SIGNIFICANT DEVELOPMENTS IN SPACE LAW: A PROJECTION FOR THE NEXT DECADE

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Ongoing Space Programs in 1980

Basically, the main elements of ongoing space programs may be divided into five categories: applications of space technology, space science and exploration, space transportation, space tracking and data acquisition, and related technologies research and development.

"Space applications" is an encompassing term including many current activities of both national and international character. Employment of satellites for communication purposes is perhaps the best known, most widely used of space applications. There are five countries with totally independent national communication satellite systems: U.S.S.R., Canada, the United States, Indonesia and Japan. In all of these countries the systems provide point-to-point relay of telephone, telegraph, facsimile, television and data services, and in some countries there are dedicated facilities used for both radio and television broadcasting. There are at least fifteen countries, maybe more, that use the multilaterally owned spacecraft of the International Telecommunications Satellite Consortium (INTELSAT)[1] for domestic communication services with wholly owned national earth station complexes. There are some countries involved in regional systems for satellite communication and there are more than one hundred and twenty-five countries using international satellite systems to help meet their global communication requirements.

"Space applications" also include meteorological satellite systems, which can collect and deliver broad-area cloud cover pictures, meteorological data and certain kinds of time-sequence imagery of weather patterns. Combined with ground-acquired data and computer systems, these space systems have permitted greatly improved capability to find, analyze and predict meteorological phenomena.

Another important "space application" is the sensing of the earth's surface from space, whether land or water. Nations use both active (radar) sensing systems and passive (latent or reflected electromagnetic radiation) sensing systems, and data is collected that is useful for cartography, crop inventory, forestry, land management, pollution control, geographic, geologic, and oceanographic work, to mention only some of the important uses. Developed and developing countries gain substantially from the use of such earth sensing data collection systems.

There are other more specialized "space applications," including mobile, maritime and aeronautical communications; surveillance and verification systems; navigation systems; continuous surface and atmospheric monitoring data relay systems;

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[1]Agreement Relating to the International Telecommunications Satellite Organization, INTELSAT, with Annexes, [1971] 23 U.S.T. 3813, T.I.A.S. 7532.

and amateur radio relay. "Space applications" also include experimental work done in laboratory environments, as in Apollo spacecraft, Skylab, Soyuz, and Salyut, and in the Apollo-Soyuz Test Project of 1975. This includes materials processing for crystal growth, alloy mixing, pharmaceutical blending and, eventually, manufacturing processes that can turn a near zero-G environment or a near perfect vacuum into an advantage, or a medical or surgical benefit.

All of these "space applications" represent what we know and what we believe we can do and, in some cases, are doing today. But experience teaches us clearly that it is likely that we will discover new applications, new systems, new technologies and new uses, that have not yet crossed our minds. We are not at the end of our experience with "space applications," we are just beginning!

In the area of "space science and exploration," we are also only just beginning. We are beginning to perceive the intricate, complex relationship between the earth and the sun; the nature, flow and effects of the solar wind, solar flares and extra-solar radiation sources. We are still measuring and defining the near-earth environment in space, essentially the characteristics of the cis-lunar sphere, lying within the distance from the earth to the moon. And, we are beginning now to digest and appreciate what we have learned about the moon itself—its composition, history, value to and relationship to the earth. We are gaining a clearer view and better understanding of the planets of our solar system and their many satellites. And we are learning a great deal about extra-galactic space, the nature and life cycle of stars and nebulae, the composition, behavior and interrelationships of galaxies, and we are discovering anomalies and new mysteries such as pulsars, quasars and black holes!

It can be said of "space applications" and "space science and exploration" that nations have enjoyed and benefited from a wide range of successful, productive international cooperative programs in these areas. Major new institutions have arisen to carry out space applications programs and some important new organizations are emerging in the space science areas, institutions like the Lunar and Planetary Institute in Houston, Texas, and the contemplated astronomical institute to collect, analyze and archive data to be acquired by the planned 2.4-meter space telescope now being built. Space dependent organizations like INTELSAT, Intersputnik, the European Space Agency (ESA), INMARSAT and the Arab Communication Satellite Corporation didn't exist twenty years ago, but they do and can provide vital global and regional services to many countries.

As a contrast, in "space transportation," for reasons of national security interests, proprietary interests, national prestige and economics, there has not been the extensive sharing of technological know-how and experience that characterizes space applications and space science. In "space transportation," some nations have preferred to retain their independence and autonomy and there has been a more apparent spirit of competition. Early in the spaceflight era, i.e., in the early 1960's, the United States opened access to its launch capabilities to all nations, and in 1972, the President of the United States formally declared such availability to the entire world, for peaceful applications on a non-discriminatory basis.

Today, in the "space transportation" area, new regional and national launch competence is being demonstrated. In addition to the major launch programs in the U.S.S.R. and the United States, there are modest capabilities in other countries to orbit more limited payloads, such as in France, China and Japan, and an important new regional capability was successfully demonstrated on December 24, 1979, when ESA successfully launched Ariane-1 from the jointly sponsored launch range located in Kourou, French Guiana. The United Nations Committee on the Peaceful Uses of Outer Space reviewed in some detail, for the first time last year, the status of space transportation systems, their development and availability to member states. The United Nations will and should continue to monitor the activities of states in regard to use of and sharing of space transportation capabilities.

The United States is moving forward in its development of a reusable space orbiter known as the Shuttle. This remarkable vehicle represents a major new step in the technology of space transportation and, not surprisingly, it is experiencing some temporary delays in the process of proving a wholly new, significantly improved launcher capability. But such problems are to be expected in so complicated and sophisticated an undertaking.

The Shuttle will add a major new capability to the world's stable of launch vehicles. With 60,000 lb. payload capability and up to 30 days orbital stay time, combined with ESA's nearly completed Spacelab, it will offer a shirt-sleeve working environment, on-orbit, for astronaut-scientists who are now in training. The Shuttle's technological development is possibly the most important event that will occur in space transportation in the next decade.

In "space tracking and data acquisition" programs, too, a new era is dawning. Whereas in the 1960's and 1970's spacefaring nations had to locate tracking stations in many countries, in aircraft and on ships at sea to keep track of and communicate with spacecraft and space vehicles, we will soon see, deployed by the United States, a new system for tracking and data acquisition, based upon geostationary satellites located above the Atlantic and Pacific Oceans. The new Tracking and Data Relay Satellite System (TDRSS) will be commercially operated and leased to NASA on a dedicated basis to support missions involving U.S. originated spacecraft and Shuttle operations. Of course, the current NASA Deep Space Network (DSN), which employs large disk antennae at earth stations in Australia, California, and Spain, will continue to serve space missions beyond the coverage capability of the TDRS system.

Coming then to "space technology research and development" we really come inexorably into the realm of prediction. What will happen next? What will nations independently and cooperatively do? With what legal consequences and implications? But before describing what I believe will occur legally in the decade of the 80's, permit me to briefly sketch the space technology of the 80's.

Technological Developments in the Next Decade

We need not worry whether or not space technology will be developed—it will. National and cooperative international programs will continue to drive developments to lower costs, increase reliability, enhance survivability, increase flexibility and increase access to space services and systems. Especially in applications areas such as meteorology, communications, remote sensing, navigation and materials processing, major new strides will be taken, even by nations other than the United States and the U.S.S.R. Nations will continue to develop scientific instrumentation, sensors, detectors, recorders, analytical tools and skills to increase our learning speed and ability in space science and exploration. For the reasons enumerated above, selected nations will forge ahead in development of new, less costly, more reliable, capacious launcher systems. Space transportation will continue, however, to be an area characterized by limited cooperation, closely controlled sharing of know-how and preciously guarded technologies. Depsite these limitations, I believe there will be more choices of launch service sources and more diversity of capabilities. I have privately expressed the opinion to close associates for several years that in due course the U.S.S.R. will enter the market of launch services as a provider. The Russians still have a great deal to learn about how to work with other non-communist nations in cooperative arrangements.

As the 1980's unfold, in addition to continued concentration on non-manned, service-oriented systems, I believe nations, preferably in groups, will renew attention to problems and technologies associated with man in space. Manned facilities will be developed for research, work and construction stations in low earth orbits (LEO), probably no higher than 500 miles. There will be improved technologies for power supplies, power storage and eventually (possibly by the turn of the century) power transmission to the earth's surface. Manned and unmanned orbital transfer vehicles will be developed to facilitate movement of persons and supplies between and among various orbits and orbital locations. New fabrication devices are going to appear, along with sophisticated remote manipulator systems.

Of course, while these technologies are being developed and tested we will also have to learn more about the effects of long stay time on man. We will add to our biological, physiological and psychological understanding of ourselves. An important new space technology spin-off will appear on earth—the automation to do routine work and repetitive functions. But they will not cost millions of dollars, as they have in the past; they will cost a few hundred dollars. New and/or better biological processes will be developed for food production, waste recycling and other life-support related functions. A new industry in space recreation will begin to emerge. There will be a flow-back to earth of benefits derived from new, strong, light-weight materials and new methods of collecting and converting solar energy to other usable forms. We will learn how to construct new habitats that will become "trendy" on earth, new clothes, new food forms. To be sure, we may not see *all* of these kinds of things within a decade, but short of some unforeseen cataclysm or a major, devastating war, these things may be expected to occur because they are the logical extension of the history of man. Such things as major manned stations in high earth orbit or at geosynchronous altitudes, solar power satellite systems, manned colonies in space are not beyond man's capability or beyond our capacity to realize, though admittedly, they are somewhere beyond the next decade!

Space Law in the Next Decade

Turning now to the questions raised earlier about the law, legal needs, legal implications, legal consequences of all these amorphous speculations, the next ten years of space law will not be a period of isolated development. It will be a period of growth, based on current foundations, and it will be a period of adaptation and creation of concepts to meet new needs. In the last fifty years, the world's legal community has produced a body of space law, some parts in isolation at first, through orchestrated harmonization and accommodation. After a period of exploration and speculation in concepts and principles, prior to the first orbiting of a manmade object in 1957, there came a period of definition and consolidation of fundamental principles. After a number of major declarations in the form of U.N. General Assembly Resolutions, the Outer Space Treaty of 1967[2] emerged. There then followed a period of elaboration and regulation. We are still in that phase of legal development, and we will be for an indefinite time. In these evolutionary phases the newest separable phase has only recently opened. It may be called the extraterrestrial law phase, beginning in December 1979, when the U.N. General Assembly promulgated the Moon Treaty.[3]

While separate national legislatures dealt in separate ways with perceived needs for national law based on levels of national activities related to space, international law began to grow into the body of space law known today, almost immediately after the first Sputnik launch. The international law began through bilateral contracts, arrangements and agreements. These evolved and paralleled regional developments that generated new regional organizations and agreements; and, in due course, the United Nations took on the central role of global coordination and formalization of new global treaties. Regulations began to emerge along with the new regional global organizations created to develop and exploit the technology.

To understand what will happen in the next decade, a clear picture of the current foundation is essential. The main strut in the foundation of international space law is the 1967 Outer Space Treaty.[4] From principles enunciated therein came the Rescue and return Agreement of 1968,[5] the Liability Convention of 1973[6], the Registration Convention of 1976,[7] and, in substantial measure, the Moon Treaty of 1979.[8] But there were, in addition, other events and legal activities of import, such as the 1959 World Administrative Radio Conference, the 1963 Extraordinary Administrative Radio Conference, the 1964 INTELSAT Conference, the 1971 World Administrative Radio Conference on Space Communications, the 1971 Intersputnik Agreement, the 1977 World Administrative Radio Conference on the Broadcasting Satellite Service, the 1977 INMARSAT Conference and the 1979 World Administrative Radio Conference. All of these conferences and agreements may be only a prelude in comparison with world radio conferences now scheduled and anticipated in the 1980's. Also, activities of the General Conferences of UNESCO during the 1970's deserve to be mentioned as important

[2]Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies (hereinafter "Outer Space Treaty"), Jan. 27, 1967, [1967] 18 U.S.T. 2410, T.I.A.S. 6347, 610 U.N.T.S. 205 (effective Oct. 10, 1967).

[3]Draft Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (herein referred to as the "Moon Treaty"), U.N. GAOR, 34th Sess., Supp. No. 20, Doc. A/34/20 (1979).

[4]Outer Space Treaty, supra note 2.

[5]Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, April 22, 1968, [1969] 19 U.S.T. 7570, T.I.A.S. 6599, 672 U.N.T.S. 119 (effective Dec. 3, 1968).

[6]Convention on International Liability for Damage Caused by Space Objects, March 29, 1972, [1973] 24 U.S.T. 2389, T.I.A.S. 7762 (effective Oct. 9, 1973).

[7]Convention on Registration of Objects Launched into Outer Space, Jan. 14, 1975, [1978] 28 U.S.T. 695, T.I.A.S. 8480 (effective Sept. 15, 1976).

[8]Moon Treaty, *supra* note 3.

contributors to the understanding of predictions for the 1980's. Apart from these meetings other plenipotentiary conferences and conferences of a constitutional nature should be recalled, including the Conference to formulate the law of the sea.

For an attentive student of space law, the last two decades may appear to have been a hectic but undeniably productive time. From now on the productivity level for international space law may be expected to show a decreasing growth rate with a possible leveling of the curve toward the end of the next ten years. But as international space law creation stabilizes, a new series of national and regional laws and arrangements will emerge. New national and international laws will be discussed or proposed to deal with such matters as: insurance and liability claims; protection of patents and proprietary rights originating in space; codes of conduct and possible international criminal law to regulate man's behavior in space, new forms of sanctions for non-respect of laws; new institutional forms to facilitate more and better international cooperation; standard or model contracts or agreements for purchase or lease of space-related services; regulations for specialized space-based services; regulations for piloted vehicles moving about in space; regulation of the use and exploitation of extraterrestrial resources; settlement regulations for persons interested in relocating in space, and international registration procedures for persons, vehicles and activities in space. The United Nations will continue to provide the central focus for international coordination and reporting of space-related activities and, in my opinion, the next decade will see the establishment of a new U.N. agency to deal with man's activities in space.

One major problem that will demand the best and most creative of all our skills, is how we will implement the new regime of "common heritage." Mankind, collectively, has a great deal to learn about and to gain from space, the space environment and space resources. We appear to have unanimously agreed that the 19th century's model of exploitation and conflict cannot be tolerated in the 21st century. But it must be understood that if there is to be no domination by a few countries, there reciprocally must be no domination by the majority.

The key concept for realizing the use and benefits of space is *equity*. Benefits cannot flow to the indolent. Non-contributors can take no measure of satisfaction from the labors of others. Opportunities must be nondiscriminatory and there must be a possibility for all to contribute to and share in endeavors in space. But returns must reflect contributions. There is no "free lunch."

The benefits of space are to be available to all nations, regardless of their levels of economic development; that is agreed. But that should not be read to mean that every nation has a right to share equally in benefits regardless of contribution. The international community still has some important clarifications to address in this area of equity. Hopefully, major strides regarding equity will be made within the next ten years.