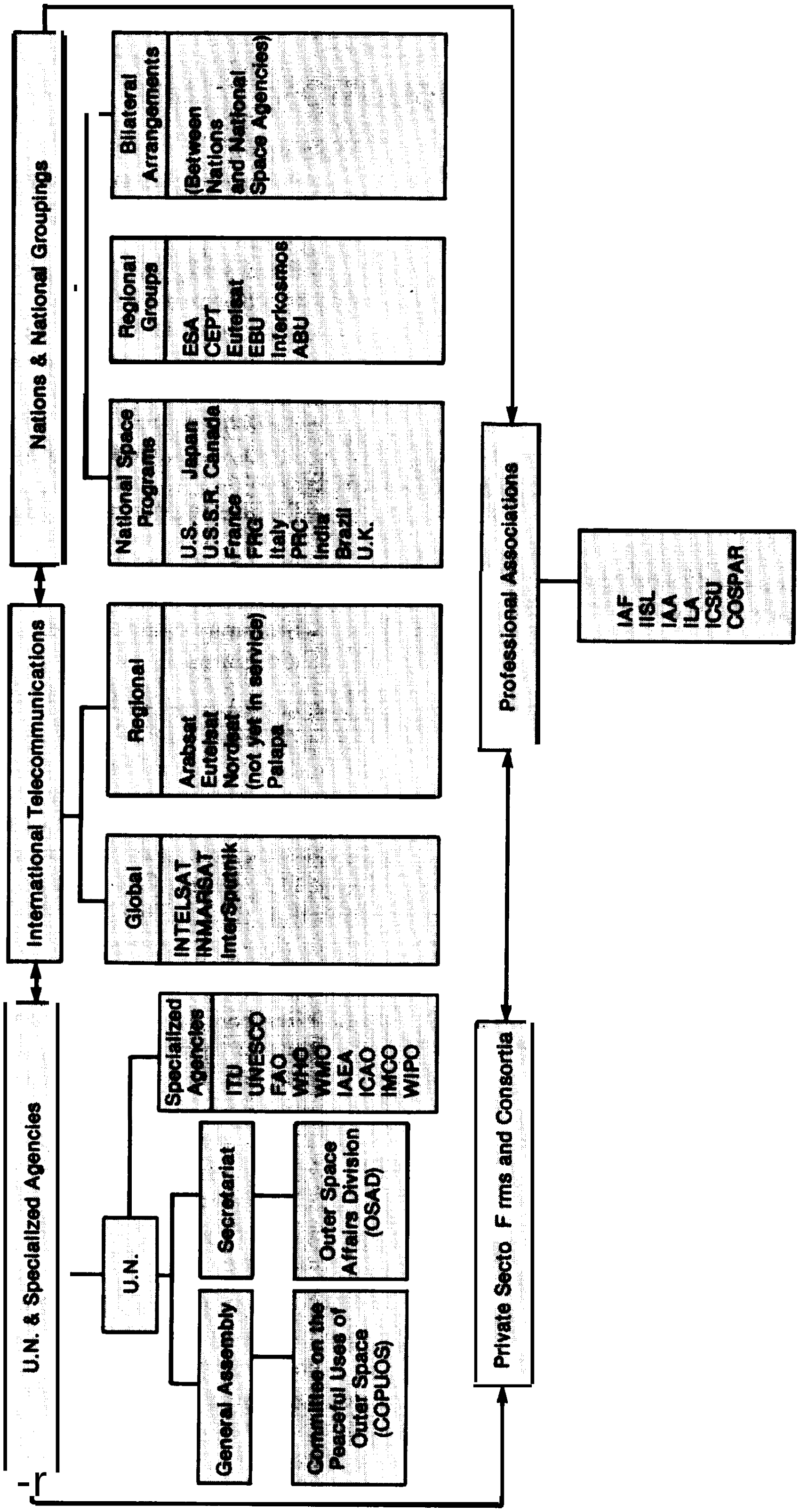
- Technological:
  - **–Affording access to foreign countries for tracking stations, launch sites, and ground receiving stations.**
  - **–Expanding research opportunities for U.S. scientists by sharing costs and acquiring/using knowledge from other countries.**
  - **–Allocating scarce resources such as the geostationary orbit.**
- Political:
  - **–Promoting international peace and reducing tensions through mutual understanding.**
  - **–Promoting greater openness and access to information.**
  - **–Increasing U.S. prestige by giving high international visibility to U.S. technical and scientific accomplishments.**
  - **–Affording political access to countries where U.S. influence is otherwise weak.**
- **Economic:**
  - **–Promoting economic development in developed as well as developing nations.**
  - **–Developing global markets** for U.S. space-related goods and services.
  - **–Sharing costs of expensive, long-term programs.**

The very success of U.S. international cooperative programs has helped intensify international challenges to U.S. leadership in space science and space applications. The pressure comes not only from other nations competing in space. Developing countries, voting in blocs, now challenge U.S. leadership in international organizations that deal with space matters. These challenges **raise critical questions about the future of** U.S. cooperative space projects:

1. How can the United States use its participation in international multilateral organizations and meetings on space to promote U.S. interests?
2. How can the United States cooperate most effectively with the developing countries?
3. On what terms might the United States most profitably cooperate with the industrialized nations?

This chapter summarizes the history of U.S. international cooperation in civilian space activities and describes its major accomplishments. it describes foreign cooperative programs and discusses issues arising from an altered international outlook with respect to space are discussed.

Figure 3-1.—Patterns of Global Governmental Outer Space Activities



INTERNATIONAL COOPERATIVE PROGRAMS WORLDWIDE

United States

Early Legislation

The history of cooperation in the use of outer space for peaceful purposes bears the indelible imprint of the U.S. Congress. Influential Members of both houses, including Speaker of the House John W. McCormack and Senate Majority Leader Lyndon B. Johnson, recognized as early as 1957 that a strong national space program offered a basis for international cooperation in activities which could extend peaceful pursuits on a worldwide frontier.

On January 15, 1958, Senator Johnson called for U.S. leadership in developing the capacity to explore the space environment. lie suggested that we invite the scientists of other nations to work with U.S. scientists on projects to extend the frontiers of mankind and to find solutions to the problems facing the world:[1]

> Our President . . . has a rare opportunity to lead in this labor boldly and forcefully and in the vigorous pursuit of peace; he will find the Nation undivided in its support . , . it would be appropriate and fitting for our Nation to demonstrate its initiative before the United Nations by inviting all member nations to join in this adventure into outer space together. The dimensions of space dwarf our national differences on Earth.

Later, on March 5, 1958, President Eisenhower approved a proposal for dividing control of space activities between the Department of Defense, which was to retain projects primarily associated with military requirements, and the National Advisory Committee for Aeronautics (NACA), which was to be the nucleus of a new civilian agency. The President's Science Advisory Committee published "Introduction to Space" on March 26, 1958, and on April 2, the President sent a special message on "Space Science and Exploration" to Congress with a draft proposal for legislation. The message stated that "a civilian setting for the administration of space functions will emphasize the concern of our Nation that outer space be devoted to peaceful and scientific purposes."

Although the Eisenhower Administration and Congress agreed on dividing space activities between military and civilian agencies and expanding NACA into the National Aeronautics and Space Administration, the special congressional space committees made several changes in the administration's bill, particularly with regard to the need for international cooperation. These actions reflected the testimony of scientists and engineers who had been engaged in global projects of the International Geophysical Year. According to Senate Resolution 327, Report No. 1925, 85th Congress, 2nd session, July 24, 1958:

> Particular attention should be paid to preserving and extending the patterns of cooperation which were formed during the International Geophysical Year. The IGY programs have been an inspiring example of cooperation between the scientists of 66 nations working through their own professional organization, the International Council of Scientific Unions (ICSU) and its Special Committee, the CSAGI (Comite Spécial de l'Année Geophysique Internationale). Another pattern of cooperation developed between scientists and their governments when public funds and facilities were provided for IGY research projects. Cosmic research and development can become an important force for world peace. We must not lose what has thus far been gained both on the international and national levels by scientists working with each other and with their governments.

The Senate also took account of certain technical facts:

> . . . that the orbits of satellites are global in nature and pass over national boundary lines; tracking stations were needed throughout the world; *and international space cooperation could promote peaceful relations among states and form the basis for avoiding harmful and destructive actions in space.* (Emphasis OTA.' S.)

The NAS Act begins with a Declaration of Policy and Purpose:

> The Congress hereby declares that it is the policy of the United States that activities in space

[1]Address by Senator Lyndon B. Johnson before a meeting of the Columbia Broadcasting System Affiliates, Shoreham Hotel, Washington, DC, Jan. 14,1958.

> should be devoted to peaceful purposes for the benefit of all mankind. (Sec. 102 (a).)

The policy declaration provides that:

> The Administration, under the foreign policy guidance of the president, may engage in a program of international cooperation in work done pursuant to this Act, and in the peaceful application of the results thereof, pursuant to agreements made by the President with the advice and consent of the Senate (sec. 205).

Recognizing that not all of NASA's international arrangements could be in the form of treaties subject to the advice and consent of the Senate, President Eisenhower, in signing the bill on JUly 29, 1958, stated that while treaties may be made in this field, the section does not preclude "less formal arrangements for cooperation" since otherwise the section would "raise substantial constitutional questions. " A later (1975) amendment incorporating provisions on Upper Atmospheric Research further specified that NASA, under the President's direction and after consulting the Secretary of State "shall make every effort to enlist the support and cooperation of appropriate scientists and engineers of other countries and international organizations. "[2]

NASA International Program

In keeping with the spirit of the 1958 NAS Act, NASA has developed an extensive program of international cooperation which has opened the entire range of its space activities to foreign participation. Cooperation by the United States with other nations (who pay their share of the cost of a project on a fully proportional basis) contributes to the U.S. space research program and to broader national objectives by:

- stimulating scientific and technical contributions from abroad,
- enlarging the potential for developing the state of the art,
- providing access to foreign areas useful for data collection during space, flights,
- enhancing satellite experiments through foreign ground-support programs,
- developing cost-sharing and complementary space programs,
- extending international ties among scientific and national communities, and
- supporting U.S. foreign relations and foreign policy.

Cooperative activities have ranged from launching foreign-built spacecraft on U.S. launchers to ground-based studies, analysis of data, and information exchanges. They include, for example, contributions of experiments or payloads to be flown in space by NASA, joint projects to develop flight hardware, use of data or lunar samples provided by NASA missions, training, visits, and joint publication of scientific results. In addition, NASA provides certain services on a reimbursable basis, including launching satellites and data and tracking services (table 3-1).

Cooperative programs and activities involving nations and groups of nations are established by: 1) agency-to-agency memoranda of understanding (MOUs), 2) agency-to-agency letter agreements, or 3) more formal intergovernmental agreements. The relative complexity, total shared cost, and duration of the program or project dictate in part the type of arrangement used to establish the cooperative effort.

Bilateral arrangements between the United States and one other country are by far the most common. NASA prefers bilateral activities over multilateral ones because they are substantially less complex and easier to manage.[3] Because of the complexities inherent in international cooperation by government agencies, the fewer involved the better. Technical and cost difficulties also arise in the joint development of hardware. For this reason, NASA has found that the most desirable arrangements involve the development of separate spacecraft or separate major components. In such missions the management and technical interactions can be kept simple.[4] Joint ventures with the European Space Agency (ESA) tend to have some of the complexity of multina-

[2] International Aspects of the National Aeronautics and Space Act of 1958, as amended (72 Stat. 426).

[3] *UNISPACE '82: A Context for Cooperation and Competition—A Technical Memorandum* (Washington, DC: U.S. Congress, Office of Technology Assessment, OTA-TM-ISC-26, March 1983), app. B (prepared by NASA).

[4] See, for example: Working Group Report on Space Science, in *Global Space Activities: An AIAA Assessment, 1981,* pp. 52-53.

Table 3-1 .—NASA Cumulative Statistical Summary Through Jan. 1, 1984

Cooperative arrangements	Number of countries/ international organizations	Number projects/ invest igat ions/actions completed or in progress as of 1/1/84
Cooperative spacecraft projects	8	38
Experiments on NASA Missions:		
Experiments with foreign principal investigators	14	73
US. experiments with foreign co-investigators or team members	11	56
U.S. experiments on foreign spacecraft	3	14
Cooperative sounding rocket projects	22	l,774a
Joint development projects	5	9
Cooperative ground-based projects:		
Remote sensing	53	163
Communication satellite	51 (27)[b]	19
Meteorological satellite	44 (122)C	11
Geodynamics.	43	20
Space plasma	38	10
Atmospheric study	14	11
Support of manned space flights	21	2
Solar system exploration.	8	10
Solar terrestrial and astrophysics	25	11
Cooperative balloon and airbrone projects:		
Balloon flights.	9	14
Airborne observations	12	17
International solar energy projects	24	9
Cooperative aeronautical projects	5	40
U.S./U.S.S.R. coordinated space projects	1	9
U.S./China space projects	1	5
Scientific and technical information exchanges	70	3

[a]Number of actual launches.
[b]AIDSAT Demonstrations,
[c]APT stations,

SOURCE: National Aeronautics and Space Administration

tional ventures (although they are considered by NASA to be bilateral), since ESA represents a multinational consortium and is subject to more complex internal political pressures than a national agency would be.

Some examples of major cooperative programs illustrate the breadth of the U.S. international space program:[5]

- **Cooperative space projects** involve cooperation between the United States and other nations to develop, launch, and operate communications satellites, scientific satellites, and Earth sensing satellites. A typical example is the Communications Technology Satellite (CTS), a joint effort with Canada in 1976. Canada built the satellite at its Communications Research Center (CRC), using special hardware supplied by the United States, which enabled the CTS to transmit at high power levels to small terminals. NASA launched the satellite and shared operations with Canada.
- **Foreign experiments on NASA missions include,** for example, an investigation of composite materials processing in space conducted by the Japanese National Research Institute for Metals in 1973 aboard the U.S. Skylab. The University of Bern, Switzerland, mounted a series of experiments on U.S. manned missions between 1969 and 1973 to measure the composition of solar wind. The Netherlands' Dekt Technical Institute built a telescope to measure cosmic ray elec-

[5]A complete list of NASA's cooperative programs can be found in 25 Years *of NASA International Programs,* NASA, January 1983.

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trons, which it mounted on NASA's fifth Orbiting Geophysical Observatory.

- **U.S. experiments on foreign spacecraft are also supported, such as a NASA experiment to study aspects of spacecraft behavior on a European** Space Agency flight.
- **Cooperation on sounding rocket projects** has involved scientific research with many nations in all regions of the world. The purpose of these flights is usually upper-atmosphere research, since sounding rockets follow a suborbital trajectory. An example is a series of flights in 1980 on NASA rockets carrying German and Norwegian experiments to study energetic processes in the upper atmosphere.
- **Foreign ground stations are evidence of the widespread use of land and meteorological remote sensing. Ten foreign Landsat receiving, processing, and data distribution facilities now exist around the world. Some 125 countries own meteorological satellite receiving stations. Remote sensing projects have resulted in research on the oceans, winds, waves, snow cover, and snow melting. When nations report their national space activities to the United Nations, the most frequent (and often the only) entry is a remote sensing agreement on the use of Landsat data and derived information products to solve resource problems.**

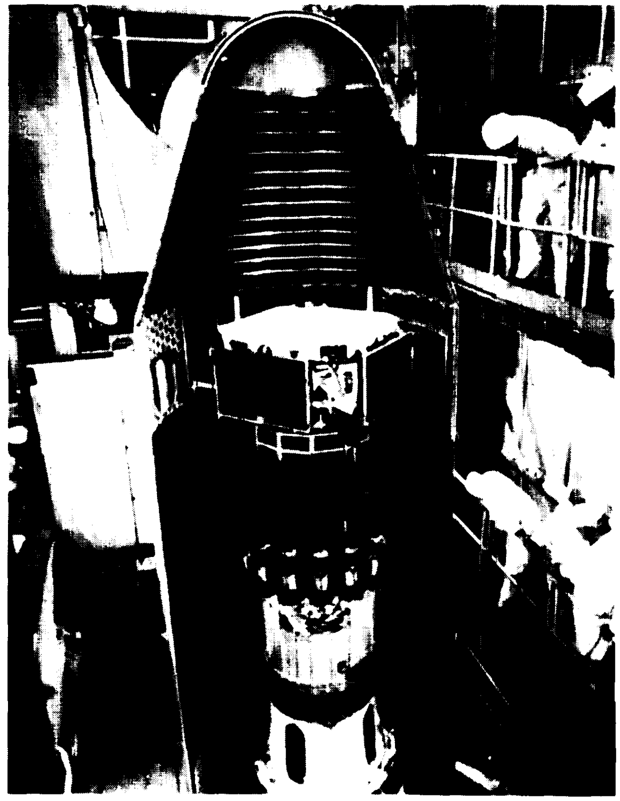


Photo credit: National Aeronautics and Space Administration

The Active Magnetospheric Particle Tracer Explorer (AMPTE) spacecraft is being encapsulated atop the Delta launch vehicle in preparation for launch (1984). AMPTE involves the United States, the United Kingdom, and the Federal Republic of Germany.

- **Cooperative ground-based projects cover a wide spectrum of cooperative research and data analysis in such fields as remote sensing, communications, meteorology, and geodynamics.** These often involve a combination of ground measurements with associated satellite data received at foreign stat ions.
- **Cooperative educational projects.**[6] The Satellite Instructional Television Experiment (SITE) was a cooperative effort (1 975-76) between NASA, which furnished the ATS-6 communications satellite, and the Indian Space Research Organization, which devel-

[6] "United **States Civilian Space Programs 1954- 1978," report prepared by Congressional Research Service for House Subcommittee on Space.**

oped programs on agriculture and family planning to broadcast to approximately 2,400 Indian villages. In 1976 the Agency for International Development (AID) and NASA sent films and discussions on remote sensing via the ATS-6 experimental communications satellite to 27 participating developing countries. (Later the ATS-6 was moved to locations above the Western Hemisphere for further cooperative demonstrations.)

- **U.S./U.S.S.R. cooperation. * These projects date from 1962, when NASA and the** U.S.S.R. Academy of Sciences cooperated on meteorological studies. Between 1962 and 1964 there were experiments on telecommunications, and from 1962 to 1973 on geomagnetic mapping.

  These early joint activities were based on agreements between NASA and the Soviet Academy of Sciences. In 1972, however, an intergovernmental agreement was reached between the Nixon Administration and the Soviet Government. One outcome of this agreement was the Apollo-Soyuz Test Project (ASTP), which culminated in 1975 in the only joint manned space flight between the two countries. Other areas of cooperation established under the agreement included meteorology, the natural environment, near-Earth space, the Moon and planets, and space biology and medicine. After the highly successful ASTP mission, the agreement was renewed by President Carter in 1977.

  The centerpiece of the renewed agreement was the commitment to plan for a joint Salyut/Shuttle program. However, in 1978 and 1979 a series of events on the international political scene led to a progressive hardening in East-West relations. This trend culminated with the Soviet invasion of Afghanistan in late 1979 and the imposition of martial law in Poland. As part of the U.S. sanctions against the Soviet Union, the May 1977[7] agreement was allowed to expire without renewal in 1982. The only remnant was a low level of information exchange in space medicine and biology.

  Recently, the climate in Congress and the Administration for renewed cooperation in space has improved. In the spring of 1984, members of the Senate Committee on Foreign Relations expressed interest in renewing and expanding U.S. cooperation with the Soviets. In July, the President proposed a joint U.S./Soviet mission to demonstrate the feasibility of space rescue. Such a mission cou Id serve as the cornerstone to increased cooperation in space with the Soviets. These interests culminated in a bill signed by President Reagan on October 30, 1984 (Public Law 98-562). Testimony presented at hearings on September 13, 1984 concerning the Senate bill indicated cooperation with the Soviets in several scientific disciplines related to space would be fruitful.[8]

  The United States and the Soviet Union are both cooperating with France and Canada in the COSPAS/SARSAT search and rescue program. (See app. A.) The United States is also cooperating with the Soviet Union, through ESA, on the International Halley Watch (see ch. 9).

- **The United States and China are cooperating** on a communications broadcast satellite system, a Landsat ground receiving station, and aeronautical technology. The Shanghai Observatory of the Chinese Academy of Science is interested in cooperating with NASA on measuring Earth's crustal movements.

NASA's international program also encompasses resident research associateships for senior foreign scientists, international fellowships, technical training for foreign scientific and technical personnel, and hosting foreign officials and scientists who visit NASA's facilities.

*See *Issues in U. S.-Soviet Cooperation in Space* **(Washington, DC: U.S. Congress, Office of Technology Assessment, in press), for a comprehensive discussion of U.S./Soviet cooperation.**

[7]The **"1 972 Intergovernmental Agreement on Cooperation in the Exploration and Use of Outer Space for Peaceful Purposes. "**

[8]President **Reagan discussed the subject in a meeting with Soviet representatives in June** 1984, **and in a speech on June 27. House Resolution 536 and the companion Senate Resolution 236 proposed the renewal of cooperation. See Issues** *in U.S./Soviet Cooperation in Space* **(U.S. Congress, Office of Technology Assessment, Technical Memorandum, in press); statement of Dr. Bernard Burke, before the Senate Committee** on **Foreign** Relations, **Sept. 13, 1984; "President Signs Bill Aimed at Restoring Cooperation in Space, "** *Aviation Week and Space Technology, Nov. 5,* 1984, p. **16; "U.S. Plans Soviet Talks on Joint Manned Mission, "** *Aviation Week and Space Technology,* **Jan.** 7, 1985, **pp.** 16-18.

The U.S. capacity for international cooperative programs is dependent on a strong U.S. national program; if civilian space budgets become overconstrained, it becomes difficult to budget for the U.S. (NASA) share of planned joint international projects. In one case the United States had to back out of a major planned project because of budgetary constraints:

> . . . NASA's success in international participation became a political liability in 1980-81 when, in order to absorb its share of the Administration's budget reductions, NASA found it necessary to reduce funding in one of its major science missions. The problem was that all three of its major science projects had significant international participation: Space Telescope (with ESA), Galileo/Jupiter orbiter probe (West Germany) and the International Solar Polar Mission (ESA). Because of the high cost of this international participation in space science, NASA, for the first time in its history, had to step back from an international commitment. NASA terminated development of the U.S. satellite for the international Solar Polar Mission. The project has been subsequently restructured and now includes only a single satellite built by Europe, but to be launched by NASA on the space Shuttle.[9]

Budget stringency has limited some of NASA's projects, but at the same time it has led to a different form of cooperation, relying on the newly developed capacities of other nations.

> A prime example is the upcoming return of Halley's Comet. After reviewing its options, the United States decided not to mount a mission to Halley's Comet, while ESA, the Soviet Union, and Japan all decided to develop encounter missions. However, in order to provide important data and assure that U.S. scientists and the world scientific community would be able to fully participate in this historic event, NASA organized an International Halley Watch (IHW) program. IHW is an international network of ground-based observatories which will provide significant scientific and ephemeris [positional] data important for assisting the three Halley encounter missions . . . By sharing leadership in exploring the heavens with other qualified space-faring nations, NASA stretches its own resources and is free to pursue projects which, in the absence of such sharing and cooperation, might not be initiated.[10] (Also see the more detailed discussion of IHW in ch. 9.)

[9]*UNISPACE '82*, op. cit., app. B.

Cooperation in building space infrastructure is perhaps the most important cooperative activity that the United States will embark upon this decade. It is keeping interested governments well informed of U.S. developments.[11] Japan and ESA have also funded their own studies of permanent stations in space.[12] Recently, Canada and Japan have signed agreements with the United States entering upon phase B (the preliminary design phase) of the space station planning. * ESA is expected to sign a similar agreement in June 1985.

Most future NASA international cooperation will raise a question as to whether bilateral arrangements can be emphasized as they have in the past. As shown by examples of multilateral cooperation in science such as the International Halley Watch, and on an even greater scale by international organizations governing satellite communications (i.e., INTELSAT and INMARSAT), multilateral cooperative efforts are manageable and may still be appropriate for certain technologies (e. g., navigation and search and rescue) in this era of emerging commercial competition. primarily because of the network of intergovernmental cooperation required, such technologies might not be implemented without multilateral cooperation.

Other U.S. Cooperative Programs in Space

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT (AID)

AID has over the years utilized new technology to support rural health, agriculture, and education programs in the Third World. In the early 1970s, immediately following its use of educational television in El Salvador and the Ivory Coast, AID examined the potential of satellites

[10]*UNISPACE '82*, op. cit., app. B.

[11]*Aviation Week and Space Technology*, Feb. 13,1984.

[12]For a thorough discussion of possible international cooperation in space stations, see *Civilian Space Stations and the U.S. Future in Space* (Washington, DC: U.S. Congress, Office of Technology Assessment, OTA-STI-241, November 1984),

*See Harry R. Marshall, Jr., "U.S. Space Programs: Cooperation and Competition From Europe, " *Current Policy, No. 695,* U.S. State Department, May 1985.

for delivery of services to remote, isolated, and rural populations. It gave particular attention to the public service projects funded by NASA Goddard using the ATS/1 and the ATS/3 spacecraft. Providing very high frequency (VHF) voice channels, the spacecraft were used in the State of Alaska Medical Network project and in the Peace-Sat Network in the Central Pacific operated by the University of Hawaii.

Preliminary project prototype work by AID was started in the mid-1970s using ATS/6 in the Brazilian SACI[13] project. AID also sponsored symposia for key Third World administrators to help them ascertain through "hands on" experience what indigenous needs might be met by applying lessons learned from the ATS/-l -3-6 demonstrations. They studied the use of various technology mixes (i. e., voice, slow-scan video, two-way audio interactions), and examined the variety of educational materials produced for parents, students, teachers, and administrators.

The results of these symposia prompted AID to fund a multinational 27-country demonstration project in 1976 called Al D/SAT, an immediate follow-on to the highly successful ATS/6 India Satellite Television Instruction Experiment (SITE) project. The AID/SAT project, simple in format but effective in its impact on the leadership of the participating nations,[14] led eventually to AID's current University of West Indies project and its Rural Satellite Program. AID is now funding satellite programs in Peru, The Philippines, and **Indonesia.**

The Department of State is responsible for coordinating the diplomacy and policies of cooperative land remote sensing programs to assure consistent development of the international aspects of the Landsat program. AID has supported and encourages remote sensing activities in developing countries by providing U.S. experts, training, and demonstrations; project grants; financial and technical support for cooperative programs with U.S. industries and institutions; and financial support for education in U.S. universities, on-the-job training, and creation of national and regional remote sensing centers. Centers have been established in Nairobi, Kenya; Ouagadougou, Upper Volta; and Bangkok, Thailand. (See table 7A-1 in app. 7A.)

Other U.S. Government agencies have also assisted AID in providing foreign nations with Earth resources remote sensing information. The U.S. Geological Survey (of the Department of the interior) has sponsored numerous international remote sensing training programs at the EROS data center in Sioux Falls, SD, and in many foreign countries, all in support of the Landsat program. NASA provided technical support in the form of hardware, personnel, and computer software.

The Soviet Union

Like the United States, the Soviet Union has long recognized the value of international cooperation in space activities. Since the early 1960s the Soviet Union has stated its commitment in principle to such cooperation, but it was not until the 1970s that it began to practice what it professed–at least with a few partners.[15] The most dramatic Soviet-U.S. cooperative activity was the Apollo-Soyuz Test Program, but the two countries engaged in a variety of other space science and remote sensing projects in the 1970s. More recently, the Soviet Union is cooperating with France, the United States, and Canada in the SARSAT/COSPAS project for locating lost ships and planes by satellite-relayed radio beacon (see app. A).

The Soviets have carried out several space science missions with France and have given considerable assistance to the Indian space program. They are active participants in multilateral organizations: governmental, such as the U .N. Committee on the Peaceful Uses of Outer Space (COPUOS); and nongovernmental, such as the

[13] "SACI: USAID, Satellite Technology Demonstration, 1974-75," *Towards International Tele-education* (Boulder, CO: Westview Press, 1984), p. 115.

[14] See *Civilian Space Policy and Applications* (Washington, DC: U.S. Congress, Office of Technology Assessment, OTA-STI-177, June 1982), p. 208.

[15] For a detailed description of overall Soviet international cooperation in space, see Joseph Whelan, "Soviet Attitude Toward International Cooperation Space" in U.S. Congress, Senate Committee on Commerce, Science, and Transportation *Soviet Space Program: 1976-80, Part 1* Committee Print (Washington, DC: U.S. Government Printing Office, December 1982), pp. 205-305.

Photo credit: *National* Aeronautics *and Space* Administration

Photo of the Soviet Soyuz spacecraft taken from the Apollo spacecraft during the joint U.S.-U.S.S.R. Apollo Soyuz Test Project in 1975.

International Astronautical Federation. However their greatest cooperative activity has taken place within the confines of the Soviet-led Intersputnik and Intercosmos programs.

Intersputnik

The Soviet Union and its allies were reluctant to join INTELSAT when it was founded in 1964. The Soviet objected to U.S./COMSAT management, to the use of U.S. technology, and to the system of weighted voting whereby influence was determined by a country's percentage of use of the system. (Soviet need was for only 2 to 3 percent of global international traffic, compared with the United States' 50 to 60 percent.) In 1968, the Soviet Union and eight other socialist states (Poland, Czechoslovakia, East Germany, Hungary, Romania, Bulgaria, Mongolia, and Cuba) proposed an alternative system, which in 1971 was formally agreed to and called Intersputnik. Although its services are open for any state to use, few other countries have joined.[16] There is relatively little commercial or private traffic between most Intersputnik members and the rest of the world. Since the Intersputnik network was initially based on use of the nongeosynchronous Molniya satellites, ' [7] it was difficult and expensive for INTELSAT Earth stations, which are designed to work with fixed geosynchronous satellites, to make use of the moving Moiniyas.

In recent years, however, the Soviet Union has begun to orbit geosynchronous Statsionar satellites which are more accessible to global users. As their international communications needs have grown, the Soviet Union, Cuba, and Romania (to be followed soon by Poland) have also begun to use INTELSAT through Earth stations on their own territories. increasing de facto integration of global satellite communications appears to be occurring even in the absence of formal agreements. [18]

Intercosmos

Most Soviet joint and cooperative projects have been conducted with allied socialist states. In 1967, the Intercosmos program was founded to coordinate activities among the Soviet Union, its East European allies, and other Communist states such as Mongolia, Cuba, and more recently Vietnam. Several scientific satellites have been flown, using instruments designed by member-states under the overall direction of the Soviet Union. Instruments and experiments, such as an East German multispectral camera built by Carl Zeiss Jena, have also flown on the Salyut series; many of these were associated with the flights of guest cosmonauts from participating states. To date, cosmonauts from Czechoslovakia, poland, East Germany, Bulgaria, Hungary, Romania, Mongolia, Vietnam, Cuba and, most recently, France and India, have been trained in the Soviet Union and spent time on board Salyut stations. The purpose of Intercosmos seems to be largely political; the Soviets thoroughly orchestrate these activities, and emphasize propaganda.

Intercosmos projects are designed and managed very differently from U.S. cooperative projects. The experiments and guest cosmonauts of member countries are invited, free of charge, onto Soviet spacecraft on a nearly rotating basis. However, it should be noted that this approach differs from that of the United States toward its

[16] Syria, Vietnam, and Laos joined for both political and technical reasons.

[17] The Molniya communications spacecraft follow a highly elliptical orbit (40,000 km by 500 km) that allows them to linger for several hours over the northern latitude of the Soviet Union and spend very little time at southern latitudes. To provide continuous communications coverage, a total of 12 satellites have been employed. Although the Soviet Union is now beginning to deploy geostationary satellites as well, the Molniya satellites continue to provide most Soviet domestic and international services.

[18] See Nicholas Matte, *Aerospace Law: Telecommunications Satellites,* prepared by the Centre for Research of Air and Space Law, McGill University, for the Social Sciences and Humanities Research Council of Canada, 1980, pp. 118-123.

allies only in degree and tone. Both nations are well aware of the manifold benefits of cooperation. A lengthy retrospective article on the subject by a former cosmonaut expressed it in the following way:

> . . . space exploration requires considerable allocations. Quite often many costly space projects are beyond the means of individual states and demand the cooperation of a number of countries . . . Now it is becoming important to create space vehicles through the joint efforts of various states and use them for peaceful scientific and practical purposes.[19]

Remote Sensing

The Soviet Union has also developed remote sensing systems for civilian as well as military purposes. Perhaps the most ambitious civilian-oriented remote sensing work has been done on manned missions, particularly aboard Salyut 6. Some 50,000 photographs were taken using the large East German MKF-6m multispectral camera, and some of the data obtained has been shared with allied and developing countries, such as Cuba, Vietnam, Morocco, and Angola.

As a member of the World Meteorological Organization, the Soviet Union has distributed weather photos from its Meteor-series meteorological satellites since 1966. Meteor satellites have carried a variety of experimental sensors including, recently, advanced Earth resources instrumentation. In July 1980, the Soviet Union launched a prototype remote sensing satellite with three experimental multispectral sensors providing ground resolution up to 30 m. They have offered to share data from this satellite with other countries.

European Space Agency (ESA)

One of the most successful examples of international cooperation in space is the European Space Agency, whose members devote anywhere from a third (France) to nearly all (United Kingdom) of their national space budgets to joint projects. In part, this organization was created to pool European expertise and place European space industries in a better position to compete with U.S. industries. At the same time, ESA has proven to be a valuable partner for the United States in a variety of cooperative programs, not the least of which has been the development of Spacelab for the space Shuttle.

ESA was established on May 31, 1975, by combining two institutions: the European Space Research Organization (ERSO) (which had been in operation since March 20, 1964) and the European Launcher Development Organization (ELDO) (dating from March 29, 1962). The establishment of ESRO for space research and ELDO for launching satellites resulted from a desire on the part of Western Europe to achieve space capabilities independently of the United States and the U.S.S.R. The institutional separation of space research from the launching of satellites proved inefficient, however, and after 15 years of intercooperative effort these space functions were merged into ESA.[20]

Eleven European states are members: Belgium, Denmark, the Federal Republic of Germany, France, Ireland, Italy, The Netherlands, Spain, Sweden, Switzerland, and the United Kingdom. In addition, Austria is an associate member; Norway has observer status; and Canada has signed a memorandum of association with ESA. The 1984 budget is about $850 million (compared with NASA's $7.3 billion) and the staff numbers about J ,400 persons, many of whom are highly accomplished experts in space science and technology,[21]

ESA coordinates the national programs of its members, developing missions in remote sens-

[19] V. Sevastyanov and A. Ursul, "Cosmonautics and Social Development, ' *International Affairs, No.* 11, November 1977, pp. 76-77.

[20] ELDO and ESRO are described and analyzed in "International Cooperation and Organization for Outer Space, " staff report edited by Eilene Galloway for the Senate Committee on Aeronautical and Space Sciences, Senate Document No. 56, 89th Cong., 1st sess., Aug. 12, 1965. See Index, p. 564; "International Cooperation in Outer Space: A Symposium, " edited by Eilene Galloway for the Senate Committee on Aeronautical and Space Sciences, Senate Document No. 92-57. 92d Cong., 1st sess., Dec. 9, 1971; M. G. Bourely, "The Legal Status of the European Space Agency," *Proceedings of the International Institute of Space Law* published by the American Institute of Aeronautics and Astronautics, 1633 Broadway, New York, NY 10019, 23d Colloquium, Tokyo, Japan; M. G. Bourely (Legal Advisor to ESA). "Institutional Arrangements for Space Cooperation in Europe, " in the 24th colloquium volume for Rome, Italy, September 1981.

[21] European Space Agency in U. N. document A/COBNF.101/BP/10, Jan. 30, 1981, pp. *34-40.*

Organization and Functioning of the European Space Agency

The Agency's policymaking body is the ESA Council, composed of representatives of the member states. The Council takes decisions on the policy to be followed by the Agency, and on scientific, technical, administrative, and financial matters, each state having one vote (but none in the case of an optional programme in which it is not participating). The level of the Agency's resources for its mandatory activities is determined for a period of five years in advance by a unanimous decision of all member states. Other decisions are taken on a simple, or two-thirds, majority vote.

The Convention established a Science Programme Committee, to which are referred matters relating to the mandatory science programme; the Committee is authorised to take decisions relating to that programme. The Council may also establish such other subordinate bodies as may be necessary for the purposes of the Agency. Delegations from the member states sit on all such committees and programme boards.

The chief executive and legal representative of the Agency is the Director General, who is appointed by the Council for a defined period. He is assisted by six directors who are responsible for the following directorates: Administration, Applications Programmes, Spacecraft Operations, Scientific Programmes, Space Transportation Systems, and the Technical Directorate.

SOURCE: European Space Agency.

ing, telecommunications, and space science, in addition to the Ariane launcher, which can place satellites in geostationary orbit. Because of the relatively limited budget, cooperative ventures are quite important to ESA as a means of broadening the basic agenda of missions. Joint ventures with individual member countries having an interest in specific areas (e.g., Germany in materials processing, or the U.K. in astronomy) are the most prominent mechanism.

ESA has also developed major cooperative programs with the United States on the basis of memoranda of understanding with NASA (i.e., agency-to-agency agreements), The U.S. Space Shuttle has orbited the ESA-built Spacelab, a reusable laboratory for manned or unmanned experiments in life sciences, materials processing, etc. NASA and ESA are also cooperating on building the Space Telescope which will be launched in 1985 by the Shuttle. ESA has not cooperated formally with Japan. It is cooperating with them on the missions to Comet Halley.

Although only an observer at meetings of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), ESA has developed stronger ways of participating with the United Nations through representation by its member states. As an international intergovernmental organization, ESA has rights and obligations under three space treaties (assistance to astronauts and return of space objects, liability for damage, and registration of space objects). The 1967 Treaty on Outer Space applies only to sovereign states, but the other agreements have provisions which have been extended to ESA by legal actions taken by its member states. (See the discussion of these treaties in the following section.)

ESA has an International Relations Advisory Committee which reports directly to the ESA council and coordinates national positions on issues before COPUOS. The Committee plays a considerable role in the preparation of ESA members for International Telecommunication Union (ITU) conferences. ESA experts can advise its members concerning positions to take on space issues before COPUOS. The association of Canada with ESA can result in even stronger representation of any position ESA may decide to espouse .22

****See Roy Gibson, "International Regional Role: Focus on the European Space Agency" presented at the University of Mississippi Law Center at a conference on Law and Security in Outer Space held by the Standing Committee on Law and National Security and the International Law Section of the American Bar Association, University of Mississippi, May 21-22, 1982. See also Annual Reports of ESA, 8-10, rue Mario- Nikis, 75738 Paris, Cedex 15, France.**

INTERNATIONAL ORGANIZATIONS

The United Nations

The Committee on the Peaceful Uses of Outer Space

The first meeting of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) was held on November 27, 1961, several years after the initial efforts had been made to establish a means for dealing with space issues. The Committee itself was a direct outgrowth of controversy over the militarization of space. The question of disarmament had prompted the U.S. delegation to the U. N., in January 1957, to make the following statement to the First Committee of the General Assembly (Political and Security Affairs):

> Scientists **in many nations are now proceeding with efforts to propel objects through outer space and to travel in the distant areas beyond the Earth's atmospheric envelope. The scope of these programs is variously indicated in the terms "Earth satellite, " "intercontinental missiles, " "long-range unmanned weapons" and "space platforms." No one can now predict with certainty what will develop from man's excursion into this new field. But it is clear that if this advance into the unknown is to be a blessing rather than a curse the efforts of all nations in this field need to be brought within the purview of a reliable armaments control system. The United States proposes that the first step toward the objective of assuring that future developments in outer space would be devoted exclusively to peaceful and scientific purposes would be to bring the testing of such objects under international inspection and participation. In this matter, as in other matters, the United States is ready to participate in firm, balanced, reliable systems of control .23**

This was probably the first mention of "Earth satellites" in U.N. debate. In the same year, Canada, France, and the United Kingdom had also suggested that a subcommittee of the Committee on Disarmament establish a technical committee to study the possibilities for an inspection system which ensure that objects sent through outer space would be used exclusively for peaceful and scientific purposes.

With the launch of Sputnik 1 on October 4, 1957, came a proliferation of statements and resolutions, including the following phrase, which the Soviet representative proposed be included in the provisional agenda of the 13th session of the U.N. General Assembly:

> **The banning of the use of cosmic space for military purposes, the elimination of foreign military bases on the territory of other countries, and international co-operation in the study of cosmic space.**

The reaction of the United States to this Soviet proposal was to say that the elimination of defense bases, originally established and subsequently maintained by the mutual consent of the nations concerned, could not be characterized as "foreign" nor extracted as a price for international cooperation in the peaceful uses of the new environment of outer space.

Henry Cabot Lodge, Permanent Representative of the United States to the U. N., attached to his letter to the Secretary General a resolution sponsored by 20 nations which set out the need for what ultimately became the Committee on the Peaceful Uses of Outer Space (table 3-2).[24]

The General Assembly resolution 1348 (X111) December 13, 1958, authorized an "Ad Hoc Committee" on the Peaceful Uses of Outer Space. The Soviets, Czechoslovakia, Poland, India, and the United Arab Republic–all of which had been named to the Committee–did not participate, although they were careful to attend each subsequent meeting.

The ad hoc committee finished its work on June 25, 1959, and submitted its report to the General Assembly on July 14, 1959. Almost 2[1]A years

[23] U.S. statement to First **Committee, Political and Security Affairs,** U.N. **General Assembly, January 1957.**

[24] During the following **months, Sept. 2—Nov. 18, 1958, the debate on the proposed** U.N. **management unearthed a number of issues of concern, not the least being questions of the sovereign rights of airspace, common heritage (then called** *res communis ominum* **–benefit of all mankind), international training and an international space center. All of the foregoing were major issues at the UN** ISPACE **'82 conference in Vienna and most are far from being resolved.**

Table 3.2.–Current Membership of COPUOS†

Albania	**Kenya**
Argentina	*Lebanon*
Australia	**Mexico**
Austria	**Mongolia**
Belgium	*Morocco*
Benin	**Netherlands**
Brazil	**Niger**
Bulgeria	**Nigeria**
Canada	**Pakistan**
Chad	**Philippines**
Chile	*Poland*
China*	**Romania**
Columbia	*Sierra Leone*
Czechoslovakia	**Spain**
Ecuador	**Sudan**
Egypt	*Sweden*
Federal Republic of Germany	**Syria**
France	*United Kingdom*
German Democratic Republic	**United Republic of Cameroon**
Greece	*United States •*
Hungary	**Upper Volta**
India"	**Uraguay**
Indonesia	*U.S.S.R. "*
Iran	**Venezuela**
Iraq	**Vietnam**
Italy	**Yugoslavia**
Japan •	

NOTE: Italics indicate COPUOS membership 1961-73. Asterisk indicates independent launch capability. ESA members also have launch capability.
†Greece and Turkey, Spain and Portugal, alternate membership every 3 years.

SOURGE: Office of Technology Assessment.

later, at the first meeting of the Committee on the Peaceful Uses of Outer Space. U Thant, Acting Secretary General of the U. N,, was appointed temporary Chairman pending the election of officers. At the same time, the U.S.S.R. became an active participating member of the Committee. in the interim between ad hoc status and permanent committee approval, the members agreed to settle differences by consensus agreement, That the consensus process worked is borne out by the formation of five major space treaties and agreements which are now in force to guide international behavior in space.[25]

Treaties and Agreements

The United States is a party to four major international agreements formulated by COPUOS:

- **Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (1967).**[26] This is the principal agreement on outer space. It holds that outer space, the Moon, and other celestial bodies are not subject to national appropriation. In addition, among other things, the treaty defines the principles for the exploration and use of outer space and holds States responsible for their own space activities and those of their citizens. The other agreements elaborate on elements of the 1967 Treaty.
- **Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched Into Outer Space (1968).**[27] This agreement provides for the rescue and return of downed or stranded astronauts as well as the return of a space object and "its component parts. " It specifies that "the State responsible for launching" shall pay the expenses for recovering and returning the space object or its parts.
- **Convention on International Liability for Damage Caused by Space Objects (1972).**[28] This convention is an extension of articles VI and VII of the 1967 treaty. It defines "damage" as loss of life, personal injury, impairment of health, loss or damage to property or persons or property of international organizations. "Launching" is held to include attempted launching, and a "launching State" is one that either launches or procures the launch of a space object. It is also one "from whose territory or facility a space object is launched. "
- **Convention on Registration of Objects Launched Into Outer Space (1974).**[29] The information registered includes the name of

[25] See "International Cooperation in Outer Space: A Symposium, " op. cit.

[26] UST 2410; TIAS 6347; Senate Report No. 8, 90th Cong., 1st sess., Apr. 17, 1967; Senate Committee on Aeronautical and Space Sciences, 90th Cong., 1st sess., staff report on "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, " committee print, 1967.

[27] UST 7570; TIAS 6599; "Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched Into Space: Analysis and Background Data;" Senate Committee on Aeronautics and Space Science, 90th Cong., 2d sess., committee print, July 16, 1968.

[28] UST 2389; TIAS 7762; Senate Committee on Aeronautics and Space Sciences, 92d Cong., 2d sess., staff report on "Convention on International Liability for Damage Caused by Space Objects, " committee print, 1972.

[29] TIAS 8480; Senate Committee on Aeronautical and Space Sciences; 94th Cong., 1st sess., staff report on "Convention on Registration of Objects Launched Into Outer Space," committee print, 1975.

the launching State or States, an appropriate designator or a registration number, the date and territory of the launching, the initial basic orbital parameters including the nodal period, inclination, apogee, perigee, and the general function of the space object.

In addition to the four international agreements which the United States has signed and ratified, the General Assembly has recommended to States the adoption of the Agreement Governing **the Activities of States on the Moon and Other Celestial Bodies** (1979).[30] Among other things this Agreement provides for the use of the Moon "exclusively for peaceful purposes. " It also provides that "the exploration and use of the Moon shall be the province of all mankind and shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development. " It further states that "the moon and its natural resources are the common heritage of mankind . . ." Austria became the fifth nation to ratify the Moon Agreement on June 11, 1984; it is now in force, the other parties being the Philippines, Chile, Uruguay, and The Netherlands. The United States played a major leadership role in obtaining consensus in 1979 on the Moon Agreement in the COPUOS session. However, while the United States and U.S.S.R. are parties to all other space treaties, neither has signed this one.

Of particular importance to potential private operators of space systems is Article VI of the 1967 **Outer Space Treaty** which states:

> States Parties to the Treaty **shall bear international responsibility for national activities in outer space, including the Moon and other celestial bodies, whether such activities are carried on by governmental agencies or by nongovernmental entities . , . The activities of nongovernmental entities in space . . . shall require authorization and continuing supervision by the appropriate State party to the treaty.**

Although the terms "authorization" and "continuing supervision" have been interpreted in various ways, article VI clearly requires some form of licensing and adherence to government-imposed regulations.

Similarly, Article II of the 1972 **Liability Convention** makes the launching State responsible for personal and property damage caused by any satellites or launchers even if they are no longer under the operation or direct control of the government. At a minimum, the government would require assurance that the owner of the satellite system had purchased adequate insurance to cover possible damages.

The U.S. Government has not yet decided on the precise mechanisms of ensuring that private corporations comply with international treaty obligations. Given the importance of this technology to U.S. foreign affairs, it is clear that the Department of State must play a major role.

International Telecommunication Union (ITU)

The United States is one of 155 nations bound by treaty to cooperate within the structure of the ITU for the use of technical facilities for telecommunications of all kinds. The ITU, which became a specialized agency of the United Nations in 1947, has performed this regulatory function since 1932. Twentieth-century communications technology imposed the requirement for international cooperation to ensure technical efficiency and prevent harmful interference between nations and stations in the use of the radiofrequency spectrum. During the early development of space communications, the ITU began to study its implications, since all space objects communicating to Earth require radio services which are under ITU jurisdiction.[31]

[30] U.N. General Assembly **Resolution A/34/68, Dec. 14, 1979; Senate Committee on Commerce, Science, and Technology, 96th** Cong., **2d** sess., **"Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, " committee print, 1980.**

[31] The ITU **was formed from the International Telegraph Union (begun in 1865) and signatories to the International Radiotelegraph Convention. For further information on the** ITU, **see "International Cooperation in Outer Space: A Symposium. " This symposium covered 41 organizations in 1965, divided into four categories: U.S. and International Space Cooperation, United Nations and Outer Space, Intergovernmental International Organizations, and** International **Scientific Community and Professional Associations. For up-to-date information on these and other organizations, see the annual report of each and also testimony their officials have given before House and Senate Committees on Commerce, Space, Science and Technology, Foreign Relations, Foreign Affairs, etc.**

The ITU is organized into four permanent bodies: 1) the General Secretariat; 2) the International Radio Consultative Committee (CCIR); 3) the international Telegraph and Telephone Consultative Committee (CCITT); and 4) the International Frequency Registration Board (I FRB). The CCIR and CCITT are technical study groups; the IFRB is concerned with orderly and effective use of the radio spectrum and orbital slot allocations, in order to reduce communications interference. All member States are represented in the Plenipotentiary Conference, which meets every 5 to 8 years and elects an Administrative Council of 36 members to coordinate ITU work between sessions.

A Plenipotentiary Conference was held September-October 1982 in Nairobi, Kenya, to review the ITU Convention (adopted in Madrid in 1932 and amended in Malaga-Torremolinos, Spain, in 1973).[32] There were a few important actions that are worthy of note: plans for a major world administrative conference on telegraph and telephone in 1988; greater status for the Consultative Committee on Telegraph and Telephone (CCITT); increased ITU involvement in development assistance for Third World members; clearer recognition of Third World needs with respect to the geostationary orbit; a newly elected leadership; and a relatively modest budgetary increase of 26 percent over the next 7 years.

ITU decisions are made by the regional or worldwide administrative conferences established to revise ITU regulations. The ITU concluded international agreements concerning space communications in 1959, 1963, 1965, 1971, 1973, 1977, and 1979. When the final acts of a conference are concluded they are referred to each ITU member for ratification. [n the case of the United States, these final acts must be submitted to the Senate for its advice and consent. The jurisdiction of the ITU includes oversight of the geostationary orbit; it registers orbital positions and assigns satellite frequencies. The 1973 Telecommunication Convention and Final Protocol, Article 33, provides a basic agreement on space communications:

> **Members shall endeavor to limit the number of frequencies and the spectrum space used to the minimum essential to provide in a satisfactory manner the necessary services. To that end they shall endeavor to apply the latest technical advances as soon as possible. In using frequency bands for space radio services Members shall bear in mind that radio frequencies and *the geostationary satellite orbit are limited natural resources, that they must be used efficiently and economically so that countries or groups of countries may have equitable access* to both in conformity with the provisions of the Radio Regulations according to their needs and the technical facilities at their disposal (emphasis OTA' s).**[33]

The ITU divides the world into three regions for regulatory purposes; in 1979 spectrum allocations were made for Region 1 (Europe, U. S. S. R., Mongolia, and Africa) and Region 3 (Asia except U.S.S.R. and Mongolia) and Australia. The United States is in Region 2, which is comprised of North and South America and Greenland. The ITU made spectrum allocations for Region 2 in 1983. It is at these regional conferences where decisions are made by majority vote that issues which significantly affect the future of this nation's communications are decided. The issues are technical but have become increasingly susceptible to political influences in a forum where each nation has one vote.[34]

The ITU has scheduled a World Administrative Radio Conference on the Use of the Geostationary Orbit for 1985 and 1988. Its first session will be held in 1985 in Geneva (ORB '85), and the second in 1988 (ORB '88). Policy is now being formulated for the U.S. delegation for this politically sensitive area. Some equatorial countries continue to claim sovereign rights to segments of the orbit above their territories; other Third

[32]" Final Acts of the Plenipotentiary Conference, " Nairobi, Kenya, 1982. ITU Document. See also, hearing before the Subcommittee on International Operations of the U.S. House Committee on Foreign Affairs, Feb. 22, 1983.

[33]International Telecommunication Convention, ch. III, Art. 33, Rational Use of the Radio Frequency Spectrum and of the Geostationary Satellite Orbit, paragraphs 130 and 131. Treaty and International Agreements Series (TIAS); also in *Space Law*, op. cit. (reference 15), pp. 86-87.

[34]Proceedings of the International Institute of Space Law, 23d Colloquium, Tokyo, Japan, September 1980: M. A. Rothblatt, International Cooperation in Regulating 12 GHz Band Geostationary Satellite Communications Technology, Geopolitics and the Common Heritage of Mankind, pp. 189-195. Also, Ronald F. Stowe, Implications of the 1979 WARC for 12 GHz Satellite Services in Region 2, pp. 93-95. American Institute of Aeronautics and Astronautics, 1633 Broadway, New York, NY 10019.

World countries are demanding orbit allocations even though they have no present plans for using the geostationary orbit (see ch. 6). Actions taken at this conference will affect INTELSAT, INMARSAT, U.S. domestic communications, and international space activities in general.

The U.S. national paper for UNISPACE '82, March 23, 1982,[35] points out that the ITU's WARC 1979 proved that international consensus on regulating and managing the frequency spectrum and geostationary orbit is possible: the capacity for channels of the fixed, broadcast, and mobile satellite services was increased; remote sensing satellites were given new allocations; and small Earth terminals and two-way communications links were facilitated. However, the United States has stated that the WARC 1985-88 conference "may be crucial in determining whether a comprehensive international regulatory system can be maintained which will continue to facilitate the flow of the benefits of communications satellite technology to developing countries. " The United States has submitted to the ITU some options and criteria for technological adjustments to communication needs. In addition, the United States is directing research and development efforts toward improving the use of the limited resources of orbit and frequencies (see ch. 6 for discussion of issues the United States will face at WARC '85-'88).

International Telecommunications Satellite Organization (INTELSAT)[36]

INTELSAT is a global commercial telecommunications satellite system owned by 109 member countries. it has a capital ceiling of $1.2 billion.

[35] United States National paper, Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space. For further details on WARC '79, see *Radio frequency Use and Management: Impacts From the World Administrative Radio Conference of 1979* (Washington, DC: U.S. Congress, Office of Technology Assessment, OTA-CIT-1 63, January 1982).

[36] For further information on INTELSAT, see *INTELSAT: 1984 Annual Report*, 490 L'Enfant Plaza, SW, Washington, DC 20024; INTELSAT: report describing the organization; *Multilateral Intergovernmental Cooperation in Space Activities*, Background Paper, Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, United Nations document A/CON F/101/BP/l O, Jan. 30, 1981, pp. 1 -27; and *Current and Future State of Space Technology*, Background Paper, Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, United Nations document A/CONF.1010/BP/2, Mar. 16, 1981, pp. 6-7.

The United States played a major part in establishing this intergovernmental organization. For the first 6 years of its operation, the Communications Satellite Corporation (COMSAT) managed INTELSAT under a contract from INTELSAT's Board of Governors. Since 1977, INTELSAT has been operated administratively and technically by an international secretariat.

INTELSAT is not an agency of the United Nations, but it has some cooperative agreements with the ITU, The organization has successfully combined both governmental and nongovernmental entities into a global commercial service. INTELSAT'S management structure provides a system within which to solve problems of national representation, investment shares, and equitable access to technology; these issues are resolved through technological solutions, seldom subject to current political rhetoric; furthermore, these practical solutions respond to the global demand for communications services, which has been constantly increasing and providing mounting profits.

INTELSAT's Operating Agreement provides in Article 6 that " . . . each signatory shall have an investment share equal to its percentage of all utilization of the INTELSAT space segment by all signatories. ' The U.S. investment share (1984), which comes through COMSAT (as signatory for the United States), is 23.1 percent. The United Kingdom owns the next highest investment share, of 12.9 percent.[37]

U.S. participation takes place within each of INTELSAT's four organizational units: 1) the *Assembly of Parties* is made up of governmental representatives who meet every 2 years to determine policies and long-term objectives; each member has one vote; 2) the Meeting of Signa*tories* is comprised of either governmental or government-designated telecommunications entities that meet annually on such matters as capital investment and shares, approval of Earth stations for access to INTELSAT services, allotment of satellite capacity, and adjustment of charges; each signatory has one vote; COMSAT casts the

[37] See ch. 6 for a complete list of I NTELSAT members, signatories, and investment shares, and the INTELSAT Annual Report for investment shares *of* any given year.

U.S. vote; 3) the Board *of Governors* is composed of signatory members who have an investment share (either individually or in groups) of not less than a specific amount which is determined each year by the signatories. INTELSAT seeks to have about 20 members on the Board and, in addition, "up to five groups composed of at least five signatories from within the same ITU region . . . regardless of the size of their investment shares"; and 4) the *Executive Organ* is headquartered in Washington, DC, and has a staff of about 400 persons from about 40 different nations.

The purposes of INTELSAT's definitive multilateral agreement, which recognizes the 1967 Treaty on Outer Space, are to provide advanced technology, efficient and economic facilities for the benefit of all mankind "with the best and most equitable use of the radiofrequency spectrum and of orbital space." The preamble provides that "satellite telecommunications should be organized in such a way as to permit all peoples to have access to the global satellite system"; and ITU members that invest in the system will participate in "the design, development, construction, including the provision of equipment, establishment, operation, maintenance and ownership of the system."[38]

Nonmembers may use the INTELSAT system and are charged on the same basis as the 109 members; 145 nations use INTELSAT services, including the U.S.S.R. INTELSAT has a program for assistance and development which can be especially helpful to developing countries. The program includes feasibility studies for Earth segment stations, reports on financing and technical proposals, modernization and training, operation and maintenance, and coordinating frequencies in accordance with ITU regulations. In some areas "INTELSAT has enabled developing countries to leapfrog over generations of communications technology without having to invest a great deal of time and money in a telecommunications satellite system of their own . . ."[39]

[38] International Telecommunications Satellite Organization (INTELSAT) Agreement with Annexes and also Operating Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT). In Space Law, op. cit. (see reference 15), pp. 173-304.

[39] Multilateral Intergovernmental Cooperation in Space Activities, op. cit. (see reference 36), p. 21.

International Maritime Satellite Organization (INMARSAT)[40]

The impetus to create INMARSAT[41] came from the commercialization of this technology by COMSAT during the 1970s and from a resolution of the Intergovernmental Maritime Consultative Organization (IMCO), a specialized agency of the United Nations, which in 1974 called for a conference to establish an international maritime satellite system. The conference was held in London in 1975-76, and concluded with two agreements patterned after those which established INTELSAT: a Convention on the International Maritime Satellite Organization and an Operating Agreement on INMARSAT. Both agreements entered into force on July 16, 1979. INMARSAT, as established, is not a U.N. organization but is comparable to INTELSAT.

INMARSAT developed technologically from the U.S. Marisat satellite system, which was started by COMSAT General Corp. in 1976. The international system, which is fully compatible with the Marisat system, has 43 member states; headquartered in London, it began operations in 1982.

INMARSAT's purposes are to improve maritime communications to handle situations involving distress and/or safety, through communication between ships and shore and among ships at sea. INMARSAT's high-speed satellite communications have improved search and rescue missions, medical assistance, warnings of weather conditions, and information to assist navigation. INMARSAT is exploring the feasibility of establishing a Future Global Maritime Distress and Safety System by the end of this decade, which would improve maritime distress and safety procedures.

[40] For more information on INMARSAT, see International Maritime Satellite Organization, INMARSAT, 40 Melton St., Euston Sq., London NW1 2EQ, England; Satellite Communications for Shipping. INMARSAT, London, England. Investment shares as of August 1981, p. 15.

[41] INMARSAT, established to facilitate maritime communication across the world's shipping lanes, is important because it represents an area of European rather than American leadership in space activities and because it marks, for the first time, the participation of the Soviet Union in an international commercial space organization.

INMARSAT is structured as follows:

1. An *Assembly* of member states meets at 2-year intervals to consider policy, activities, and long-range objectives for recommendation to the Council.
2. The *Council* has 18 signatories (or groups of signatories) which have the largest shares of investment and, in addition, four representatives to ensure fair geographical representation and concern for developing countries; it is responsible for the space segment and its economic and efficient management; members vote according to the percentage of their investment shares.
3. The *Directorate* has a Director General and staff responsible for the actual operation of worldwide maritime communications.

The United States has the largest investment share (31 percent), followed by the United Kingdom (15 percent), Norway (12 percent), Japan (7 percent), and the U.S.S.R. (7 percent).[42] Voting shares are limited to a maximum of 25 percent. The United States designated COMSAT as the signatory for its representation.[43]

The space segment of the INMARSAT system is composed of satellites and tracking, telemetry, command, monitoring, etc. Capacity to perform maritime communications has been leased from COMSAT General (a wholly owned operating subsidiary of COMSAT). INMARSAT leases some transponders from the European Space Agency—the Maritime European Communications Satellites and some from INTELSAT (V-MCS). Future INMARSAT satellites will have greater capacity and higher in-orbit power than the transponders it now leases. IN MARSAT has recently signed a contract for purchase of second generation satellites from a consortium headed by British Aerospace. Hughes Aircraft Corp. is the prime subcontractor.

[42]See app. 6C for a complete table of I NMARSAT members and Investment shares,

[43]*International* Cooperation *in Outer Space: A* Symposium, edited by Eilene Galloway for the Senate Committee on Aeronautical and Space Sciences. Senate document No. 92-57, 92d Cong., 1st sess., Dec. 9, 1971 (see pp. 331-363).

World Meteorological Organization (WMO)

The origins of the WMO can be traced back to 1853, when the first International Meteorological Conference was held in Belgium. Participants recognized the importance of sharing meteorological research and data. In 1873, the international Meteorological Organization (IMO) was organized. IMO became a specialized agency of the United Nations in 1947 and began functioning as the WMO in 1951. All sovereign states and territories with weather services may become members. WMO is not an international *operational* organization, but rather a planning and coordinating body with basic programs to assist all nations. It is a specialized agency with specific weather-related tasks that are planned with due regard for operating efficiency to produce needed information from global sources and for worldwide distribution. The WMO has been highly successful in eliciting cooperation among nations.

The United States launched the first meteorological satellite on April 1, 1960. When the U.N. General Assembly passed resolution 1721 (XVI) on December 20, 1961, on the peaceful uses of outer space, it recommended that the WMO make an early and comprehensive study:

> (a) to advance the state of atmospheric science and technology so as to provide greater knowledge of basic physical forces affecting climate and the possibility of large-scale weather modification; and
>
> (b) to develop existing weather forecasting capabilities and to help member states make effective use of such capabilities through regional meteorological centers . . ,

WMO was requested to consult with others and submit a report to its members and the Economic and Social Council (ECOSOC) "regarding appropriate organizational and financial arrangements to achieve those ends, with a view to their further consideration by the General Assembly. " In addition, the General Assembly requested COPUOS to review the WMO report and submit comments to ECOSOC and the General Assembly. These U. N.-initiated WMO studies led to plans for the World Weather Watch (WWW), which was organized to use the new satellite technology to improve meteorological services:

> Such improvements will have a profound impact on the agriculture, commerce, and industry of all nations and will permit more accurate and timely warnings of severe storms and other weather hazards for the protection of life and property. It will further the safety and efficiency of international air traffic and transportation and provide essential support to nations in the management of weather resources and food production.[44]

An additional U.N. resolution in 1967 led to the organization of the Global Atmospheric Research Program (GARP), a joint project of the WMO and the International Council of Scientific Unions (ICSU).

WMO organizes symposia, workshops, seminars, and provides training courses and fellowships in atmospheric science and meteorology. WMO's Voluntary Assistance Program assists developing countries purchase satellite data receiving stations. The weather services of all countries now depend on information from satellites. Through WMO, global, regional, and national environmental data are collected from the satellites of Europe, Japan, the United States, and the U. S. S. R., and distributed among all nations.

WMO projections for the future emphasize that more international cooperation will be required, especially for the planned World Climate Program. In 1978, WMO requested a U.S. and a Soviet expert to evaluate the future need for environmental satellites, including those for meteorology.[45]

In discussions of the Legal Subcommittee of COPUOS, the United States has, for many years, been extremely careful not to commingle meteorological satellites of the NOAA/WMO type with land remote sensing. However, some delegates from other nations have discussed rules and regulations for *all* remote sensing satellites—civilian and military, meteorological, and general use as represented by the Landsat system.

For more than a decade, COPUOS, within its two operating subcommittees, the Legal Subcommittee and the Science and Technology Subcommittee, has discussed the formulation of principles which are subject to political differences such as the issue of prior consent to distribute data sensed from space. Prior consent has not been made an impediment to WMO/NOAA weather agreements or those of any other nation. However, the situation is now further complicated by U.S. national actions to turn the Landsat system over to the private sector (see ch. 7).

[44] U.N. General Assembly Resolution 1721 (XVI) Dec. 20, 1961.

[45] "The Role of Satellites in WMO Programmed in the 1980s, " World Weather Watch Report No. 36, Annex Ill.

ISSUES IN COOPERATION

The changing role of industrialized countries in space, and the aspirations of the developing countries, coupled with a relatively static U.S. approach to cooperation in space, have raised several important issues for the United States:

- **How can the United States use its participation in international multilateral organizations and meetings on space to promote U.S. interests?** The conduct and outcome of recent international meetings on space has not always been favorable to U.S. interests. In part, this has come about as a result of U.S. attempts over the last few years to limit potential damage to its positions, while at the same time posturing itself to reduce its activities within the various organs of the United Nations that deal with communications, treaty, and regulatory matters.
- **How can the United States cooperate most effectively with the developing countries?** Developing and newly industrialized nations are demanding a greater voice in the use of the assets of outer space (e.g., apportionment of the geosynchronous orbit—see ch. 6), and a larger share of the perceived social

and economic benefits. Their demands have taken the form of intense political pressure at the United Nations and elsewhere.

- **On what terms might the United States most profitably cooperate with other industrialized nations?** Greater competitiveness, both among governments and the private sectors of different countries, alters the context for cooperation and may make it more difficult to establish cooperative programs.

Cooperating in International Organizations

Space is by nature and treaty an international realm about which cooperation between nations on some level is essential, if only to avoid potential conflict over its resources. The United Nations and other multilateral organizations serve as the forums for countries to discuss their needs and resolve their differences, The various treaties that provide the framework for the international use of space were forged in the U.N. COPUOS.

When arranging the terms of cooperative technical agreements, the United States has preferred to cooperate bilaterally rather than multilaterally. Nonetheless it has actively participated in COPUOS and the International Telecommunication Union (ITU), and during the 1960s and 1970s it provided leadership in forging the five ratified space treaties and agreements. Today, however, the U.S. approach to international organizations in general, and to the United Nations i n particular, is exemplified by its behavior at the United Nations Conference on the Peaceful Uses of Outer Space (UNISPACE '82) and the ITU Plenipotentiary in Nairobi in October 1982, "The United States has been generally reluctant to concede that its interests can be promoted or seriously jeopardized at such conferences (i. e., UNISPACE '82). It approached UN I SPACE '82 warily and attended primarily to "limit the damage" that UN I SPACE '82 could cause to U.S. interests. "[46] Although the United States was effective at UNISPACE '82 in preventing wording inimical to U.S. interests from appearing in the final UNISPACE '82 conference report, it was less effective in using the conference to promote and explain U.S. positions on outer space.

U.S. actions at recent conferences indicate that the United States has adopted a "damage limitation" approach to participating in multinational organizations. It has also threatened to withdraw on several occasions, Such a stance, if maintained, will leave the United States in the position of having to "go it alone," while others, both friends and potential adversaries, continue to operate in coalitions.

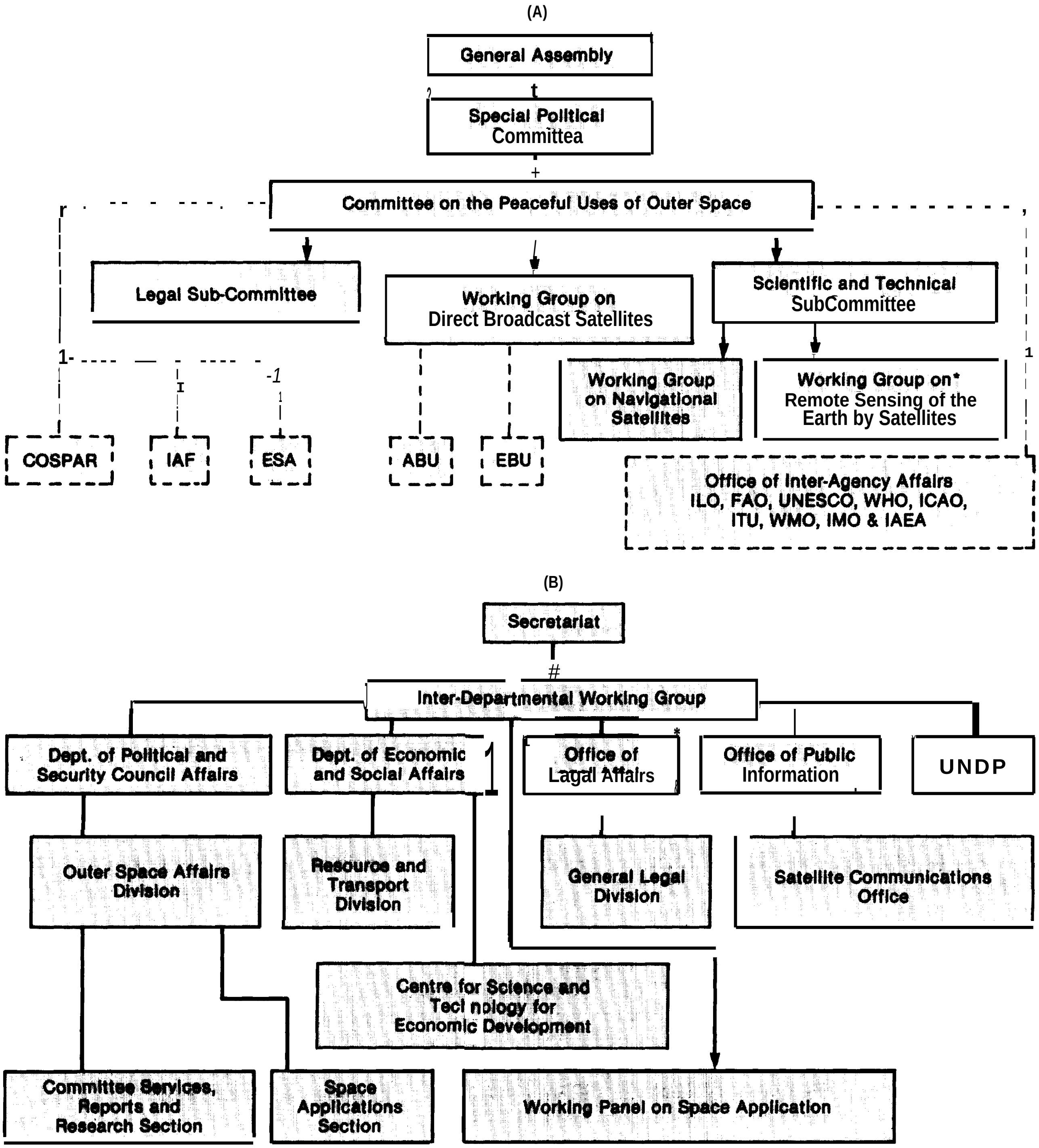
The United Nations

The United States played a leading role in the formation and development of the U.N. Committee on the Peaceful Uses of Outer Space. It encouraged cooperative programs with NASA and transfer of some space technology to industrialized and developing countries. U.S. programs have consequently helped them realize some of the benefits of space technology. Because of these efforts by the United States, and the rapid evolution of space industry, applications of space technology have become an integral part of the operations of several U.N. committees and U.N. specialized agencies such as the ITU, the Food and Agricultural Organization (FAO), the World Meteorological Organization (WMO), and the international Maritime Commission (IMCO).

Developing countries see the U.N. as their preferred agent for deliberation and guidance for space affairs as well as a forum in which to express their political views. Specifically, the U.N. Special Political Committee, under whose administrative management the Committee on the Peaceful Uses of Outer Space (COPUOS) functions (fig. 3-2), is the focus of their hopes and aspirations, fears and concerns with respect to space. It provides the major forum for space-related issues–new regulations, proposed restrictive regimes, and challenges to Western world policies, politics, and business practices. If COPUOS, which operates by means of consensus, fails to reach agreement on a given course of action, the Special Political Committee, which is dominated by the developing countries, may refer matters to the General Assembly for action.

[46] *UNISPACE '82: A Context for Cooperation and Competition,* op. Cit., p. 4.

Figure 3-2.—U.N. Bodies



For example, one issue which COPUOS has deliberated for 10 years is that of direct broadcast satellites (DBS). The United States wants no restrictions imposed on the right to broadcast or otherwise to transfer information across national borders. Until 1982 it had been successful in preventing a restrictive set of principles on DBS from being adopted. However, in November of that year the developing countries, led by the G-77, demonstrated their willingness to take this unresolved issue directly to the General Assembly. The Special Political Committee, despite the objections of the United States and a few Western allies, removed the DBS issue from COPUOS and referred it to the General Assembly. The latter passed the resolution by a large majority and adopted a set of nonbinding principles governing the use of direct broadcast satellites.[47] These principles endorse the right to "prior consent" to the nations receiving such broadcasts. Although nonbinding, the principles foster a disturbing trend of bringing political pressure on the United States and other industrialized countries at the expense of the consensus process.

Championed by the G-77, the use of majority voting rather than consensus may also be used to influence the outcome of other long-term issues of international debate, such as remote sensing and equitable sharing of the geostationary orbit. Members of the G-77 see the control of new technologies as necessary in order to change their societies in the directions in which they wish to move.

Currently, the U.S. response to the well-organized political pressure from the developing countries is to threaten to withdraw or curtail its support for the organization in question. The United States has withdrawn from UNESCO and raised this possibility in the ITU, COPUOS, and the United Nations Conference on Trade and Development (UNCTAD). Each of the above organizations serve different purposes and the usefulness of U.S. participation in them may differ. The question of U.S. participation in one should be analyzed independently of participation in others. Although threat of withdrawal may appear to be an effective short-term tactic in some circumstances, its potential long-term cost in political, social, diplomatic, and economic terms may be too large a price to pay. Stressing, as the Administration does, that the U.N. has changed dramatically since the emergence of space technology, but refusing to change with it, is to circumvent the critical question of our political effectiveness within the U.N. Withdrawing from a given committee or specialized agency simply further reduces our effectiveness in working within multilateral forums on substantial issues that affect our interests in space.[48]

In the U.N. Secretariat, the office within which space issues are administered is the Outer Space Affairs Division (OSAD). Currently the United States has no high-level representation in OSAD,* although the Soviet bloc is well represented. Because all U.N. employees are international civil servants, countries cannot intervene directly in the personnel actions of the Secretariat. However, they can further their own interests by recommending the selection of citizens for the OSAD staff. The United States has not been as active as it could be in promoting U.S. interests in OSAD.** If the United States desires to increase its effectiveness in the United Nations, it should be alert to potential openings and plan in advance to recommend the appointment of qualified personnel. To such end, advance discussion with incumbents, U.S. departments and agencies, and foreign government and U.N. officials as appropriate, should be undertaken in timely fashion.

[47] A/SPC/37/L. 5/Rev, 1; Nov. 19, 1982. Preparation of an International Convention on Principles Governing the Use by States of Artificial Earth Satellites for Direct Television Broadcasting (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Egypt, India, Indonesia, Iraq, Kenya, Mexico, Niger, Nigeria, Peru, Philippines, Romania, Uruguay, and Venezuela; revised draft resolution).
The relevant section reads:

Consultations and agreements between States.

A State which Intends to establish or authorize the establishment of an International direct television broadcasting satellite service shall without delay notify the proposed receiving State or States of such intention and shall promptly enter into consultation with any of those States which so requests.

An International direct television satellite service shall only be established after the conditions set forth in paragraph 1 above have been met and on the basis of agreements and/or arrangements in conformity with the relevant Instruments of the International Telecommunication Union shall be exclusively applicable.

[48] *UNISPACE '82 A Context for Cooperation and Competition*, op. cit., p. 8, 9.

*See *Unispace '82: A Context for International Cooperation and Competition*, op cit., pp. 32-33, for an account of the selection of the Chief of OSAD prior to UNISPACE '82, and how countries may become involved in the selection of U.N. personnel.

**Ibid.

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In 1984, the United States drastically reduced its participation in the deliberations of COPUOS, which is the chief forum for international rules of outer space. The full Committee of COPUOS (composed of 53 member nations) is essentially a plenary session of its member nations to consider items on the agenda it adopts at the opening meeting of each session. Subjects assigned to its two subcommittees are routinely included and form a major part of its agenda. It is within these subcommittees that the United States over the years has been able to gain support of other nations for its positions in the full Committee and U.N. General Assembly sessions. The reports of the COPUOS subcommittees are also routinely included in the annual report COPUOS submits to the General Assembly. The General Assembly, after consideration of the COPUOS report, by resolution assigns the items for deliberation of the subcommittees at its next session. Although in the past the United States has maintained a leading presence in COPUOS and its subcommittees, and generally sends several delegates with a variety of expertise in space-related matters, it sent only one delegate to the February 1984 meeting of the Scientific and Technical Subcommittee of COPUOS.[49] In 1985, the United States, by sending several experts to the COPUOS subcommittees, participated more fully in the ongoing work of the Com m ittee.

The uncertain stance of the United States toward COPUOS, arising from controversy within the Administration concerning the usefulness of COPUOS, has already had an adverse effect on how other countries perceive U.S. participation. A long-term drastic reduction in U.S. participation in COPUOS could send a message to the developing countries that the United States lacked interest in working with them in the peaceful application of space technology.

The importance of COPUOS to the world space community should not be underestimated. it is the one place where all countries, developing and industrialized alike, can discuss legal, scientific and technical issues related to space on a continuing basis. Attendees at both COPUOS subcommittees (the Legal Subcommittee and the Scientific and Technical Subcommittee) tend to have strong technical or legal backgrounds, and their discussions focus on legal and technical issues. To a large extent the discussions of these subcommittees are protected from overt political rhetoric.

Legal problems currently being discussed within the Legal Subcommittee include:

- the definition and/or delimitation of outer space;
- matters relating to the character and utilization of the geostationary orbit;
- legal implications of remote sensing of the Earth from space, with the aim of formulating draft principles; and
- the possibility of supplementing the norms of international law relevant to the use of nuclear power sources in outer space,

The Scientific and Technical Subcommittee has over the years discussed such issues as:

- *Exchange of Information:*
  - –National, regional and international programs.
  - –Governmental and nongovernmental space organizations.
  - —Manuals on technical requirements.
  - —World Data Centers.
  - –SPACEWARN communications networks.
- *Encouragement of International Programs:*
  - –International Year of the Quiet Sun,
  - –World Magnetic Survey.
  - –Synoptic rocket experiments,
  - —Polar cap experiments.
  - –Space communications.
  - —Satellite meteorology.
  - –Scientific and technological assistance, education and training.

[49]His statement to that group reflects one point of view about the usefulness of U.S. participation in COPUOS:

> Finally, Mr. Chairman, my delegation wishes to underscore that our doubts about the future usefulness of the committee have not in any way dissuaded the United States of the importance of international cooperation in the use of outer space. . Delegations can be sure that our many existing cooperate programs with other nations in space science and applications will continue to grow in the future. Nonetheless, we find it quite regrettable that the Committee on the Peaceful Uses of Outer Space now threatens to join the growing number of U.N. bodies that have grown increasingly impotent and irrelevant as a result of confrontation, politicization and rhetorical excesses.

Statement by Ambassador Jose S. Sorzano, U.S. Deputy Permanent Representative to the United Nations, to the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space, Feb. 15, 1984.

- *International Equatorial Sounding Rocket Launching Facilities:*
  - –Scientific value.
  - —Usefu Iness.
  - —Basic facilities.

Given the importance of the subcommittees to the work of COPUOS, it may not be possible to protect U.S. interests fully by cutting back drastically on U.S. participation either there or in the plenary sessions of COPUOS. Often, points of view at variance with the democratic principles of a free and open society could be debated, tempered, and sometimes changed within these subcommittees.

Although in the short run, the threat of cutting back drastically on U.S. participation at COPUOS may serve a useful political purpose in countering the perceived trend toward politicization of COPUOS, in the long term, reduced U.S. participation will lessen U.S. influence in international decisions on space activities. When the United States and the Soviet Union were the only two players in space, such a stance would have been more plausible than today, when all the major industrialized nations and several newly industrialized nations have increasingly strong space programs. In particular, as the U.S. private sector increases its investment in space technologies, it will need the support and encouragement of its Government in international forums such as COPUOS, where **the** private sector point of view is often misunderstood. By sending only one delegate to the Scientific and Technical Subcommittee in 1984, and one with relatively little technical or scientific expertise, the United States ran the risk of being perceived to be uninterested in the matters being discussed therein, and of itself contributing to the politicization of COPUOS. As noted, the United States sent more delegates to the Subcommittee meetings in 1985.

The International Telecommunication Union (ITU). Cooperation with other countries within the ITU has been crucial to maintaining access to frequencies the United States needs in order to support its Armed Forces, the Intelligence Community, its diplomatic missions, the Voice of America, and Radio Free Europe and indeed for everyone who wishes to use the electromagnetic spectrum. Similar cooperation will be necessary in the future if U.S. industry is to expand its sales of telecommunications equipment and services. **Inherent in any multilateral undertaking is cooperation and compromise on the sometimes conflicting interests of parties to the process.** This is generally attainable when technical managers apply their knowledge and understanding of the limitations of the usable spectrum to maximize its use for the maximum public good.

However, the technical experts must also work in the context of the political and economic interests of the countries they represent. This is why in the ITU the West faces strong political pressures from the group of nonaligned nations which function as the Group of 77 (G-77). The G-77 is committed to using international multilateral organizations to gain economic and political power. For example, at the ITU Plenipotentiary in Nairobi in 1982, the G-77 garnered strong support for a resolution condemning Israel for its invasion of Lebanon. After long and heated discussion, the United States, citing dangers to the international management of the electromagnetic spectrum if such strictly political issues were allowed to disrupt the workings of a technical group, threatened to pull out of the ITU if the vote carried.

The resolution condemning Israel failed by a scant four votes, demonstrating the power of the G-77. However, the United States cannot use the threat of a pullout in every instance of political concern. It is certain that the United States and its allies will face similar situations more often at the series of ITU meetings to be held over the next 5 years—all of which will address issues of great importance to the United States.

How the United States presents itself, or is perceived by others to present itself, to the rest of the world at multilateral conferences is a source of some concern to Congress.[50] Yet, the question is not whether multinational organizations present the optimum means for the United States to pursue its cooperative programs, but, rather, whether the United States can use its participation in the ITU and other international organizations as opportunities for exerting leadership that would benefit the United States, including its space-related private sector industries.

Two critical issues, requiring global cooperative support, must be kept in the diplomatic forefront during this period of criticism of the U. N.: first, the White House commitment to the Space Station program and, second, the expansion of the U.S. private sector into U.N. member nations' markets for telecommunication goods and services. Those nations under criticism are now and will be in the future, in part, the same countries that NASA will eventually turn to for support and that the private sector will be asked to do business within an effort to reduce U.S. trade imbalances.

Attitudes established and policies created in one U.N. organization do carry over to others. As UN ISPACE '82 and the 1982 ITU Plenipotentiary in Nairobi clearly demonstrated, wherever possible the G-77 pursues its strategy of using U.N. and global conferences to demand changes in global resource allocation and technology t ransfer.[51]

Space Technology as a Tool for Development

Space technology has become increasingly important to some developing and newly industrialized nations because they have come to see it as a way to bypass intermediate stages of development and to become more independent of the industrialized countries. Cooperative space ventures can assist developing countries in this development process. For example, as chapter 7 points out, land remote sensing data have aided both industrialized and developing countries to achieve better control over their agricultural and forestry planning. These data have also served as a powerful tool for locating needed nonrenewable resources.

As the SITE experiment in India demonstrated, satellite communication can help countries to "leapfrog" certain older technological developments and allow countries with inadequate terrestrial communications to build a strong educational and telecommunications network.

> **Space technology can be a powerful tool to accelerate national development: it provides a way of leap-frogging over obsolete technologies and getting away from percolation and trickle--down models of development for which developing countries do not have the time. It could effectively deal with the problems of illiteracy, isolation and lack of information afflicting the development process. Depending on each country's unique social, economic, cultural and resource context, and taking account of other alternative technologies, space could play an important role in specific areas of development.sz**

Developing countries face four major difficulties in joining the "space club" in any significant way: 1) lack of capital; 2) few technically skilled

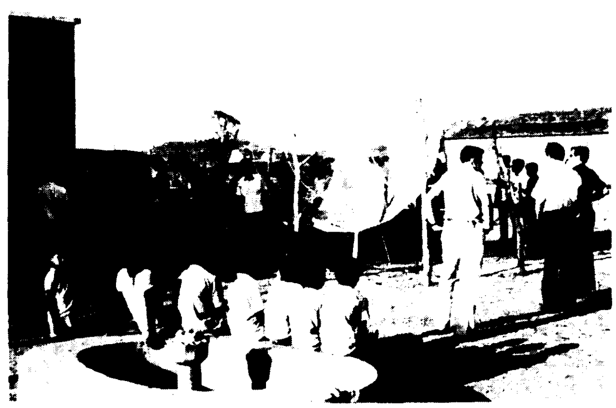

Photo credit: National Aeronautics and Space Administration

A Satellite Instructional Television Experiment (SITE) Direct Receive Antenna installed in the village of Kerelli, about 100 kilometers west of Hyderabad, in 1975.

[50] See hearing before the Subcommittee on Space Science and Applications of U.S. House Committee on Science and Technology, 97th Cong., July 14, 1982; hearing before the Subcommittee on International Operations of U.S. House Committee on Foreign Affairs, 98th Congress, Feb. 22, 1983.

[51] *UNISPACE '82: A Context for Cooperation and Competition,* op. cit., p. 49.

[52] Report of th, Second United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, Aug. 9-21, 1982, U.N. A/CON F.101/1 O; paragraph 11.

personnel; 3) small scientific support base (computers, facilities, etc.); and 4) the need for stable government and policymaking apparatus committed to the long-term political and financial support of space. In addition, because of these impediments to using space technology, developing countries also have difficulties in forming and participating in stable multinational associations for using space.

One of the trickiest political issues for developing countries relates to the difficulty of relying on foreign assistance without becoming overly dependent on, or influenced by, the donor country. India, for example, has judiciously employed the assistance of both East and West over the past 15 years, while working toward an independent space capability. The People's Republic of China has attempted to do the same, though its unstable internal politics has prevented China from taking full advantage of all the external aid it might have received in developing indigenous space capabilities.

Developing countries have shared in the benefits of space technology by using satellite communications for international telecommunications (primarily via INTELSAT-see ch. 6) and tracking weather patterns using meteorological satellite data (see ch. 7). Some have also begun to make limited use of Landsat data. Most developing countries depend heavily on foreign aid to support applications of both the Metsat and Landsat data.

Major cooperative options available for developing nations are likely to continue to fall between those offered by the United States and the U.S.S.R. ESA, as a multinational coordinating body, has no mechanism for funding foreign aid to developing countries, nor does it solicit foreign proposals (other than from the United States or the Soviet Union and Japan) for cooperative missions. Individual European nations do carry on cooperative activities in space on a bilateral basis with developing countries, especially with former colonies, and though these are often of significant value to the recipient country, the overall amount of assistance is small compared to that offered by the United States or the Soviet Union. Japan is not likely to seek a wide variety of cooperative bilateral agreements with less capable nations, as its tightly defined program is highly national in character and Japan engages in cooperative programs only for clear, pragmatic returns. However, it has engaged in a limited number of multinational projects. It is most likely to cooperate with other nations in the Western Pacific Rim.

India, with its highly successful, if small, indigenous space program, and its influence in the G-77, is an obvious potential partner for cooperative activities with smaller countries. However, lack of available capital limits what it can do. China, which has offered to cooperate in launching other Third World satellites and in developing joint space systems when its own abilities have matured, could be a major force in cooperative activities in a decade or two.

Developing countries need general education in mathematics, science, and technology; direct training with space technology; and funding for equipment in order to overcome their deficiencies in being able to put space technology to work in their economies, Though they have used a variety of multilateral platforms within and without the United Nations to press their case for greater assistance from the industrialized nations, they have made little headway in obtaining support for broad multilateral help from the United States, From the U.S. standpoint, bilateral and limited multilateral cooperation are preferable to blanket extensions of technology sharing to a wide variety of parties because the former two modes allow for greater specificity in meeting the needs of both the donor and recipient.

The United States has less to gain from broad multilateral cooperation because the direct political and economic benefits to the United States are less clear. Nevertheless, the developing countries are pressing for greater multilateral cooperation. The United States might gain political and economic benefits by offering to fund more multilateral educational programs, supported in part by private industry. The U.S. Telecommunications Training Institute (USTTI) is one example of the sort of training that might be offered. In the USTTI, expenses are shared by the U.S. Government and the telecommunications companies that participate in the program.

This issue is tied directly to the question of how the United States should participate in the United Nations. U.N. assistance in technology development is necessarily multilateral. Yet, in contributing to development programs, the United States loses much of the control over the funding and nearly all of the credit for having provided the funding. Thus, it is loath to contribute to development programs within the U.N. structure, particularly if the funding is used on projects the United States would not otherwise agree to or to support the U.N. bureaucracy. If the United States were to contribute more heavily to multilateral assistance, it would certainly wish to do so in circumstances in which it could exercise more control over funded projects.

Cooperation in the Face of Competition

Cooperative agreements with other industrialized countries have always been undertaken for a different set of reasons and under a different set of guidelines than those with developing countries; in addition to the considerable political benefits accruing from cooperating with our allies, considerations of saving U.S. costs and of exchanging engineering know-how have been important. However, in recent years those industrialized countries with whom we cooperate have also become commercial and scientific competitors. Thus, as noted elsewhere in this report, the terms on which we might wish to cooperate with the industrialized, space-capable nations have altered. Because of their increased capability in space our new competitors have something to teach us, The possibility for cost-saving and sharing engineering and scientific know-how have become more important than they once were.

Although by cooperating with other space-capable nations the United States can accomplish important technological goals, it also runs the risk of transferring certain technology to potential economic competitors. Yet the United States cannot hope to lead in all space technologies without enormous expenditures. Cooperation continues to be in the long-term economic interest of the United States. As the technology chapters discuss, precisely what policy to follow will depend on the particular technology under consideration. The competitive risks of technology transfer are high in some and lower in others. In general, however, the potential for technology transfer to the United States, or cost sharing, requires a re-examination of the terms of cooperation with the industrialized nations.

In some respects, the United States must cooperate with the western industrialized nations in order to demonstrate leadership in space. As chapter 4 emphasizes, the terms of such competition in the political realm extend not only to the western industrialized nations, but also to the Soviet Union. For example, the Soviet Union has cooperated with France in space science and in the manned space program by bringing a French cosmonaut aboard the Salyut space station. The United States has flown a German payload specialist aboard the Shuttle and will, in the future, fly French and Arab payload specialists as well as other foreign nationals.

Cooperation among competitors is well illustrated in the commercial satellite communications industry, where competitors sometimes team up for commercial reasons. For example, in the competition for supplying Arabsat, for political reasons U.S. companies were at a strong disadvantage. However, by teaming with the French firm Aerospatiale, the U.S. firm Ford Aerospace was able to capture the majority share of the contract to build Arabsat.[53]

If the United States is able to establish the private sector in the land remote sensing business (see ch. 7), the French-built SPOT remote sensing satellite will in one sense be in direct competition with a U.S. firm for high resolution data. Yet, data from the U.S. system will not have spatial resolution comparable to the SPOT data for several years. On the other hand, the U.S. system will have greater spectral capabilities. Consequently, because the competing systems serve somewhat different aspects of the overall market, it is in the interest of both to cooperate, at least, in setting data format, satellite passage, and perhaps in using the same receiving stations. The United States could promote the interests of the

[53]See ch. 6. Aerospatiale became the prime contractor and Ford Aerospace the chief subcontractor. Ford Aerospace has actually built the satellite.

U.S. data sellers and data users by encouraging cooperation between the two countries. Mechanisms already exist for such cooperation, and these could be continued and perhaps extended in some form if transfer of U.S. land remote sensing to the private sector is accomplished. As offered as an option in chapter 7, it maybe appropriate to consider establishing an international remote sensing corporation.

Because cooperation for scientific purposes can benefit all participants, it may be appropriate for the United States to seek cooperative ventures in studying materials processing in space. It might be possible to provide facilities, etc., on a cooperative basis. However, in this area, technology transfer at the production stage is a serious concern, because the potential for using U.S. technology in competition with U.S. private sector is higher. In some areas of materials processing, because of European experience, the United States could be in a position to gain technology from the Europeans.

in activities such as meteorological or ocean remote sensing where the public interest is paramount, interdependence and cooperative arrangements are and will remain highly productive. For example, the United States is now attempting to develop a cooperative meteorological polar orbiter system with the Western industrialized countries (see ch. 7). This is a form of cooperation that would not have been possible before the Europeans and the Japanese developed the ability to compete with us in designing and building space systems.

As noted in chapter 9, space science has also become an arena for competition among nations. However, space science remains the most active area for government-to-govern ment cooperation, for the purpose of saving costs as well as for increasing understanding among nations and furthering scientific knowledge. Chapter 9 details the many cooperative ventures in space science that the United States has carried out or has planned with other nations.